

Digital trade harnessing Artificial Intelligence; implications and future direction

By

EUM, Min Yong

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

MASTER OF DEVELOPMENT POLICY

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ABSTRACT

In the first two decades of this century, we witnessed the most innovative and influential development of data-driven AI technologies including digital trade harnessing artificial intelligence. However, only a few studies have focused on the intersection between digital trade, AI, and big data- a term often quasi-synonymously used with AI. Nonetheless, this is an important emerging field and disruptive technology.

The study adopts a mixed analysis to answer the research questions. The study analyzes emerging fields such as digital trade and artificial intelligence and its intersections. Although there are problems of relating to lack of recent empirical studies on intersections between digital trade and AI, the study does suggest trust regulatory environment for international collaboration using trustworthy AI in the digital trade given conditions 1) ongoing fierce competition between the US and China, and also 2) relatively weak moderating role by the EU. Asia-Pacific initiative by Singapore, Australia, Japan and South Korea might be a potential alternative to devise regulatory frameworks for AI, although getting a consensus and reaching an international agreement are becoming difficult among the major players.

Key words: Digital trade, AI, Regulatory frameworks, Asia-Pacific initiative.

List of Abbreviation

AI	artificial intelligence
AIA	Artificial Intelligence Act
APEC	Asia-Pacific Economic Cooperation
CBPR	Cross Border Privacy Rule
CPTPP	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
DEA	Digital Economy Agreement
DEPA	Digital Economy Partnership Agreement
DFAT	Department of Foreign Affairs & Trade
DFFT	Data Free Flow Trust
DPA	Digital Partnership Agreement
DTAs	Digital Trade Agreements
EPA	Economy Partnership Agreement
EU	European Union
FTA	Free Trade Agreement
GATT	General Agreement on Tariffs and Trade
GATS	General Agreement on Trade in Services
GDP	gross domestic product
GDPR	General Data Protection Regulation
GPAI	Global Partnership on Artificial Intelligence
HAI	Human-Centered Artificial Intelligence
ICCPR	International Covenant on Civil and Political Rights
IDRC	International Development Research Center
IEC	International Electrotechnical Commission

IEEE	Institute of Electrical and Electronics Engineers
ISO	International Standards Organization
ITU	International Telecommunication Union
JSI	Joint Statement Initiative
JUSGDCP	Japan-US Global Digital Connectivity Partnership
KEUDTA	South Korea-EU Digital Trade Agreement
KSDPA	South Korea-Singapore Digital Partnership Agreement
MFN	Most Favored Nation
NT	National Treatment
OECD	Organization for Economic Cooperation and Development
RCEP	Regional Comprehensive Economic Partnership
RTA	Regional Trade Agreement
SADEA	Singapore-Australia Digital Economy Agreement
SATFA	Singapore-Australia FTA
SDGs	Sustainable Development Goals
SLR	systematic literature review
TAPED	Trade Agreements Provisions Electric-commerce Database
TRIPs	Agreement on Trade-Related Aspects of Intellectual Property Rights
UKSDEA	UK-Singapore Digital Economy Agreement
UNESCAP	United Nations Economic and Social Commission for Asia and the Pacific
US	United States
USMCA	US-Mexico-Canada Agreement
WEF	World Economic Forum
WTO	World Trade Organization

Chapter 1. Introduction

Digital trade using Artificial Intelligence (AI) technologies is rapidly increasing. There is no single agreed definition of digital trade, however, it is defined by various inter-disciplinary research communities as an international trade that can be transacted digitally, similar to e-commerce, by harnessing disruptive technologies including trustworthy AI that could drive massive transformations and disruptions in the next few years. The COVID-19 pandemic further accelerated the digital trade transition in a wide range of sectors such as AI-powered machine translation, logistics, smart warehousing, finance, and insurance sectors across the world. According to the World Trade Organization (WTO) estimates (2023), during the COVID-19 pandemic in 2020-2021, the total export volume of digitally enabled service increased by 14% compared to the previous year, and e-commerce sales have also skyrocketed.

Few studies have focused on the intersection between digital trade, AI, and big data, often quasi-synonymously used with AI (e.g., Peng et al, 2021). According to Nemoto and Lopez-Gonzalez (2021), regulatory frameworks for digital trade harnessing trustworthy AI are becoming increasingly complex and specialized. For instance, Free Trade Agreements (FTAs) and Regional Trade Agreements (RTAs) are getting steadily more provisions on data flows, data localization, and protection of personal information, which are at the heart of data-driven innovation. Data is a new capital for the digital trade and economy; thus, disciplined access to global data flows and data ecosystem have become increasingly important. However, there is little information about human-centric approach to AI governance and trusted data sharing framework (e.g., Data Free Flow with Trust (DFFT), Asia-Pacific Economic Cooperation (APEC)'s Cross Border Privacy Rule (CBPR) and European Union (EU)'s General Data Protection Regulation (GDPR)). It would be obvious, therefore, that further investigations are

needed in order to address fundamental challenges for global communities to meet international regulations such as WTO rules including ongoing plurilateral negotiations for Joint Statement Initiative (JSI) on e-commerce, Organization for Economic Cooperation and Development (OECD)'s AI Principles and AI Policy Observatory, Digital Economy Agreement (DEA) and Digital Economy Partnership Agreement (DEPA), which is the world's first plurilateral digital trade agreement, for AI-based digital trade.

The aim of this paper, ultimately, is to demonstrate potential leadership of the so-called "Asia-Pacific (e.g., Singapore, Australia, Japan, and South Korea) Initiative" to build a comprehensive framework of global standard for a digital trade as well as sustainable regulatory framework for harnessing AI in the digital trade. In particular, it examines the following questions: **(RQ1)** Can the competition between the United States (US) and China in AI-driven innovation build an international consensus in the digital trade which contribute to global trading system (e.g., WTO's "General Agreement on Tariffs and Trade" (GATT), "General Agreement on Trade in Services" (GATS) and "Agreement on Trade-Related Aspects of Intellectual Property Rights" (TRIPs))? **(RQ2)** If WTO law does not prove to be effective for an edge-cutting AI technologies under the competition between the US and China, how can the EU's role contribute to devise global standards for disruptive AI technologies among the US, China, and EU? **(RQ3)** How can the international communities address the controversial use of trustworthy AI technologies with a sense of urgency?

The plan of the paper is as follows. Chapter Two describes the key elements of methodology. Chapter Three is divided in three sections. Section one reviews strategic competition between the US and China to take global leadership in digital trade harnessing AI in terms of cross-border data flows, data localization and personal information protection under the WTO legal frameworks. And it also provides an overview of the global responses to such

competition between the superpowers. This is also followed by an intensive discussion on devising sustainable regulatory frameworks by the EU as well as WTO's Information Technology Agreement (ITA) and RTAs in Section two. Section three examine the legitimacy of WTO and RTA's regulatory framework for digital trade harnessing AI, and also importance of the so-called "Asia-Pacific initiative" which is also rapidly emerging in the digital trade. The final Chapter offers recommendations for the future direction of international cooperation on harnessing trustworthy AI in digital trade.

Chapter 2. Methodology

The study adopts a mixed analysis to answer the research questions in order to analyze effectively emerging fields such as digital trade and artificial intelligence and its intersections. Although there are problems of relating to lack of recent empirical studies on intersections between digital trade and AI, I have conducted a systematic literature review (SLR) and also combined a qualitative analysis with a quantitative analysis. This involves the qualitative approach in answering research question 1 and 2. As shown in Figure 1, I found relevant articles, working papers and detailed information about intersection between digital trade and AI, which focus on devising sustainable regulatory frameworks for the use of AI in digital trade. This basic search was done mainly from the Central Library of "the KDI School of Public Policy and Management" (KDI School), Google Scholar by searching under keywords (e.g., "AI and digital trade", "Regulations on digital trade", "Regulatory frameworks for AI"). Therefore, in total 69 academic papers excluding grey literature were identified from my initial screening, and finally 25 papers were selected through the full process of screening. I have read 25 papers, which was published since 2017 and also available in English only. Out of the 25 papers, 11

papers were focused on research question 1 and 6 papers were centered on research question 2 (see Figure 1, bottom left panel). However, there are very few studies, to date, on intersections between digital trade and AI and big data. The lack of empirical study is probably a consequence of fundamental disagreements about the global regulatory framework for trustworthy AI, which is mainly based on human-centric sustainability, between the US, EU, and China.

I have also read extensively about the research topic (e.g., digital trade harnessing AI and its regulatory frameworks) through working papers, annual reports on the websites of related governments and agencies (e.g., “Office of the United States Trade Representative” (USTR), EU and European Parliament, Ministry of Commerce & Ministry of Industry & Information Technology of China, and Ministry of Trade & Industry of Singapore, Department of Foreign Affairs & Trade of Australia, and Ministry of Economy, Trade and Industry and Ministry of Internal Affairs and Communication of Japan, and Ministry of Trade, Industry and Energy of South Korea) as well as multinational organizations (e.g, WTO, World Bank, OECD, UNESCAP) to effectively analyze their responses, which will be tremendously important for digital trade harnessing AI in the near future.

To answer the research question 3, I used the quantitative analysis that adopts the AI Readiness Index published by “Oxford Insights” and along with “the International Development Research Center” (IDRC), created the Index for the first time in 2017, to measure government readiness to implement AI in the public sector. There are three pillars such as Government, Technology sector, and Data and Infrastructure, and also 39 indicators to measure regularly. To be specific, Government pillar is comprised of 4 dimensions such as governance & ethics, vision, digital capacity, and adaptability while Technology pillar consists of

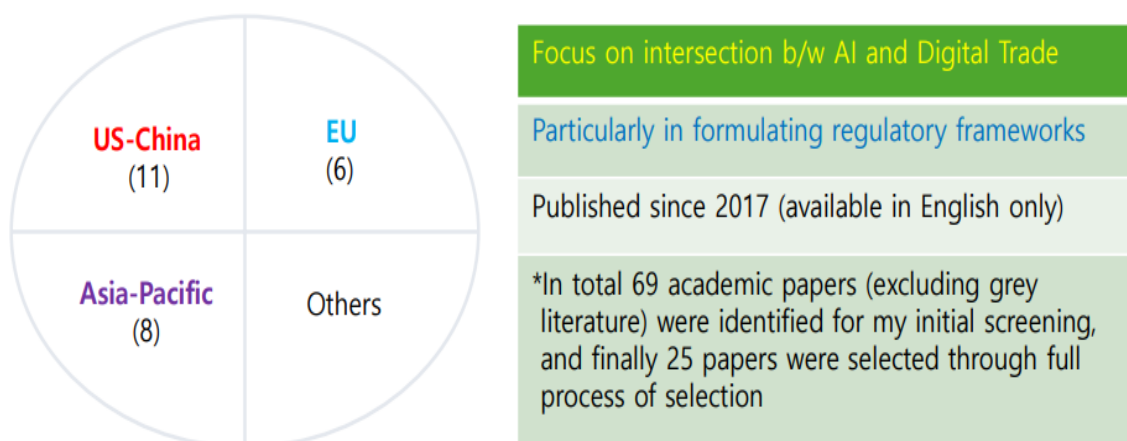
innovation capacity, human capital and maturity, and also Data & Infrastructure pillar consist of data representativeness, data availability and infrastructure respectively.

As can be seen in Figure 2, it is clear that Singapore, Australia, Japan, and South Korea are Top 10 in AI readiness index almost continuously since 2017 (first annual report of AI readiness Index) to demonstrate their potential leadership of so-called “Asia-Pacific Initiative” in order to formulate regulatory frameworks globally for disruptive AI technologies.

Figure 1. Research Method: Qualitative plus Quantitative analyses

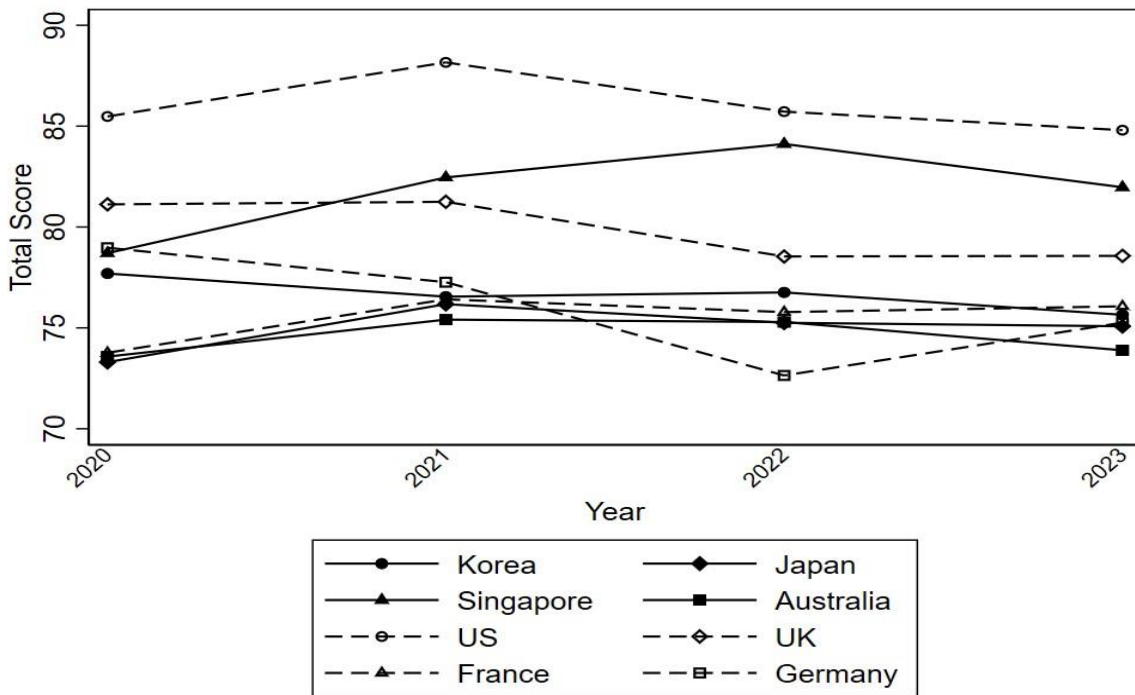
- Qualitative Method (Mainly for RQ1/RQ2)

- ① KDI School (Central Library) <12>
- ② Google/Google Scholar <54>
- ③ Multinational Organizations websites (World Bank, OECD, UN ESCAP) <3>
- ④ Government websites (mainly related to AI and Digital Trade in the ministries and agencies of US, China, EU, and Singapore, Australia, Japan, and South Korea)



- Quantitative Method (Mainly for RQ3): Data analysis from AI Readiness Index 2020-2023

Figure 2: AI Readiness Index Rankings (2020-2023)



*Author's analysis based on AI readiness Index 2020-2023

To the best of my knowledge, to date, there is no data published to describe explicitly intersection between AI and digital trade. The lack of empirical study is probably a consequence of fundamental disagreements about the global regulatory framework for trustworthy AI, which is mainly based on human-centric sustainability, between the US, EU, and China.

Chapter 3: Results

3.1 Use of AI technologies under strategic competition between the US and China

In the first two decades of this century, we witnessed the most innovative and influential development of data-driven AI technologies, particularly for data-intensive sectors,

better supply-chain management, and lower trade costs, by AI-powered machine translation, generating efficiencies in the logistics, and financial sectors. Although AI can benefit humanity, society, and global community, it can also contribute to significant challenges if proper regulatory actions are not undertaken. Furthermore, there is still fierce competition between the US and China to take the leading role in AI driven technologies including formulating global regulatory frameworks for the use of AI based on their own regulations and standard rules (e.g., cross-border data flow, data localization, and privacy protection etc.), that is to say, the US is an example of “free flow data first” while China’s “security first” continues to China’s focus. It is widely recognized that the WTO’s GATT, GATS, and TRIPs are not the appropriate international trading systems for regulating many aspects of issues central to the AI and Big Data.

When it comes to competition in AI regulation between the US and China, there are the so-called “Big Nine” as it comprised of “G-MAFIA” such as Google, Microsoft, Amazon, Facebook, IBM, and Apple that all originated in the US and “BAT” such as Baidu, Alibaba, Tencent from China (Webb, 2019). This ongoing competition between G-MAFIA and BAT includes a competitive environment for potentially disruptive AI-driven technologies (e.g., regulatory frameworks for AI in digital trade).

Several studies have found AI driven technologies have been controversial both politically and economically between the US and China despite mutual interests in many fields (Zhou, 2019; Fernyhough, 2019; Ryan et al, 2019). First, there has been much ongoing tension between the countries over posing restrictions against China’s TikTok application and Chinese Huawei’s 5G networks. The US Secretary of State’s statement delivered in July 2020 included the US proposed restriction against TikTok being installed on US mobile phones. According to the US administration, TikTok has collected users’ personal data for use by the Chinese

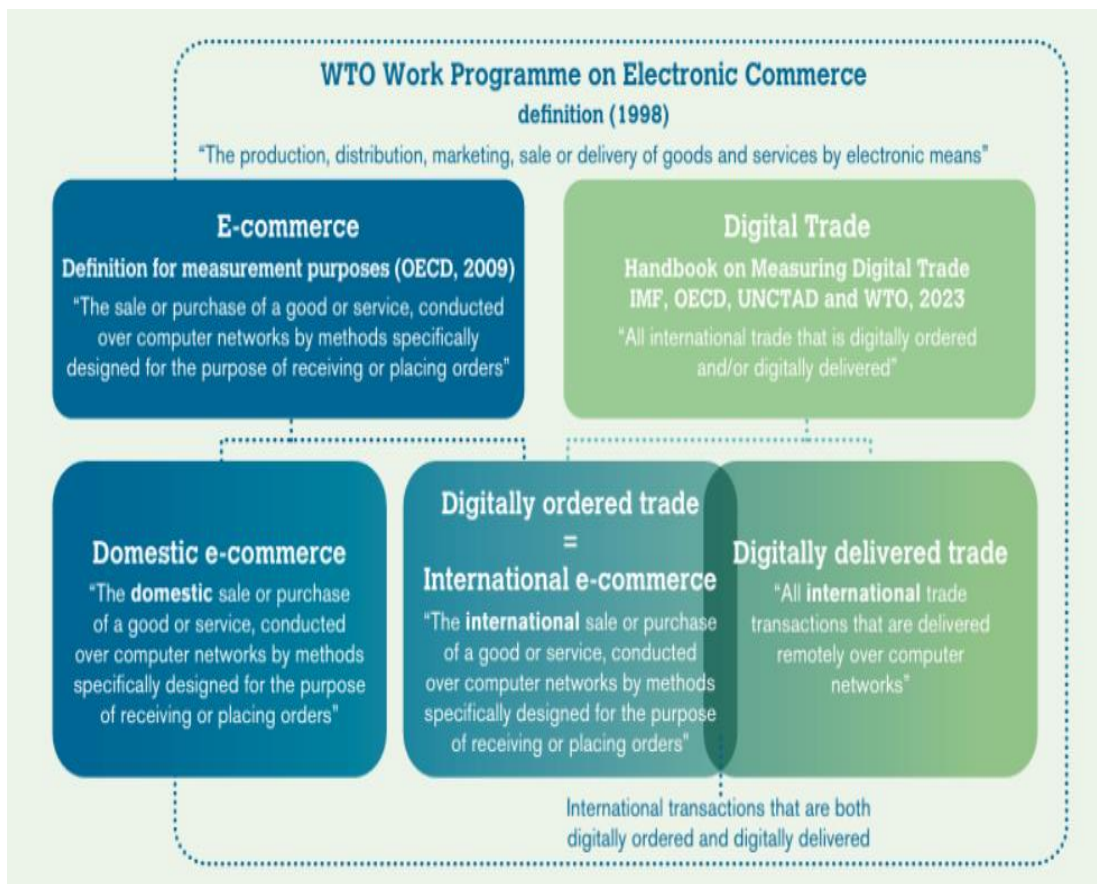
government. However, TikTok has repeatedly emphasized that the ban is based on a misconception of the application and has also denied sharing information with Chinese officials.

Furthermore, amid growing concerns over its network and data security in the US, Huawei, the Chinese 5G network equipment manufacturer, was excluded from the plan of SK Telecom and Korea Telecom, the Korea's top two wireless providers, to construct nationwide commercial 5G infrastructure. However, it remains unclear whether Australia's ban on Huawei is indefensible under the WTO law. These two cases have been investigated by many researchers (e.g., Zhou, 2019). They have indicated that the US and Australia breach "Most Favored Nation" (MFN) or "National Treatment" (NT) rules, which are some of the most important principles of WTO.

Although the AI technologies have great potential, there is little sign that they have yet affected aggregate productivity statistics. For example, there were about 2.2 million employees working in the 6,800 call centers in the US as well as hundreds of thousands of home-based agents in India and Philippines as of 2015. New developments in voice- recognition systems using AI technologies have improved customer service drastically, hence they can handle 60-70% of the calls by AI-based tools (e.g., IBM's Watson). According to Brynjolfsson et al (2017), while AI technologies increased US labor productivity by 1%, they reduced the numbers of employees by 60%. Nonetheless, it is projected that there will be an astounding 16% increase in global GDP introduced by AI-driven technologies by 2030 (McKinsey Global Institute 2019).

As shown in Figure 3, WTO has launched their "Work Programme on e-commerce" in 1998, to date, however, has been only implementing a temporary moratorium on customs duties on e-commerce, which is not purely based on WTO legal frameworks but also obviously political commitment (Kariyawasam, 2007).

Figure 3: E-Commerce & Digital Trade– basic definitions



(Source: Digital Trade for development, OECD UN World Bank WTO, 2023, p 11)

3.2 The EU’s role for Sustainable Regulatory Frameworks

In the views of many scholars, the EU as a whole has a relatively limited competitive advantage to compete with the US and China, which are taking leadership roles in AI-driven technologies. This is mainly due to absence of global big-tech companies (e.g., Amazon, Alphabet, JD.Com, Meta, Alibaba, Tencent, ByteDance), a not-so-big and fragmented market, and only small investment from outside of EU, which leads to a widening gap between the EU and the leading countries in terms of disruptive AI-driven innovation. Although the EU has still

lead research and development (R&D) fields with strong technical and industrial bases, which can contribute to catch up with their potential competitors, and also substantial progress in formulating rules and regulation not to misuse of disruptive controversial AI and Big data. The EU's GDPR and newly approved "Artificial Intelligence Act" (AIA), which has been dubbed the "mother of all AI laws" (Heikkilä, 2022), are good examples of showing EU's potential leading role to protect personal information, although the EU has not specifically commented on its status, compared to the US and China yet.

The most recent generation of EU FTAs contains chapters on E-commerce and digital trade, under which the parties affirm that AI systems should include safeguards in line with democratic values (e.g., human rights, rule of law, and diversity). The discussions among EU member states helped pave the way for the OECD AI Principles, which was first adopted in 2019, and the associated work launching OECD AI Policy Observatory and AI networks of experts in 2020. This situation has resulted in intensive negotiations for new AI-based regulatory frameworks. Furthermore, OECD has clearly stated in their principle 1.2 of the OECD AI principles (OECD, 2019) that AI actors should respect human rights and democratic values, and also identified "five complementary value-based principles" for the reliable AI. These values-based principles focus on how AI actors including government can shape a human-centered approach to the trustworthy AI.

At the same time, the EU has decided to launch their negotiations on one of the key rules such as cross-border data flows in their "Economy Partnership Agreement" (EPA) in October 2022 and expanding similar activities with New Zealand through "EU-New Zealand Trade Agreement", also with the UK in Trade and Cooperation Agreement, with Singapore and South Korea through bilateral "Digital Trade Agreements" (DTAs) respectively.

In 2019, OECD announced AI Principles that AI should respect fundamental democratic values and also the Principles on AI promote AI in a trustworthy way. Trustworthy AI is an important pillar of the digital trade transition globally. Its eventual full adoption across the world as well as in the broader trading sector will play a significant role in moving to perfect digital trade and e-commerce without a controversial use of AI technologies.

Although “WTO Joint Statement Initiative (JSI) on E-commerce” negotiation is ongoing among member states, the designed regulatory measures aimed at developing multilateral digital trade regulations including e-transaction frameworks are yet to be finalized. Therefore, designing a different initiative through several international fora such as “the International Telecommunication Union” (ITU), “the International Standards Organization” (ISO), “the International Electrotechnical Commission” (IEC) and “the Institute of Electrical and Electronics Engineers” (IEEE) to achieve UN Sustainable Development Goals (SDGs) with digitally enabled development may be the alternative solution in light of future direction of trustworthy AI technologies. This finding can help government make strategic decisions on the effective use of AI technologies. In addition, governments should develop consensus-driven global technical standards for interoperable AI technologies according to the principle 2.5 of the OECD AI principles (OECD, 2019).

3.3 Asia-Pacific initiative, as a potential leadership in digital trade

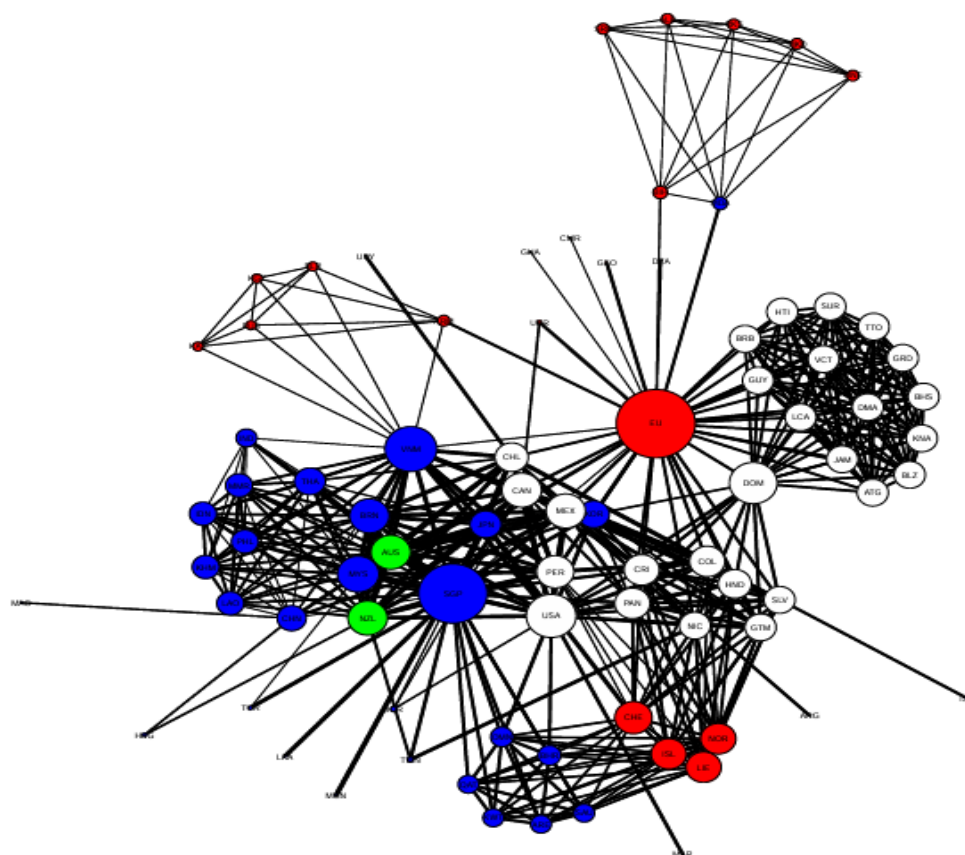
Recent studies have focused on interactions between AI and international trade (e.g., Nemoto and Lopez-Gonzalez, 2021; Burri and Polanco, 2020). To begin with, according to Nemoto and Lopez-Gonzalez (2021), regulatory frameworks for digital trade harnessing trustworthy AI are becoming increasingly specialized and complex. For example, RTAs and

FTAs are progressing steadily with more provisions on data flows, protection of personal information, data localization and cybersecurity, which are at the heart of data-driven innovation. This allows data to flow across borders freely and prohibit data localization except for legitimate purposes such as privacy and personal data protection, and to respond to the whole range of cyber-threats.

In addition, “Trade Agreements Provisions Electric-commerce Database” (TAPED) (Burri and Polanco, 2020) regularly updates on status of provisions related to emerging digital trade agreements, which increasingly tend to diffuse AI technologies for international trade. Indeed, out of 188 agreements data flows provisions are included in 32 agreements, while provisions related to personal information protection are included in 93 agreements, which means the RTAs include more provisions on data protection. Also, data protection related to international standards is reflected in 39 agreements. For instance, “the US-Mexico-Canada Agreement” (USMCA) and “the Singapore-Australia FTA” (SAFTA) are examples of the RTA provisions related to the protections of personal information and privacy, which were originally contained in the APEC Privacy Framework and the APEC’s CBPR respectively, and also refer to the OECD Privacy Guidelines.

Finally, cybersecurity aspects of AI also have become increasingly important. To date, 46 agreements include provisions on cybersecurity (e.g., Article 19.15 of the USMCA, and Article 14.16 of “the Comprehensive and Progressive Agreement for Trans-Pacific Partnership” (CPTPP) or Article 9 of “the ASEAN-Australia-New Zealand FTA”) including collaboration activities, such as capacity building for national entities to prevent the spread of malicious code affecting electronic networks and detecting malicious intrusions according to OECD trade policy paper (2022).

Figure 4. Network analysis; e-commerce, digital trade, and data flows



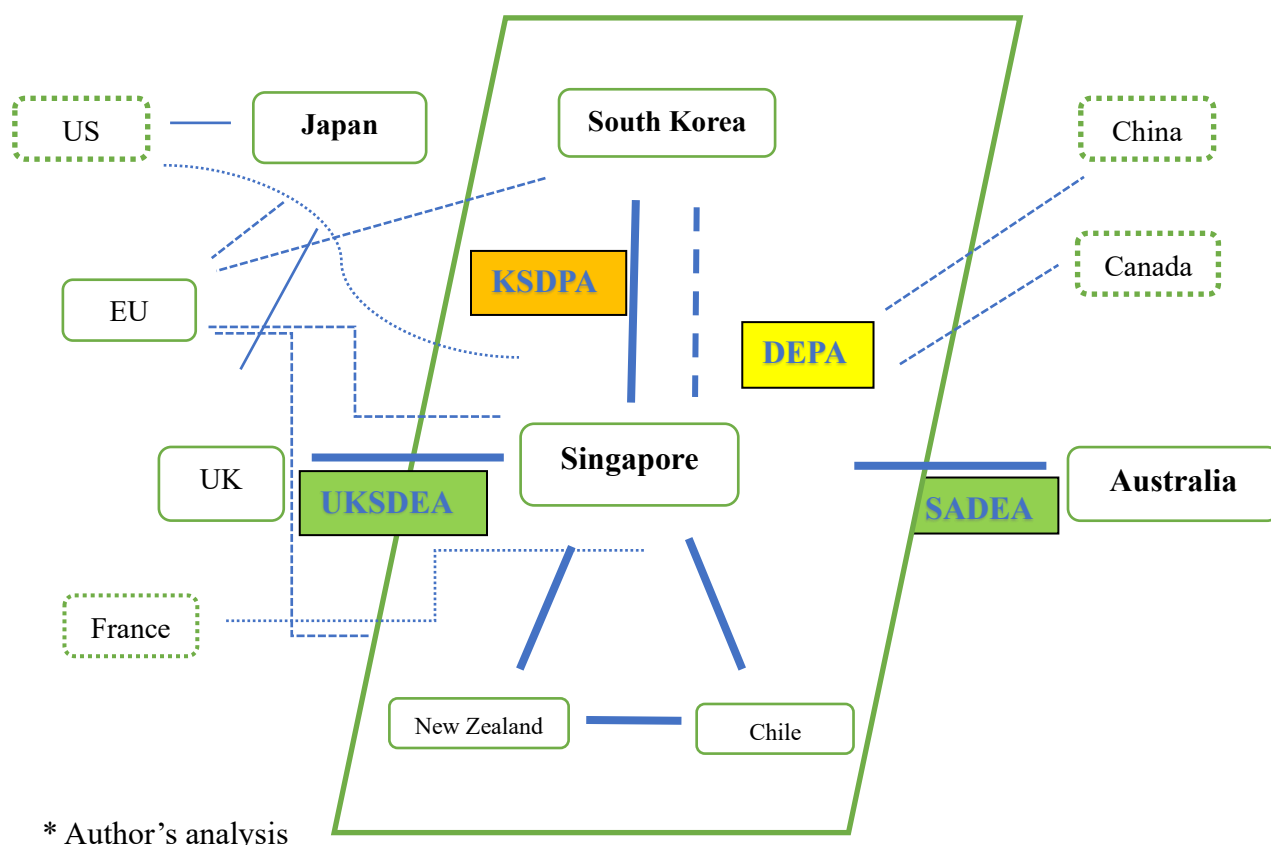
White: America, Red: Europe, Blue: Asia, Green-Oceania

(Note: Adapted from, WTI Working Paper No. 03/2018)

As can be seen in Figure 4 shows that there are some countries (e.g, the EU, the US, Singapore, and Australia) play pivotal roles in the global trading networks and thus are taking leading role in devising certain regulatory models on digital trade and data flows. Furthermore, countries in the Asia-Pacific region such as Singapore, Australia, Japan, and South Korea lead to the world in digital economy by concluding “Digital Economy Partnership Agreement” (DEPA), “Digital Economy Agreement” (DEA) and “Digital Partnership Agreement” (DPA)

recently mainly with the like-minded countries and expanding DEPA, DEA, and DPA with major countries (e.g., the US, EU, and China, See the Figure below)

Figure 5. Blocks of digital trade by DEPA, DEA and (DPA)



1. Digital Economy Partnership Agreement (**DEPA**)
(Singapore, New Zealand, Chile), Signed on 12 June 2020
2. Singapore-Australia Digital Economy Agreement (**SADEA**),
Entered in force on 8 December 2020
3. UK-Singapore Digital Economy Agreement (**UKSDEA**)
Entered in force on 14 June 2022

4. Korea-Singapore Digital Partnership Agreement (**KSDPA**) Signed on 21 November 2022
5. EU-Singapore Digital Partnership was signed on 1 February 2023
6. Japan-US Digital Trade Agreement signed on 19 October 2019
7. Japan-EU Digital Partnership was launched on 12 May 2022
8. Japan-UK Digital Partnership was launched on 7 December 2022
9. Japan-US Global Digital Connectivity Partnership was launched on 27 May 2021
10. Korea-EU Digital Partnership was launched on 28 November 2022
11. Korea-EU Digital launched negotiations for EU-Korea Digital Trade Agreement on 31 October 2023

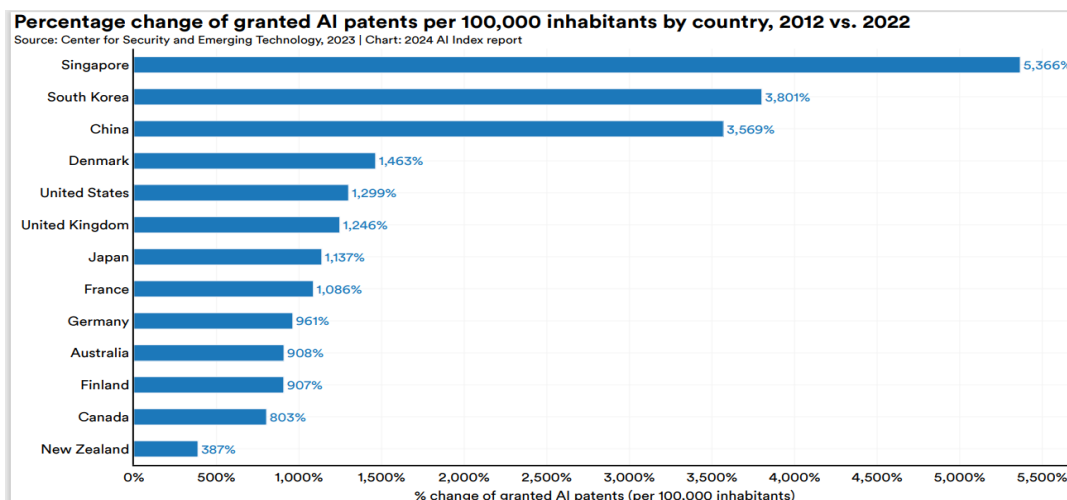
1) Singapore:

In June 2020, we saw the launch of “the Global Partnership on Artificial Intelligence” (GPAI), which is the outcome of an idea developed within G7 to address the digital divide by supporting disruptive AI technologies to foster international cooperation. GPAI has 29 members including Singapore, Australia, Japan, and South Korea. To begin with, according to the Ministry of Trade and Industry of Singapore, since 2020, They have concluded 4 DEAs with other like-minded countries. For example, DEPA with Chile and New Zealand, and SADEA, which is an amendment of existing Singapore-Australia FTA, UKSDEA, and KSDPA, particularly aligned with APEC’s CBPR, which has allowed cross-border data flow with narrow exception. In addition, along with Australia and Japan, Singapore has been working as one of the co-convenors of “WTO Joint Statement Initiative on E-Commerce”, which is ongoing plurilateral negotiations to develop digital trade and e-commerce under the global trading systems (e.g., WTO) since December 2017.

Finally, Singapore has also participated in RTAs such as CPTPP, which is also prohibited cross-border data flow restrictions with narrow exceptions together with Australia and Japan from 2018, and “Regional Comprehensive Economic Partnership” (RCEP), which is the world’s largest free trade agreement in terms of global GDP, with China. Surprisingly, China, for the first time, made an official commitment partly on binding rules on free data flow, by joining the RCEP to enhance digital trade environment with so-called Asia-Pacific Initiative countries (e.g, Singapore, Australia, Japan, and South Korea).

As can be seen Figure 6, there has been an unprecedented increase in the granted AI patents per 100,000 inhabitants between 2012 and 2022 in Singapore, thus, can lead AI-driven technologies in digital trade as well as a global leading country.

Figure 6. Granted AI patents per 100,000 inhabitants by country (2012 vs 2022)



(Note: Adapted from AI Index 2023, Stanford University, HAI)

2) Australia:

Somewhat similar with Singapore, Australia has an ambitious vision to be a top 10 digital economy by 2030 according to the Department of Foreign Affairs and Trade (DFAT) of

Australia, although their technology pillar is relatively not so strong compared to government, and data and infrastructure pillars according to Government AI Readiness Index (Oxford insights, 2017-2023). Also, as for the digital trade forecast (Export Council of Australia,2018), the country's digital trade will grow from A\$43 billion in 2017 to A\$192 billion by 2030.

thus, Australia is taking a leadership role on digital trade rules under the current global trading system (e.g., WTO) as one of the co-convenors of WTO JSI on E-Commerce along with Singapore and Japan, particularly making permanent moratorium on imposing customs duties on e-commerce. Also, they are focusing on cross-border data flows without limitation (with narrow exception) and prohibition of data localization requirements to facilitate digital trade.

3) Japan:

Japan has concluded Digital Partnerships with the EU in May 2022 and with the UK in December at the same year, respectively. Japan is the first country with which the EU has signed the Digital Partnership. According to the progress report of “Japan-UK Digital Partnership” (January 2024), there are four pillars around the Partnership: Digital infrastructure and Technologies, Data, Digital Regulation and Standards. Similar with “Japan-EU Digital Partnership”, promoting regulatory frameworks for the disruptive cutting-edge technologies including Artificial Intelligence is one of the most important aims of this Partnership, stressing the importance of democratic values and human rights. In addition, Japan has launched a Digital Trade Agreement with the US in October 2019 and also concluded a “Japan-US Global Digital Connectivity Partnership” (JUSGDCP) in May 2021. The Ministry of Internal affairs and Communications of Japan is playing a key role in the JUSGDCP, while the Ministry of Economy, Trade and Industry of Japan is initiating the Digital Partnerships on behalf of their

government to deepen bilateral cooperation on digital technology issues including 5G wireless technologies and digital trade and internet economy.

Finally, cross-border data flow and data localization are not prohibited according to “the Japan-US Digital Trade Agreement”, and this enables boost digital trade and more likely to become major part of the global standard for the interoperable AI technologies.

4) South Korea:

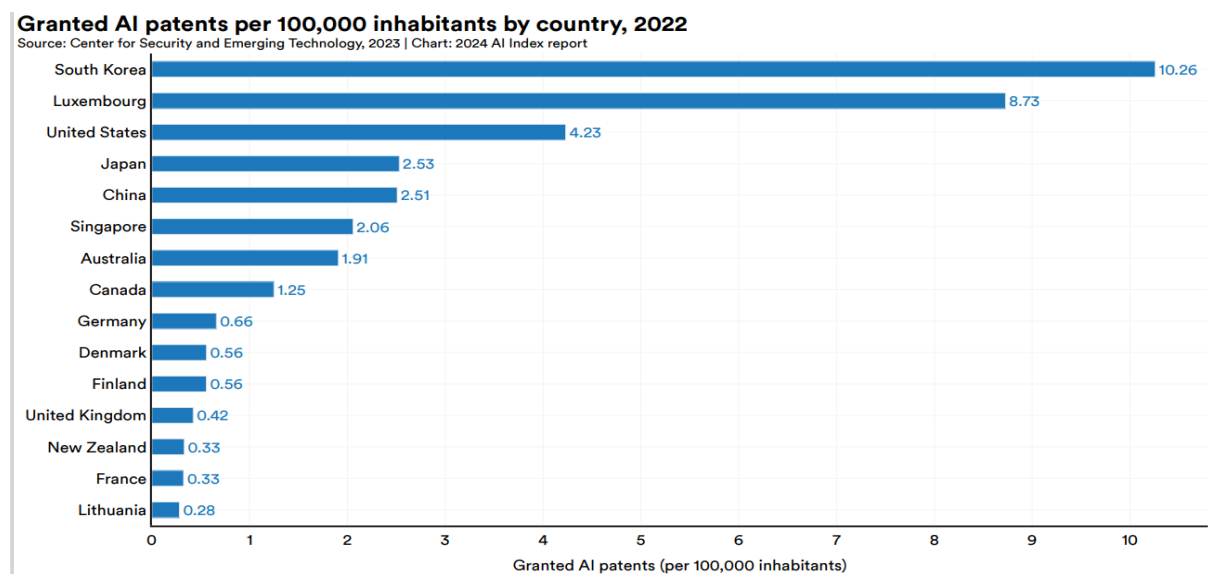
Unsurprisingly, first, South Korea became the first country to join “the Digital Economy Partnership Agreement” as non-founding member on 4 May 2024 according to the Ministry of Trade, Industry and Energy of South Korea. It is considered a quite historical moment particularly in the proliferation of “Digital Economy Partnership Agreement” (DEPA) to standardize global regulations for a digital trade and economy. Furthermore, the procedure for joining DEPA for China and Canada launched on August 2022 respectively and Costa Rica and Peru also declared their interest to join DEPA in December 2022 and May 2023. As evidence of growing importance of DEPA, as a potential global standard for AI-driven digital trade initiated by Asia-Pacific countries seems to be emerging.

Second, “South Korea-Singapore Digital Partnership Agreement” (KSDPA) was signed on 21 November 2022 and effected from 14 January 2023 to strengthen the bilateral collaboration that already existed on digital trade and e-commerce.

Finally, “South Korea-EU Digital Trade Agreement” (KEUDTA) was also launched a negotiations on 31 October 2023, which aims to devise a new digital trade rules and regulations based on human-centric democratic values in order to enhance mutual interest through the expansion of digital trade network.

As shown in Figure 7, South Korea was top rank in the world in granted AI patents per 100,000 inhabitants in 2022, according to AI index 2023, published by Stanford University, Human-Centered Artificial Intelligence (HAI), that South Korea has a strong influence on AI-driven sectors including digital trade in the world although China and the US remained the top rank with 61.1% and the second rank with 20.9% in the world total granted AI patents in 2022 respectively.

Figure 7. Granted AI patents per 100,000 inhabitants by country (2022)



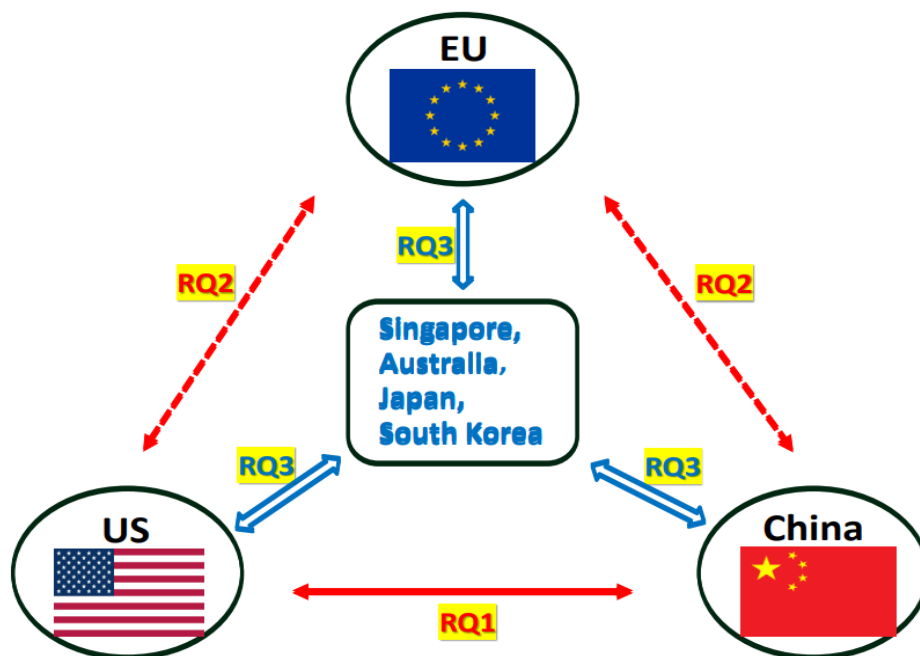
(Note: Adapted from AI Index 2023, Stanford University, HAI)

This paper emphasizes contentious provisions on cross-border data flows, data protection, prohibitions of data localization and disclosure of source code and cybersecurity. Data is a key component for AI systems and free data flows, privacy protections and cybersecurity are becoming increasingly complex.

In addition, all provisions related to AI being negotiated continuously among the US, China, and the EU through RTA and World Economic Forum (WEF) because the regulatory

landscape for digital trade harnessing trustworthy AI is becoming increasingly complicated. For example, provisions concerning data protection and privacy are widely included in the RTAs, such as USMCA and SAFTA, which are originally contained in APEC Privacy Framework and APEC's CBPR respectively. As AI applications are going, the cybersecurity aspects of AI are also increasingly important. Protecting AI algorithms will also be the key. Currently, the DEPA between Singapore, Chile, and New Zealand or DEA between the UK and Singapore supports data-driven innovation by using regulatory sandboxes and also developing ethical governance frameworks for the trusted, safe, transparent, and responsible use of AI technologies. Finally, the findings of this paper may help to deepen understanding of the empirical case studies on the application of AI in trade, such as AI-powered machine translation, AI technologies used in supply chains and the applications of AI in the finance sector.

Figure 8. Asia-Pacific initiative for devising regulations for digital trade



* Author's analysis

To date, surprisingly, few studies have conducted analyses on quantifying the preliminary implications of AI for international trade. Although interaction between AI and international trade seems obvious, very few academic studies have confirmed the empirical interaction. In addition, some scholars have questioned “Modern productivity paradox” (Brynjolfsson, Rock and Syverson, 2017), which was originally from “Solow paradox” (1987) that “You can see the computer age everywhere but in the productivity statistics”. In other words, there is no meaningful evidence about AI’s contribution to the measuring analysis of productivity, particularly in the data intensive sectors such as banking, professional and entertainment services. According to Brynjolfsson, Rock, and Syverson (2017), there are four potential explanations behind the paradox such as false hopes, mismeasurement, redistribution, and implementation lags. To some extent, these explanations are similar to the explanations for the Solow Paradox (Brynjolfsson, 1993). Ironically, implementation and restructuring lags might be the biggest contributor to the insufficient evidence on enhanced productivity; thus, substantial positive effects are expected to drive once AI technologies and systems are diffused more widely.

The limitations of this study are clear that there has never been properly quantified by a detailed academic study on intersections between AI and digital trade. Notwithstanding its limitations, the study does suggest sustainable regulatory environment for global cooperation harnessing trustworthy AI in the digital trade. First, recently, we have seen the launch of “the Global Partnership on Artificial Intelligence” (GPAI), which is the outcome of an idea developed within G7 to bridge the gap between theory and practice on AI by supporting cutting-edge technologies to foster international cooperation. GPAI has 29 members including the US, the EU, and Korea.

On the other hand, global digital divide is worsening with the advanced AI technology between the developed countries and the emerging countries as well as between the rich and the poor. This digital divide is one of the major factors that inevitably lead to potential risks of increased inequality and affect unemployment. Despite the potential risks created by the global digital divide, it also has positive side. For instance, it may contribute to more opportunities in the areas of employment for the short term, however, it remains unclear whether the proven data will be available or not. While expanding AI-based technology into various sectors, from precision agriculture to manufacturing and services, trustworthy AI technologies should be human-centered AI ecosystems. Also, digitization has impacted from advanced nations (e.g., the US, EU, and China) across the world, as a result, there has been a concerted thrust by most of the countries in the world, although technological inequality between the countries has been increasing for years.

Finally, Trust should be built and realized through various legal frameworks. In other words, trust should be more transparent to protect data. When establishing new legal frameworks for harnessing trustworthy AI in the digital trade, is there always competition between the US, China, and EU? That is the real challenge.

To the best of my knowledge, little attention is on the current status of the Appellate body of the WTO. The appellate body is unable to review appeals given its ongoing vacancies since November 30, 2020. Furthermore, The EU, G20, OECD have been negotiated regulatory measures for the development and use of data-driven AI technologies. However, there was no legally binding agreement to be reached globally. So, with a sense of urgency, the US, China, and EU may create amicable solutions to react to a rapidly digitizing world based on human-centered AI technologies meaning that major AI power countries can play a central role

determining the outcome of AI's development instead of the WTO playing that role. That is the way to a better world, driven by harnessing AI.

Chapter 4: Conclusion

In the first two decades of this century, we witnessed the most innovative and influential development of data-driven AI technologies, particularly for data-intensive sectors, better supply-chain management, and lower trade costs, by AI-powered machine translation, generating efficiencies in the logistics, and financial sectors. Although AI could be greatly beneficial to humanity, society, and global community, it could also contribute to significant challenges if proper regulatory actions are not undertaken.

While it becomes the tendency towards the proliferation of emerging AI technologies, it is much more important for the international community to formulate strictly objective rules and regulations for AI policies on the basis of “the International Covenant on Civil and Political Rights” (ICCPR) and the principle of non-intervention in internal affairs as a general principle of international law. It is also important that the use of AI technologies for purposes is potentially controversial, thus, complete disciplines should be placed on the usage of AI for competition. China's Military-Civil Fusion Policy as well as face recognition software and security system are examples to focus on fundamental rights or national security concerns (Shang and Du, 2021).

This study has addressed only the question of intersection between AI and digital trade with the exception of finding properly empirical analysis of international trade. Notwithstanding its limitations, the study does suggest trust regulatory environment for

international collaboration using trustworthy AI in the digital trade. Despite the ongoing discussions among WTO members, a legally binding agreement on AI policies has not yet been reached. With the public moral exception, security exception, international peace and security exception, AI sanction can be justified not to breach WTO rules (e.g., GATT 1994 and/or GATS). It is obvious that the US, China, and the EU have very different approaches to data, digital activities, and its regulations, which has potential to be a global standards in the near future. Some of Asia-Pacific countries (e.g., Singapore, Australia, Japan, and South Korea) already have concluded a far-reaching DEPA, DEAs and DPA to lead an innovative digital trade environment, although getting a consensus and reaching an international agreement are becoming difficult, thus, the Asia-Pacific initiative is inevitable.

To empirically test this conjecture, there is need for more analysis on implications of AI for digital trade based on the substantial progress in reformulating international standards for AI technologies.

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