

# Estimating the Economic Impact of Digital Trade Agreements

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## I. Introduction

As the digital economy develops, digital trade is growing in importance and share of total trade. Over the past two decades, digital trade has grown faster than traditional trade. According to APEC (2023), between 2000 and 2018, trade in digital services among APEC economies grew at an average annual rate of 7.8%, outpacing the growth rate of total trade in services (6.3%), with trade in digital goods and services growing at an average annual rate of 31.6% between 2016 and 2018. According to OECD (2023) estimates, the rapid expansion of digital trade has led to an increase in the share of digital trade in total trade from 19% in 1995 to 24% in 2018.

With the growth of the digital economy and digital trade, discussions to establish common rules for digital trade and to enhance cooperation in the digital economy are taking place on various platforms. At the multilateral level, WTO e-commerce negotiations are in progress, and at the bilateral level, e-commerce

chapters of regional trade agreements are being revised. Korea is also expanding its digital trade network by promoting a number of digital trade agreements. Digital trade rules introduced within digital trade agreements are expected to have an economic impact through various channels. Digital trade rules are able to facilitate digital trade by reducing trade barriers, leading to overall trade expansion. Expanding trade not only boosts production through increased imports and exports, but can also increase productivity through the spillover of new technologies and increased competition. As the digital trade network expands, the need to analyze the economic impact of digital trade agreements also grows.

The purpose of this report is to present the findings of Kim et al. (2023), who quantitatively analyze the economic effects of digital trade agreements through a general equilibrium model. Kim et al. (2023) first identify the

key digital trade rules in digital trade agreements and estimate how much they reduce trade barriers. Then the macroeconomic impact of introducing digital trade rules is analyzed by building a general equilibrium model that includes the characteristics of the digital economy.

## II. Digital Trade Barriers and Digital Trade Agreements

Digital trade barriers are policy, regulatory, and technological barriers to digital trade between countries that can impede growth and innovation in the digital economy. As the digital economy rapidly expands, some countries have begun to erect digital trade barriers that restrict digital trade to foster their domestic industries. Digital trade barriers can be categorized into those that are fiscal or tariff-based and those that are non-tariff-based, with most barriers falling into the category of non-tariff barriers. Non-tariff barriers to digital trade include requirements for the localization of computing facilities, restrictions on cross-border data flows, intellectual property infringement, discriminatory and proprietary technical standards or burdensome testing and certification requirements, filtering or blocking, restrictions on electronic payment systems, cyber theft of trade secrets, and forced technology transfers. In response, many countries are establishing digital trade rules through digital trade agreements to reduce barriers to digital trade, harmonize national policies, regulations, and technical standards on digital trade,

and to strengthen cooperation.

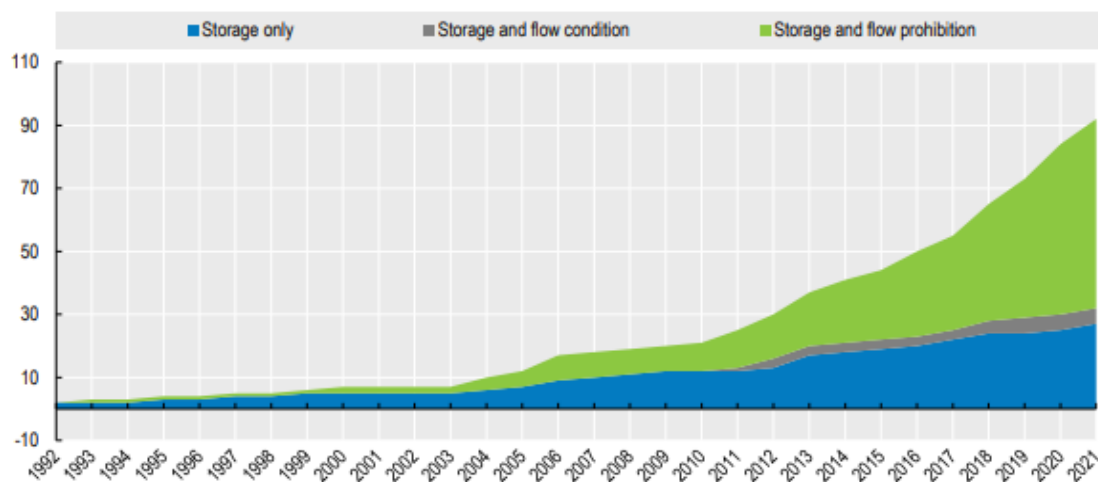
Localization requirements for computing facilities are measures that force companies to perform certain digital trade-related activities within their borders. While some localization requirements may be intended to achieve legitimate public policy goals, such as privacy or national security, they also function as non-tariff barriers to market access for foreign companies as a means of protecting domestic industries. Localization requirements may apply across all sectors, or they may be specific to certain sectors, e.g., financial, public, or healthcare. Requiring companies to use local server infrastructure or to build infrastructure within a country as a condition of doing business in that country can lead to redundant installations that increase costs and reduce efficiency. This is why some FTAs, such as the CPTPP and USMCA, include provisions that prohibit localization requirements as a condition of doing business to prevent restrictions on digital trade.

The free flow of information across borders is recognized as a critical enabler of digital commerce, but the level of openness prescribed within national digital policies varies widely, with some countries having very restrictive policies on cross-border data transfers. Research conducted by the Global Data Alliance shows that while some countries, such as the United States and the United Kingdom, have relatively open digital policy environments, others, such as China and Russia, have comprehensive and systematic restrictions on

cross-border data transfers across their economies. Restricting cross-border data flows has also been linked to forcing localization of computer facilities, with one OECD report finding that by 2021, 92 measures in 39 countries explicitly mandated domestic storage or processing of data, with two-thirds of these identified measures including storage requirements alongside bans on cross-border information transfers. As shown in Figure 1, prohibitions on cross-border data transfers and cross-border information transfers are on the rise, with 60% of the measures applied by

OECD countries containing only storage requirements, while in non-OECD countries, the majority of measures (83%) are in the form of storage requirements with cross-border information transfer prohibitions. Governments are increasingly imposing regulations to restrict global data flows, but unnecessary and arbitrary restrictions on data flows that do not serve legitimate policy objectives can lead to unpredictability in digital trade and harm investment and market access. Several FTAs, including the CPTPP, have introduced provisions that prohibit measures that restrict cross-border data transfers.

**Figure 1. Trends in Data Localization and Cross-border Data Transfer Regulations**



Source: OECD (2022).

At the time of the Uruguay Round of WTO agreements (1986-1994), e-commerce was not well understood and no explicit rules were established. The WTO e-commerce negotiations have made efforts to establish explicit rules in this regard, and at the 11th Ministerial Conference in December 2017, 71 WTO members agreed to initiate exploratory work for future

WTO negotiations on trade-related aspects of e-commerce. However, they have been unable to reach consensus on rules such as source code regulations, privacy, cross-border data transfer and localization, and general and security exceptions. In the absence of explicit rules on digital trade in the WTO, the expansion of digital trade has led to an increase in

the number of countries setting up barriers to digital trade for various purposes, such as protecting domestic industries, national security, and privacy, and digital trade rules have been introduced in FTAs and digital economy stand-alone agreements to mitigate these barriers.

The e-commerce chapter of the KORUS FTA was narrow in scope, but the e-commerce chapter of the CPTPP has strengthened the scope and normative level of provisions within its e-commerce chapter. Since its withdrawal from the TPP, the U.S. has further increased the scope and level of related norms through the USMCA, which does not include developing countries, and China has decided to accept e-commerce norms that are not as high as the CPTPP through the RCEP, also adopting a

more active attitude toward establishing international e-commerce norms compared to the past, for instance applying to join the DEPA and CPTPP. Korea has also signed and entered into force the Korea-Singapore DPA (KS DPA), revised the e-commerce chapter of the Air Transport Agreement, and completed its accession to the DEPA, becoming the first country to join the DEPA. Recent digital trade agreements, such as the DEPA and the KS DPA, introduce cooperation regulations in areas such as financial technology cooperation, artificial intelligence, government procurement, and competition, which are expected to have positive effects on cooperation in various fields in the digital economy. However, this study focuses on a number of mandatory regulations to estimate the economic effects of digital trade agreements for quantitative estimation.

**Table 1. The Impact of Digital Trade Rules on Importers' Trade Costs**

	KORUS FTA Chapter 15	CPTPP Chapter 14	USMCA Chapter 19	RCEP Chapter 12	KS DPA Annex A	DEPA
E-Authentication/E-Signatures	15.4	14.6	19.6	12.6	14.8	-
Domestic Electronic Transactions Framework	-	14.5	19.5	12.10	14.7	2.3
Electronic Invoicing	-	-	-	-	14.10	2.5
Electronic Payments	-	-	-	-	14.11	2.7
Paperless Trading	15.6	14.9	19.9	12.5	14.12	2.2
Logistics	-	-	-	-	14.9	2.4
Express Shipments	-	-	-	-	14.13	2.6
Online Consumer Protection	15.5	14.7	19.7	12.7	14.21	6.3
Unsolicited Commercial Electronic Messages	-	14.14	19.13	12.9	14.20	6.2
Source Code	-	14.17	19.16	-	14.19	-
ICT Products that Use Cryptography	-	Ch.8 Annex 8-B Sec.A	Ch.12 Annex 12-C	-	14.18	3.4
Personal Information Protection	-	14.18	19.8	12.8	14.17	4.2
Cross-Border Data Transfer	15.8	14.11	19.11	12.15	14.14	4.3
Location of Computing Facilities	-	14.13	19.12	12.14	14.15	4.4
Customs Duties	15.3.1	14.3	19.8	12.11	14.5	4.2

Source: Author's calculation.

### III. The Economic Impact of Digital Trade Agreements

This study analyzes the economic impact of digital trade rules in two steps. The first step is to examine the impact of digital trade rules on trade barriers. Based on this analysis, the second step is to analyze how the changes in trade barriers caused by digital trade rules ripple through trade to the rest of the economy, for which a general equilibrium model was used. Since we are analyzing the impact of digital trade rules through a general equilibrium model, we look at the impact of digital trade rules on trade barriers instead of their direct impact on trade. This study estimates total trade barriers and then analyzes the impact of digital trade rules on total trade barriers. In order to directly estimate digital trade barriers, digital trade statistics must be available, but in practice, reliable digital trade statistics are difficult to obtain, and the estimation error of digital trade barriers based on estimated trade statistics will be amplified if the statistics must also rely on estimation. It is also necessary to look at the impact of digital trade rules on total trade barriers, considering that digital trade rules not only directly affect digital trade, but also directly or indirectly affect traditional trade.

We analyze the impact of digital trade rules on trade costs, focusing on the rate of change of different trade costs because there is no single best way to estimate trade costs. We employ two different approaches to estimate the

effect of trade rules on trade costs, one for importers and one for bilateral trade costs, and then focus on cases where there is a significant impact on both ways. The Trade Agreement Provisions on Electronic-commerce and Data (TAPED) dataset was used to measure the level of digital trade rules. The analysis is based on whether or not countries in the TAPED data have adopted digital trade rules. However, we excluded the imposition of tariffs on electronic transfers from our analysis because there is already a moratorium in place at the WTO level, which means that not all WTO members currently impose tariffs on digital products, making it difficult to quantitatively estimate their effect.

The model is set up with a number of considerations, based on previous literature analyzing the impact of digital trade rules, to ensure that our estimates are robust. According to previous studies, (1) the impact of digital trade rules may take some time to materialize, including the development of relevant laws and institutions. (2) The impact may be different depending on the income level of the exporting and importing countries, which may vary depending on whether the trading countries share the same regulatory approach and the level of regulation of the approach. (3) The number of data-related regulatory measures in each country has increased in recent years, and the digital trade rules may be a response to the proliferation of such measures. (4) Depending on the provisions, the costs of compliance may exceed the benefits of facilitating data flows and may even hinder trade. In addition to the

baseline model, we estimated a time lag model, a regulatory level control model, and a model by country income level (developed and developing countries). As mentioned above, the analysis was divided into the impact of digital

trade rules on trade costs for importing countries and the impact on trade costs between signatory countries, the results of which are summarized in Table 2 and Table 3.

**Table 2. The Impact of Digital Trade Rules on Importers' Trade Costs**

	Manufacturing	Other Services	Postal, Mail, and Telecommunications	Financial Services
Enabling Electronic Commerce			Developing Country (-)	
Enabling Electronic Commerce (hard)				Total Trade (-) Intermediary Goods (-) Developed Country (-)
Consumer Protection			Developing Country (+)	
Consumer Protection (hard)		Intermediary Goods (+)		
Source Code				Total Trade (+) Intermediary Goods (+) Final Goods (+)
ICT Products that Use Cryptography			Total Trade (-) Time Lag (-) Developed Country (-)	
Personal Information Protection			Total Trade (-) Intermediary Goods (-) Final Goods (-) Developing Country (-)	Developed Country (-)
Personal Information Protection (hard)				
Cross-Border Data Transfer			Developing Country (-)	
Cross-Border Data Transfer (hard)				
Location of Computing Facilities	Intermediary Goods (-)	Total Trade (-) Developing Country (-)		Developed Country (-)
Location of Computing Facilities (hard)	Intermediary Goods (+)	Intermediary Goods (-) Developing Country (-)		

Notes: Total Trade, Intermediate Goods, Final Goods, Developing Country, and Developed Country are estimated using the basic model using data by product and country income level, respectively. Time Lag is analyzed using a model that controls for time lag in total trade data.

Source: Author's calculation.

Table 3. The Impact of Digital Trade Rules on Bilateral Trade Costs

	Manufacturing	Other Services	Postal, Mail, and Telecommunications	Financial Services
Enabling Electronic Commerce	Total Trade (-) Intermediary Goods (-) Developing Country (-)	Total Trade (+) Intermediary Goods (+) Time Lag (+) Developing Country (+)	Total Trade (+) Intermediary Goods (+) Final Goods (+) Time Lag (+) Developed Country (+) Developing Country (+)	Total Trade (+) Intermediary Goods (+) Developing Country (+)
Enabling Electronic Commerce (hard)				Developing Country (-)
Consumer Protection	Developing Country (+)	Developing Country (-)		Developed Country (-) Developing Country (-)
Consumer Protection (hard)		Final Goods (-)	Developed Country (+)	Total Trade (-) Intermediary Goods (-)
Source Code	Final Goods (-)	Total Trade (+) Developing Country (-)	Developed Country (-)	Total Trade (+) Intermediary Goods (+) Time Lag (-) Developing Country (+)
ICT Products that Use Cryptography			Intermediary Goods (+) Final Goods (+)	
Personal Information Protection	Time Lag (+)	Intermediary Goods (-) Final Good (-) Time Lag (-)	Final Goods (-) Time Lag (-) Developing Country (-)	Final Goods (-) Time Lag (-)
Personal Information Protection (hard)	Time Lag (-) Developing Country (-)	Total Trade (+) Intermediary Goods (+) Final Goods (+) Developed Country (+) Developing Country (-)	Total Trade (+) Intermediary Goods (+) Time Lag (+)	Total Trade (+) Intermediary Goods (+) Final Goods (+) Time Lag (+) Developed Country (+) Developing Country (+)
Cross-Border Data Transfer		Total Trade (-) Intermediary Goods (-) Final Goods (-) Time Lag (-)	Total Trade (-) Intermediary Goods (-) Final Goods (-) Time Lag (-) Developed Country (-)	
Cross-Border Data Transfer (hard)	Final Goods (+) Developing Country (+)		Time Lag (-) Developed Country (+)	
Location of Computing Facilities	Intermediary Goods (-) Developing Country (-)	Intermediary Goods (-) Final Goods (-)	Time Lag (+) Developed Country (-)	Intermediary Goods (-) Time Lag (+) Developed Country (+) Developing Country (+)
Location of Computing Facilities (hard)	Final Goods (-)		Intermediary Goods (+)	Intermediary Goods (-) Final Goods (-)

Notes: Total Trade, Intermediate Goods, Final Goods, Developing Country, and Developed Country are estimated using the basic model using data by product and country income level, respectively. Time Lag is analyzed using a model that controls for time lag in total trade data.

Source: Author's calculation.

**T**hen we build a theoretical model as a framework for analyzing the macroeconomic impact of digital trade rules. The model is basically based on the models of Caliendo and Parro (2015) and Antras and Chor (2018), with the same focus on multi-country, multi-industry production and trade, but with household decision-making reflecting the characteristics of the data economy. In the model, data is generated from households' consumption behavior, and the better the ICT infrastructure in a country, the more data is generated when consumption is from key digital industries. At the same time, households experience disutility as more data is generated from their consumption due to concerns about data leakage. This data-related externality drives household decision-making. When the model incorporates the changes in trade costs resulting from digital trade agreements, estimated above, the production costs and prices of intermediate goods and the prices of final goods change, which in turn changes the share of intermediate and final goods imported from different sources. From a production perspective, this change in trade structure also changes the total amount of output produced in a country and sold as intermediate or final goods. By observing these changes in trade, production, and welfare in the new equilibrium, we can measure the economic impact of digital trade rules.

**T**o demonstrate the application of the model, we analyzed the impact of WTO e-commerce negotiations as a case study. Three scenarios are analyzed: (1) a low-level agreement that includes only e-commerce facilitation and

consumer protection-related rules which have been agreed to date; (2) a high-level agreement that includes privacy, source code, and data-related rules which have not been agreed to; and (3) a high-level separate agreement between only a few countries, including Korea, given the difficulty in reaching a high-level agreement under the WTO due to the withdrawal of the U.S. proposal. We considered not only the change in trade costs among signatories of the digital trade agreement, but also the change in trade costs for all trading partners, and we separated the change in trade costs for intermediate and final goods to reflect the characteristics of the model that considers industry linkages.

**I**f the WTO e-commerce negotiations are concluded at a low level, positive export and import effects and welfare effects are predicted for the negotiating countries, and positive output effects are also predicted, except for some countries. This is explained by the decrease in trade costs in the negotiating countries, which increases demand from abroad while domestic demand is met by sourcing from abroad. On the other hand, non-participating countries decreased in their share of world trade as both exports and imports declined. Production fell in many of the participating countries as well as in non-participating countries, with positive production effects observed predominantly in countries that are competitive in manufacturing and services. This is likely due to the fact that digital trade rules affect trade in services as well as trade in manufacturing. The change in welfare was driven by an increase in output



and exports, as well as a decline in prices due to improved terms of trade.

If the WTO e-commerce negotiations are concluded at a high level, this would have larger export and import effects. Not surprisingly, the larger reductions in trade costs occur across a wider range of industries. It is worth noting that while the low level of digital trade rules predicted a decrease in exports, imports, and benefits for non-negotiating countries, the high level of digital trade rules predicted a small increase in exports, imports, and benefits for non-negotiating countries. This is likely due to the fact that digital trade rules lower trade costs for all trading partners

through changes in domestic laws and institutions.

In the case of a separate agreement between a selection of countries that support the adoption of a high level of digital trade rules, the difference in economic impact between participating and non-participating countries is clear, as in the first scenario. If many countries do not participate in an agreement, such as in the WTO e-commerce negotiations, the positive economic effects of adopting high standards and reducing trade barriers for all trading partners do not seem to extend to non-participating countries.

**Table 4. The Impact of Digital Trade Rules on Importers' Trade Costs**

(unit: %)

		Export Effect	Import Effect	Production Effect	Welfare Effect
Scenario 1	Participants	9.9	10.3	1.9	1.7
	Non-participants	-2.8	-2.3	-0.3	-0.3
	Korea	13.9	13.8	3.4	3.3
Scenario 2	Participants	25.6	26.6	3.5	3.1
	Non-participants	2.2	1.8	-0.3	0.3
	Korea	27.5	27.4	6.0	5.1
Scenario 3	Participants	23.6	22.8	3.7	2.9
	Non-participants	-0.2	-0.2	-0.3	-0.1
	Korea	21.9	21.8	4.6	3.6

Source: Author's calculation.

## IV. Policy Implications

Korea has been actively exploring digital trade agreements with several economies, including the Korea-Singapore Digital Partnership Agreement and the Digital Economy

Partnership Agreement, and is negotiating a digital trade agreement with the EU. There have been various opinions on whether Korea's Act on the Conclusion Procedure and Implementation of Commercial Treaties should be applied to digital trade agreements.

Although a digital trade agreement is not exactly an FTA, it has similar aspects, such as the commissioning of economic feasibility studies before the start of trade negotiations, and impact assessments when the text of the trade treaty is agreed upon with the negotiating partner.

According to the Act on the Conclusion Procedure and Implementation of Commercial Treaties, the impact of a commercial treaty on the domestic economy, related industries, taxation, and employment must be evaluated beforehand, and the economic effects of the treaty and the effectiveness of domestic measures for the affected industries must be evaluated afterward. These evaluation factors were relatively easy to incorporate into existing FTAs. Since opening the market based on concessions was the main element of conventional FTAs, it was possible to quantitatively analyze the reduction in trade costs by deriving tariff reduction rates by industry through concessions. However, in the case of a digital trade agreement, there is no market opening element, but mainly trade rules and digital-related cooperation provisions, which makes it difficult to analyze quantitatively. As a result, feasibility assessments and impact evaluations have either been conducted by qualitatively predicting the economic effects of digital trade agreements based on theoretical frameworks, or, even when quantitative analysis is conducted, there is no analysis of the effects of each provision, so the analysis process has been combined with qualitative approaches

such as industry surveys. In addition, the models used for quantitative analysis are set up for traditional trade mechanisms and have limitations in reflecting the characteristics of the digital economy and trade.

The methodology presented in this report is expected to contribute to the ex ante and ex post evaluation of digital trade agreements. First, by presenting the trade barrier reduction effects of each digital trade rule, it will allow for a wider range of scenarios to be considered when ex ante evaluating digital trade agreements. In recent years, the level of digital trade rules has been gradually increasing, and digital trade agreements are being discussed in more diverse forms in order to reach an agreement. The DEPA has 16 modules and its scope can vary depending on the negotiations, with only some modules being accepted. In the case of the digital trade chapter in the IPEF, which is currently under negotiation, there are also persistent calls to start with a relatively low level of agreement and then gradually increase this. Given the diversity of agreement types, it would be wise to consider a range of scenarios when conducting economic feasibility assessments in advance.

The methodology in this study can also be used to identify potential negotiating partners for a digital trade agreement by conducting a hypothetical economic impact assessment upon different types of digital trade agreements with different countries or groups of countries. Previous studies propose criteria for prioritizing negotiating partners by considering the size of Korea's digital service exports,

the growth rate of digital service exports, the degree of heterogeneity in digital-related regulations between Korea and the other country, and the feasibility of the agreement. In addition to these criteria, simulations of the economic impact of a digital trade agreement can be conducted to prioritize more specific negotiating partners. For example, Lee et al. (2022) selected three groups of priority negotiating partners based on the criteria above. In particular, many of Korea's FTA partners are classified in the second group with the FTA upgrade. Specific scenarios can be constructed by considering the combination of additional digital trade rules in the FTA upgrade if the digital trade chapters in each FTA were to be

updated from current levels. It is possible that the impact could be significantly different even for countries in the same group because those countries show a different structure of trade in intermediate and final goods. Then the strategy for the digital trade agreement can be further refined by prioritizing the countries in the same group. As mentioned above, the level of the agreement, as well as how many countries participate in the agreement, produces a significant difference in the economic effects of a digital trade agreement. Given the increasing number of digital trade agreements involving multiple countries, as observed in the IPEF and DEPA, it will also be important to establish a set of potential negotiating partners. **KISP**