


ORIGINAL ARTICLE

On the Non-Discrimination Principles in Digital Trade

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Abstract

What do the provisions on the non-discrimination principle (*the principles*) in digital trade mean under trade agreements, especially in the absence of a clear international consensus on the subject of *the principles*? To answer this question, this study first identifies the issues related to the application of *the principles* in digital trade and presents a theoretical framework to explain how *the principles* can affect digital trade despite such issues. Using various data sources, such as digital trade flows, the inclusion of *the principles* in digital trade agreements, and digital trade barriers, we empirically test the hypotheses constructed from our theoretical framework. We find that inclusion of *the principles* in the trade agreements is more likely to increase digital trade flows. Moreover, though digital trade barriers decrease digital trade flows, this negative effect can be mitigated when *the principles* are more clearly defined in the trade agreements.

Keywords: digital trade; non-discrimination principle; digital trade agreement; digital trade barriers

1. Introduction

Digital transformation is progressing through the expansion of digital trade and the spread of COVID-19 pandemic has accelerated this trend.¹ This trend requires demands for updated international rules that fit in with this progress.² At multilateral trade fora, the ‘Declaration on Global Electronic Commerce’³ adopted in 1998 had already promised to continue the current practice of not imposing customs duties on electronic transmissions. However, other than the ‘Moratorium on Customs Duties on Electronic Transmissions’ in the Declaration, more visible progress has never been made. Delays in rule-making at the multilateral level have induced negotiators to develop digital trade rules under the Regional Trade Agreements (RTAs). This began with a few clauses such as the ‘paperless trading’ provision,⁴ but soon it has evolved into a separate chapter for digital trade, and recently into a stand-alone digital trade agreement covering various issues including artificial intelligence (AI) and data innovation.⁵ Along this course, the goals of the digital trade rules in the RTAs have expanded from promoting digital trade to enabling trusted data flows, building trust in digital systems, and so on. The goal for promoting digital

¹OECD, ‘Leveraging Digital Trade to Fight the Consequences of COVID-19’, p. 5.

²UNCTAD, ‘COVID 19 and E-Commerce’, 2021, p. 124.

³The Geneva Ministerial Declaration on Global Electronic Commerce, Ministerial Conference: Second Session Geneva, 18 and 20 May 1998.

⁴The New Zealand–Singapore FTA signed in 2000 is known as the first trade agreement which stipulates a digital trade related provision in Article 12 (Paperless Trading) under Section 4 (Customs Procedure).

⁵The Australia–Singapore FTA in 2003 had the separate chapter on electronic commerce. The US–Japan Digital Trade agreement is recorded as the first stand-alone type of digital treaty.

trade especially has materialized into certain principles against unjustified trade barriers.⁶ In general, the fundamental trade norms in the multilateral trade fora include principles on non-discrimination, market access, fair trade, and solutions to conflicts between free trade and social value,⁷ and it is easy to find that the recent digital trade agreements also adopt similar principles.⁸ Among them, this study concentrates on the ‘non-discrimination principles’ (denoted by *the principles* hereinafter, to avoid confusion),⁹ prohibiting discrimination against ‘like’ objects for the purpose of providing a fair and free trade environment in the context of digital trade.

Discussion on *the principles* in digital trade is not a new topic in itself. The Seventh Session of the WTO Ministerial Conference in 2009 had already decided to begin discussions on *the principles* by ‘Work Program on Electronic Commerce’.¹⁰ However, with the development of digital technology, discriminatory measures in digital trade are taking more diverse forms over time, such as placing additional requirements on overseas digital service providers (e.g. data localization, additional license or fee, local presence) and unforeseen blocking or delaying the supply of overseas digital services for specific purposes (e.g. social order, cultural or political inappropriateness).¹¹ Responding to this, the importance of *the principles* has recently been reconfirmed in that ‘addressing discriminatory practice’ was set forth as the main goal in the ‘Digital Economy’ category under Pillar I (Trade) of IPEF (Indo-Pacific Economic Framework) in September 2022.¹²

Even if *the principles* are stipulated in the international agreements, it is still not clear how they will be applied in practice. One of the most fundamental obstacles comes from the fact that it is difficult to determine what the discriminatory treatment itself means without having a common definition of ‘digital trade’. To make it worse, it is even harder to specify the subjects of *the principles* in digital trade. *The principles* usually materialize with ‘market access’, which is referred to as the ‘ability of foreign suppliers to compete in the national markets without encountering discriminatory, excessively burdensome or restrictive conditions’.¹³ However, commitments on market access of digital trade are not mentioned or at best are unclear in most RTAs. What does it then mean to have *the principles* in the agreement?

To address these issues, we first investigate those associated with the unclearness of the subject of *the principles* under the existing trade norms and introduce a theoretical framework on the

⁶The digital trade chapter of the USMCA is the most representative example of the recent digital trade agreement. Paragraph 1 of its Article 19.2 states the following: ‘the Parties recognize the economic growth and opportunities provided by digital trade and the importance of frameworks that promote consumer confidence in digital trade and of avoiding unnecessary barriers to its use and development’. This is not the case only for developed countries. Digital trade rules by developing countries, such as the ASEAN Agreement on Electronic Commerce, also stress their function against trade barriers. Also, the preamble of the ASEAN Agreement on Electronic Commerce focuses on its contribution in lowering barriers to entry and operating costs for businesses.

⁷P. Van Den Bossche and W. Zdouc (2021) *The Law and Policy of the World Trade Organization*, 4th edn. Cambridge University Press, p. 38.

⁸For instance, Article 19.4 stipulates the non-discrimination principle, paragraph 4 of Article 19.2 indirectly prescribes the principle on market access, and Article 32.1 contains the principle on the conflict between free trade and social value.

⁹The principles’ encompass non-discrimination principles of the WTO as well as RTAs (including recent digital trade agreements). This study particularly focuses on non-discrimination principles under RTAs.

¹⁰WTO, ‘Work Program on Electronic Commerce Decision of 2 December 2009’, WT/L/782, 11 December 2009.

¹¹More examples and descriptions are found in the United States’ ‘National Trade Estimate (NTE)’ report (USTR, 2022) and M. Fink (2020) ‘Legal Analysis of International Trade Law and Digital Trade’, Think Tank European Parliament. For example, USTR annually publishes a long list of digital trade barriers by trading partner countries of the US in the NTE (National Trade Estimate) Report. Under the section on ‘Digital trade and electronic commerce’, it points out the barriers to cross-border data flows, including data localization requirements, discriminatory practices affecting trade in digital products, and restrictions on the provision of internet-enabled services, which are often *de facto* discriminatory to foreign suppliers.

¹²Ministerial Text for Trade Pillar of the Indo-Pacific Economic Framework for Prosperity, Pillar I (trade).

¹³J. López González and J. Ferencz (2018), ‘Digital Trade and Market Openness’, OECD Trade Policy Paper No. 217, OECD Publishing, Paris, p. 34.

incentives behind introducing *the principles*. We then empirically test, using our framework, whether the inclusion of *the principles* in a trade agreement actually helps to promote digital trade flow and what their roles are. Though one may argue that it is clear that *the principles* help to promote digital trade, how *these principles* are actually applied and implemented in practice is by no means a simple issue. As will be discussed later, the effect of *the principles* on digital trade flow may be more effective even in a situation where the subject of *the principles* is not completely clear as *the principles* are more densely stipulated in more areas. We also briefly discuss how *the principles* are stipulated in the RTAs to overcome such unclearness and which form of *the principles* can be clearer solution at a current stage of a norm development process.

This study is related to three different strands of literature on *the principles*. First, a majority of studies focus on how or whether the existing WTO rules should be changed or *mutatis mutandis* applied in digital trade. Thus, *the principles* are covered as a part of other existing WTO rules. For instance, these types of studies focus on issues such as the gap between the GATS and the digital economy.¹⁴ Their main interests lie in reviewing the applicability of WTO rules in digital trade and do not focus on *the principles* in detail.

Second, some studies analyze *the principles* in the very specific context of digital trade. Most of them so far have been embodied mainly in the field of digital taxes. They investigate whether a specific country's unilateral imposition of digital taxes may violate *the principle* under WTO. Discussions have continued with conflicting views on whether this does violate the non-discrimination principle¹⁵ or not,¹⁶ for example, studies on the EU's digital tax and the 'Equalization Levy'¹⁷ imposed by India. Our study differs from them in that it deals with the more general aspect of *the principles* rather than just digital tax.

Third, recently a few narrowly tailored studies on *the principles* have been undertaken in policy research institutes. For example recent trend changes in *the principles*, such as the range of interpretations on 'like products' or applications on their exceptions under the digital trade agreement by the US since the US makes a constant effort to recognize only very exceptional excuses for applying *the principles*.¹⁸ Rather than dealing with the particular digital trade-related provisions in a specific group of trade agreements, we investigate the most fundamental principle provisions of digital trade across all existing agreements.

In sum, only a few studies have dealt with *the principles* to be applied 'throughout digital trade', not limited to specific areas such as digital taxes. In addition, there has been no research on *the principles* 'in connection with their expansion effect on digital trade as a whole'.¹⁹ From this point of view, this study contributes to the literature in that it directly addresses a very fundamental question on *the principles*, whether and how they may cause the effect of promoting digital

¹⁴A representative example must be A.D. Mitchell and N. Mishra (2018) 'Data at the Docks: Modernizing International Trade Law for the Digital Economy', *Vanderbilt Journal of Entertainment & Technology Law* 20(4).

¹⁵O.O. Okanga (2021) 'Testing for Consistency: Certain Digital Tax Measures and WTO Non-Discrimination', *Journal of World Trade* 55(1), 101–126.

G. Rajgopalan (2018) 'Taxing Digital Economy – Applicability of Non-Discrimination Rules in International Agreements', Background Paper for New Delhi Conference of the International Fiscal Association, April 2018, 12 Pages, posted 4 June 2018. This study also points out that the EU digital tax regime is open for questioning violation of *the principles* of GATS.

¹⁶M. Elisabet and Y. Komalasari (2021) 'Digital Services Tax Regulations and WTO Non-Discrimination Principle: Is the Deck Stacked?', *Indonesian Journal of International Law* 19(1), art. 2. The imposition of PTE by Indonesia and the DST by the EU does not violate the WTO's non-discriminatory principles, namely the National Treatment and Most-Favored Nation principles in Article II and Article XVII of the GATS.

¹⁷India's Digital Service Tax is called the Equalization Levy, or Equilibrium Levy under Section 166A.

¹⁸S. Lester (2021) 'Digital Trade Agreements and Domestic Policy', *Free Trade Bulletin*, CATO Institute, 14 April 2021, Number 79.

¹⁹S. Wunsch-Vincent (2009) 'Trade Rules for the Digital Age', *GATS and the Regulation of International Trade in Services*. Cambridge University Press.

trade. To our best knowledge, this is the first study to discuss the meaning and role of *the principles* and to empirically analyze how *the principles* affect digital trade particularly.

The rest of this study proceeds as follows. Section 2 summarizes the issues related to *the principles* in trade agreements and provides a theoretical framework to explain them. Section 3 introduces the digital trade-related data we use and empirically analyses the relationship between *the principles* and digital trade across trade agreements. Based on the results from previous sections, Section 4 discusses additional considerations of the empirical analysis and derives policy implications. Finally, we conclude in Section 5.

2. Issues and Theoretical Framework

2.1 Issues on the Definition of Digital Trade

To begin with, it cannot be denied that a wide range of international organizations played a critical role in continuously discussing digital trade and its potential rules at the international level. According to the ‘Work Program on Electronic Commerce’²⁰ adopted by the WTO General Council on 25 September 1998, the term ‘electronic commerce’ is understood to mean the production, distribution, marketing, sale, or delivery of goods and services by electronic means. Moreover, IMF made an attempt to define ‘digital trade’ as all international trade flows that are either digitally ordered, digital intermediary platform-enabled, or digitally delivered.²¹ In a similar sense, the OECD stipulates digital trade as ‘all trade that is digitally ordered and/or digitally delivered’.²²

However, there is no consensus among countries with regard to the definition of ‘digital trade’, as the process of regulating digital trade within a determined scope is highly connected with each country’s national interest and domestic industries. First of all, in the case of the US, the US International Trade Commission (USITC) tends to broadly define digital trade.²³ We anticipate the US to easily regulate the online sales of tangible goods in conformity with the rules of trade-in-goods, while the US intends to concentrate on establishing new digital rules to regulate intangible goods and related services. Second, the EU’s definition on digital trade²⁴ is not sufficient to evaluate the EU’s position on digital trade because it is too broad and vague. Meanwhile, China is reluctant to accept the term of ‘digital trade’ and adheres to the term ‘e-commerce’ instead.²⁵ As outlined above, only a few FTAs contain a clear-cut definition of ‘e-commerce’

²⁰WTO (1998) ‘The Declaration on Global Electronic Commerce’, adopted by Ministers at the second session of the Ministerial Conference, WT/L/27430 September 1998.

²¹IMF, ‘Towards a Handbook on Measuring Digital Trade: Status Update’, BOPCOM–18/07, p.6.

IMF defines digital trade in an extensive and comprehensive approach. According to IMF, the three dimensions of digital trade are referred to as follows: (1) Digitally ordered trade transactions include all the international trade transactions that are classified as the sale or purchase of a good or service, conducted over computer networks by methods specifically designed for receiving or placing orders (following the existing definition of e-commerce, but including additional clarification that e.g. in-app purchases should also be considered in scope). (2) Digital intermediary platform-enabled trade transactions include all the international trade transactions via digital intermediary platforms, which in turn are defined as online interfaces that facilitate, for a fee, the direct interaction between multiple buyers and multiple sellers, without the platform taking into account the economic ownership of goods or providing the services that are being sold. (3) Digitally delivered trade transactions include all the trade transactions involving products (predominantly services) that are delivered remotely over ICT networks, following the definitions developed by the TG Service Task Group and the TFITS for ICT-enabled services.

²²Moreover, the OECD further defines digitally ordered trade as an international sale or purchase of a good or service, conducted over computer networks by methods specifically designed for the purpose of receiving or placing orders.

²³USICT (2017) ‘Global Digital Trade 1: Market Opportunities and Key Foreign Trade Restrictions’, p. 14. USICT defines digital trade as ‘the delivery of products and services over either fixed-line or wireless digital networks. It also describes the use of digital products and services by a wide range of industries, including online sales of goods and services over e-commerce platforms.’

²⁴EU Commission website, defines digital trade as ‘commerce enabled by electronic means’, <https://ec.europa.eu/trade/policy/accessing-markets/goods-and-services/digital-trade/> as EU.

²⁵According to RCEP by China, it stresses trade facilitation by allocating a separate Section B (Trade Facilitation), while avoiding digital contents and services. See Chapter 12 (Electronic Commerce) of RCEP.

or 'digital trade'.²⁶ Accordingly, it is unclear what is digitally traded and furthermore, whether the digital products are classified as goods or services.

Although a variety of views on the definition of digital trade are presented as aforementioned, a core issue from the promotion of the digital trade perspective is whether the target of digital trade is subject to 'goods', 'services', or 'tertium quid'.²⁷ *The principles* under trade-in-goods provide that foreign products should be accorded no less favorable treatment than domestic products, and *the principles* under trade-in-services, in a similar manner, provide that foreign services and service suppliers should be accorded no less favorable treatment than domestic services and service suppliers. In addition, *the principles* in digital trade stipulate that no less favorable treatment should be granted to other 'like' digital products, along with the definition of 'digital products'. Meanwhile, digital trade rules usually set up 'measures affecting trade by electronic transmission' as their scope of application. This is similar to the scope of cross-border trade in services, which is defined as 'measures affecting cross-border trade in services by foreign service suppliers'. However, unlike trade-in-services which expressly specify the modes of supply from Mode 1 to Mode 4, it is complicated to answer correctly what the subject of market access is in digital trade and what the target of *the principles* is, due to the controversy over the term 'trade by electronic transmission'. However, since the term 'electronic transmission' is generally defined as the transfer of digital products using 'electromagnetic or photonic means', digital trade is highly likely to be closer to trade-in-services rather than trade-in-goods considering the dichotomy under the current WTO system. Still, digital trade is not clearly distinguished from trade-in-services because the subject of digital trade is somewhat ambiguous. Furthermore, the recent dichotomy between goods and services is unclear because newly released smart items using digital technology cannot be clearly considered as goods nor their embedded services.²⁸ In addition, it is highly likely that countries are reluctant to categorize digital trade as either trade-in-goods or trade-in-services. The types or forms of exceptions clauses in RTAs are able to support this theory. For instance, in accordance with the Korea-US FTA,²⁹ e-commerce is, at a glance, likely to be categorized as trade-in-services because it quotes GATS Article 14 (Exceptions) other than GATT. Whereas, its footnote explicitly states that 'Article 23.1 is without prejudice to whether digital products should be classified as goods or services'.³⁰ Moreover, dominant phenomena such as the advent of new digital business models, package of goods and services, and servicification effect might make the market access more complicated and critical.³¹ To make it worse, digital technology, which enables the trade of bundling of goods and services, will challenge the traditional market access commitment under the clear-cut divided WTO world, such as trade-in-goods and trade-in-services.³² As previously stated, disagreements on the

²⁶Many FTAs allow for the indirect figuring out of the concept and scope of digital trade by providing the definitions of 'electronic means' and 'using electronic means' instead of defining 'digital trade'. For example, FTA between EAEU and Vietnam includes a separate chapter on 'Electronic Technologies in Trade'. Under this FTA, 'electronic commerce' is defined as 'trade with the use of electronic technologies'. Center for WTO and International Trade -VCCI, <https://wtocenter.vn/upload/files/fta/174-ftas-concluded/188-vietnam---eurasian-/241-full-text/FTA%20VN%20-%20EAEU%20-%20Full%20text.pdf>.

²⁷Wunsch-Vincent, supra n. 20, p. 5. According to this study, it is not visible at the moment for the WTO participating members to agree on the classification of digital products whether they are governed by GATT, GATS or some unique category deserving its own set of trade rules.

²⁸OECD, 'The Impact of Digitalization on Trade', www.oecd.org/trade/topics/digital-trade/.

²⁹Under Article 23.1 of the Korea-US FTA, 'Article XIV of GATS is incorporated into and made part of this agreement, mutatis mutandis for the purpose of the e-commerce chapter', <https://ustr.gov/trade-agreements/free-trade-agreements/korus-fta/final-text>.

³⁰Although many issues have been resolved in recent RTAs, it seems that many countries are still reserving a clear attitude on how to classify digital trade. For instance, even a cutting edged type of digital trade agreement, DEPA, cites both GATT and GATS exceptions without distinguishing goods and services in digital trade.

³¹OECD, 'Digital Trade and Market Openness', OECD Trade Policy Papers No. 217, p. 38.

³²Ibid.

definition of digital trade and difficulties in the classification of digital trade produce manifold problems, especially how to apply *the principles* to digital trade.

2.2 Issues on the Principles in Digital Trade

The traditional meaning of *the principles* in international trade implies no discrimination between 'like' products according to the nationality of the products. *The principles* under WTO are two-fold: the most-favored-nation (MFN) principle, which prohibits a country from discriminating between other countries, and the national treatment (NT) principle. The NT principle under the WTO requires that no less unfavorable treatment should be imposed under the concept of 'like product' or 'direct competition or alternative product'. In this regard, there is not much controversy over the interpretation of 'no less unfavorable treatment'; contrariwise, there have been disputes on 'like product'. The MFN principle is also a concept to guarantee fair conditions of competition by preventing intervention in the market to favor or unfavorably manipulate the products of a specific country. In the case of digital products, it is even more difficult to distinguish the country of origin among foreign digital products because it is harder to determine the country of origin than for goods or services and furthermore, a method on country of origin has not been established under digital trade. As will be shown later, in practice the MFN principle for digital trade has overall so far been secondary to the NT principle in that there is no RTA which stipulates the MFN principle only without the NT.

The GATT and WTO's appellate body and panels have relied on a traditional interpretation of 'like product' on a case-by-case basis.³³ The basic criteria for determining 'likeness' are stipulated in the Report of the Working Party on Border Tax Adjustments,³⁴ which includes the following: (i) the product's end uses in a given market or the product's objectives in a particular market, (ii) consumers' tastes and habits, (iii) the product's properties, and (iv) the nature and quality of the product. In other words, its criteria include physical characteristics or the physical identity of two products: functional likeness or end-uses, tariff classification such as harmonized system code (HS Code), and consumer tastes and habits. *The principles* share exactly the same hurdle as aforementioned, that is, 'likeness'. It is even worse for grouping 'like digital products' since it is intangible and wirelessly transmitted.

In the case of physical products, it is possible to distinguish whether they are in the same or a different group according to their appearance and propensity, which can be distinguished with the naked eye. However, in the case of digital products, which are intangible, their appearance or propensity cannot be uniformly determined. The consumption behavior and final consumption purpose of digital products are extremely diverse. Many FTAs provide for the non-discrimination principle under chapters on trade-in-goods and trade-in-services respectively, and the interpretation of these provisions follows the above WTO jurisprudence which applies to goods under the GATT or services under the GATS. However, when it comes to *the principles* specific to digital products, there is a debate on how to interpret them. Furthermore, many FTAs reserve decisions on whether digital products are goods or services by adding such a footnote under Korea-US FTA, 'the definition of digital products should not be understood to reflect a Party's view on whether trade in digital should be categorized as trade-in-services or trade-in-goods. Some commentators try to indicate that it is unavoidable to consider additionally new criteria such as skills, size of the company, business areas, experience and knowledge, number of employees, type of assets, and technology equipment in the case of intangible services.³⁵ Of course, even though digital products such as online games and videos are likely to be standardized in a very basic sense, it is not always straightforward to classify digital products or digital

³³WTO, 'Report of the Working Party (97-109) Border Tax Adjustments', adopted on 2 December 1970.

³⁴Ibid.

³⁵W. Zdouc (1999) 'WTO Dispute Settlement Practice Relating to the GATS', *Journal of International Economic Law* 2(2), 333.

services into existing CPC code.³⁶ Digital products have no form and thus can often be individually tailored to all individual consumers with excellent reproducibility and process ability. In sum, it is not easy to distinguish whether digital products optimized for individuals are ‘like products or not’.

Therefore, there is an obvious limit to responding to the discriminatory measures in digital trade by making use of *the principles* developed solely for trade-in-goods and trade-in-services. Thus, in the long run, a separate and additional principle on non-discrimination specialized for digital trade should be contemplated. In this sense, there is room for ambiguity in the application of *the principles*. Against such a backdrop, to be sure of providing a level playing field, it can be more effective for the time being to stipulate that *the principles* apply to both trade-in-services and digital trade than to stipulate that they apply to only one of them.

2.3 Theoretical Framework on the Principles in Digital Trade

Despite the ambiguity in the subject of *the principles*, as discussed, then why do many trade agreements include clauses on *the principles*? What is the theoretical reasoning that these provisions will help facilitate digital trade? There can be at least two possible theoretical explanations for the incentives to include *the principles*.

First, the inclusion of *the principles* in digital trade agreements may help mitigate trade policy uncertainty. The emergence of new objects of digital trade causes uncertainty as to whether they are goods or services, and if so, which classification code they fall under. Even if the new object of digital trade is classified as a service for instance, most of the FTA negotiations on service concessions are often based on the 1998 CPC code.³⁷ Therefore, it is highly unlikely that concessions on new digital services will be accepted under ‘the positive list approach’, under which the subject sectors of liberalization, conditions, and restrictions are explicitly inscribed on the list. Even when concessions are granted with ‘a negative list approach’ under which liberalization is committed for all those that are not included in the schedule of reservations, it is not certain whether the other country will accept the interpretation as including new trade objects that could not be foreseen at the time of the negotiation. Such a situation implies additional compliance costs for exporting countries and institutional uncertainty for exporters, which in turn impedes trade.

Defining a new area and newly including *the principles* are expected to have the effect of mitigating this uncertainty. Although *the principles* may be partially redundant with the existence of *the principles* under trade-in-goods and trade-in-services chapters, it could still be helpful to have a clause on *the principles* specific to digital trade as long as there is novelty to which market participants believe that *the principles* under other chapters may not apply. Specifically, to raise an issue against the discriminatory measures of the importing country, it should be possible to specify on what legal basis the measures are problematic. However, due to the ambiguity of the definition of digital trade itself, there may be uncertainties in whether the clause on *the principles* in either trade-in-goods or trade-in-services is applicable to the case or an additional clause on *the principles* is needed to cover the case. Such uncertainty hinders companies from entering foreign markets. Explicit inclusion of *the principles* on digital trade under the trade agreements can mitigate such uncertainty, though not completely, by improving the credibility of the importing country not to take discriminatory measures. This is particularly important for exporters when they must decide on costly irreversible investments, such as adopting a technology, producing a new product, or selling in a new market even if applied trade barriers are currently low or do

³⁶Elisabet and Komalasari, supra n. 16, 47. According to this study, the CPC defines only the activity of the service provider and not the service provider.

³⁷For example, the Annex 7-A-1 of the EU–Korea FTA states that ‘In identifying individual sectors and sub-sectors: ... (b) CPC ver. 1.0 means the Central Products Classification as set out in Statistical Office of the United Nations, Statistical Papers, Series M, N° 77, CPC ver 1.0, 1998’.

not exist³⁸. Related examples are requirements for server localization³⁹ or local presence,⁴⁰ and unforeseen control over international data flow (e.g. purposed data transmission delay, website blocking⁴¹). For example, imposing a server localization requirement on multinational digital platform companies doing business in a specific country that requires them to keep their server locally would impose a much greater burden on foreign companies than on domestic companies, which are more likely to already have servers in this country. In this respect, server localization is directly related to *the principles*. When policy uncertainty over cross-border data transfer is significant, it discourages foreign firms' market entry decision and investment, and subsequently hinders the flow of digital trade across borders.

Second, having *the principles* can help to mitigate trade costs incurred by the characteristics of digital technology. One of the key objectives of trade agreements between countries is trade liberalization, and digital trade is no exception. Even if two countries have agreed to abolish a cross-border measure, the importing country can restore it through the imposition of discriminatory domestic measures against the imported goods. And the principle devised to solve such a problem is national treatment.⁴² It is also argued that the same logic is maintained in digital trade as well.⁴³ In digital trade, discriminatory treatment by itself creates substantial trade costs for foreign firms. Trade liberalization generally aims at reducing trade costs and it is more relevant for digital trade which is often characterized by the reduction of various costs (e.g. search costs, transportation costs, replication costs.⁴⁴ In a situation where any other transaction costs are dramatically reduced due to digital technology, additional costs incurred due to the discriminative measure of the importing country can be significant enough to undermine the foreign producers' accessibility to the importing country's market. That is to say, as the absolute cost level related to digital trade decreases, the relative importance of the cost due to the discriminatory measures becomes decisive. In this sense, the non-discrimination treatment becomes a critical factor for market access when other transaction costs get relatively smaller. After entering the market, foreign firms may encounter additional trade costs in the form of de facto discriminatory fees⁴⁵ or license costs.⁴⁶

³⁸Handley and Limão (2015) show that trade agreements can bring a positive trade effect by credibly reducing trade policy uncertainty (TPU) (K. Handley and N. Limão (2015) 'Trade and Investment Under Policy Uncertainty: Theory and Firm Evidence', *American Economic Journal: Economic Policy* 7(4), 189–222).

³⁹According to the 2022 NTE report, data localization requirements are imposed in many countries such as Brazil, Canada, China, Ecuador, El Salvador, EU, India, Indonesia, Kenya, Korea, Malaysia, Nigeria, Norway, Pakistan, Philippine, Russia, Saudi Arabia, Swiss, Thailand, Turkey, UAE, UK, and Vietnam, which can raise costs for the construction or use of unnecessary and redundant local data storage. As even more extreme data localization measures, Russia and China plan to introduce measures to centralize, control, and restrict Internet infrastructure services, driving Internet fragmentation at all levels (refer to Russia's 'Sovereign Internet' law and Chinese 'Draft Data Security Management Measures of 2020', article 29) (Internet Society, 'Internet Way of Networking Use Case: Data Localization', 30/Sep/2020).

⁴⁰The 2022 NTE report presents that local presence requirements are imposed in many countries, such as Jordan, Korea, Pakistan, Russia, Thailand, Turkey, and Vietnam, which can limit the ability of firms to provide services on a cross-border basis. As an example, Russia implemented the 'Landing Law' in 2001, which requires local presence for a website or application with more than 500,000 daily users (2022 NTE report, p. 437). 2022 NTE report website, <https://ustr.gov/about-us/policy-offices/press-office/press-releases/2022/march/ustr-releases-2022-national-trade-estimate-report-foreign-trade-barriers>.

⁴¹China, Egypt, Kenya, Pakistan, Russia, Singapore, Thailand, UAE, and Vietnam restrict or block access to certain websites that are deemed politically or culturally inappropriate. Specially, China currently blocks legitimate websites and imposes significant costs on both suppliers and users of web-based services and products, and it has been estimated that more than 10,000 sites are blocked, affecting billions of dollars in business, including communications, networking, app stores, news, and other sites (2022 NTE report, p. 107).

⁴²H. Horn (2006) 'National Treatment in the GATT', *American Economic Review* 96(1), 394–404.

⁴³R.W. Staiger (2021) 'Does Digital Trade Change the Purpose of a Trade Agreement?', mimeo, www.nber.org/papers/w29578.

⁴⁴A. Goldfarb and C. Tucker (2019) 'Digital Economics', *Journal of Economic Literature* 57(1), 3–43.

⁴⁵On 1 July 2019, Bangladesh imposed VAT on sales of B2C and B2B transactions ranging from 15% (a standard rate) to 5% (a reduced rate), to non-resident providers of digital services to domestic consumers (R. Asquith, 'Bangladesh VAT on Foreign Digital Services', 15 December 2021).

⁴⁶On 1 August 2019, Turkey's Radio and Television Supreme Council (RTUK) published the Regulation to require providers of Internet streaming services to establish a commercial presence in Turkey and to obtain a broadcasting license. On 21

Even when restrictions on cross-border data movement are expected, the existence of these measures or other restrictive technology requirements could incur additional costs to foreign firms in terms of the deterioration of their service quality, especially when the service is operated through well-integrated globally distributed data networks.

Due to these underlying functions of *the principles*, we can expect the following phenomena to be observed. That is, when the effect of alleviating policy uncertainty and that of reducing trade costs exist, we can expect that a country has the incentive to include the non-discrimination principle in its trade agreement anticipating an increase in digital trade flow. For such an effect on trade flow of *the principles*, we call it *the trade promotion effect*. Notice that it is very challenging to directly empirically measure how much the uncertainty has been reduced and how much trade cost has been alleviated due to *the principles*. To overcome this, instead we measure indirectly how effective the introduction of a *principle* is in mitigating trade barriers, assuming that the uncertainty and trade costs are embodied as trade barriers. For such an indirect effect of mitigating the uncertainty and trade costs, which materialized as alleviating trade barriers, we call it '*the trade barrier mitigation effect*'. Finally, these effects are expected to be stronger when *the principles* are more clearly stipulated, even if they overlap, than when *the principles* are marginally added to the existing terms. We denote it as *the acceleration effect* by rule clarification. Based on this framework, we can establish empirical hypotheses as follows.

H 1.1 (Trade promotion effect) *A pair of countries that have a trade agreement containing non-discrimination clauses on digital trade are more likely to experience more digital trade flows.*

H 1.2 (Trade barrier mitigation effect) *Having the non-discrimination principle clauses on digital trade mitigates the negative impact on digital trade caused by digital trade barriers.*

H 2: (Acceleration effect) *This tendency is even more pronounced as the principles are stipulated (albeit overlapping) more clearly in the agreement.*

3. Empirical Analysis

3.1 Data Description

3.1.1 Digital Trade Flow

To test the empirical hypotheses, we use various digital trade related datasets. First, to measure the digital trade flow between two countries, we use the cross-border trade in services (which is known as 'Mode 1' trade in GATS) in a sector which heavily depends on digital trade. Specifically, based on the bilateral service trade flow information, we apply a proportional allocation method to the modes of supply.⁴⁷ For the bilateral service trade flow, we use the database established by the OECD–WTO, BaTiS (Balanced Trade in Services Database) which covers the period from 2005 to 2019. For the share of Mode 1 trade information by country-sector, we use TiSMoS (Trade in services data by mode of supply).⁴⁸ As the representative sectors closely related to digital trade, we focus on the cross-border ICT (Information, Computer, and Telecommunication) service sector in this study. Suh and Roh show that the Mode 1 trade in ICT-enabled service sectors, the

February 2022, RTUK warned three international online media outlets. Deutsche Welle, Voice of America, and Euronews, to obtain broadcast licenses. Failure to obtain the licenses could result in RTUK blocking access to or removing content on the sites and imposing criminal sanctions. The broadcast license, which covers 10 years, costs \$7,382 (100,000 Turkish liras) for digital streaming platforms and online TV broadcasting (E. Sahinkaya (2022) 'Turkey's Media Regulator Forces VOA and Others to Obtain License', 10 February 2022).

⁴⁷M. Mann and D. Cheung (2019), 'Measuring Trade in Services by Modes of Supply', Eurostat Statistical Working Papers, <https://ec.europa.eu/eurostat/documents/3888793/10282481/KSTC-19-007-EN-N.pdf/730bfc0b-8c13-db03-a903-1dbb0c69013f>.

⁴⁸For both BaTiS and TiSMoS, see www.wto.org/english/res_e/statis_e/trade_datasets_e.htm.

Table 1. Frequency table of the *principles* for digital trade

	D-chapter			Total
	Inclusion of principles	No	Yes	
S-chapter	No	24	0	24
	Yes	43	30 ^a	73 ^b
Total	67	30	97	

Notes: ^aMost of them include both ‘National Treatment’ (NT) and ‘Most Favored Nation Treatment’ (MFN) but three which mention NT only: India–Singapore ECA, Korea–Singapore FTA, and Central America–Korea FTA.

^bFollowed by GATS 16.17, it is typical that national treatment is mentioned only if market access is allowed in an agreement on trade in service. In contrast, MFN is based on a negative system that unconditionally applied to all services regardless of whether or not market access is allowed, and only items to which MFN does not apply are listed separately. Therefore, in our study, whether the trade agreements include *the principles* in the S-chapter is determined by whether the service and investment chapters include ‘market access’ and ‘national treatment’ in the trade agreements. Since our study focuses on the ICT sector, we only consider *the principles* for computer, telecommunication, and related services sectors.

Source: calculated by the authors based on the TAPED.

most digital trade-intensive service sector, can be a reasonable proxy for digital trade. For more discussion on the validity and significance of this approach.⁴⁹

3.1.2 Non-Discrimination Principles in Digital Trade Agreements

To identify the trade agreement that includes the non-discrimination principles related to digital trade, we use the TAPED (Trade Agreements Provisions on Electronic-commerce and Data) database, which covers the trade agreements signed since 2000.⁵⁰ To match the period with the digital trade flow data, we focus on the active agreements in force until 2019. During the period, there were 97 trade agreements containing at least more than one digital trade-related provision (in short, *digital trade agreements*). Of these, 73 agreements include *the principles* either in a separate digital chapter or in a service chapter.⁵¹

In the separate digital chapter, *the principles* usually appear in the article titled either ‘digital products’ or ‘non-discriminatory treatment of digital products’. In the service chapter, *the principles* are stipulated under the article such as ‘market access’, ‘national treatment’, ‘national treatment, and most favored nation treatment’. For its simplicity, we call the former case *D-chapter* and the latter *S-chapter*. Table 1 summarizes the distribution of agreements depending on whether and how they include *the principles*.

There are 24 agreements that do not include *the principles* in any chapters, even when they contain digital trade related provisions. 43 agreements do not include *the principles* in the D-chapter, but do so in the S-chapter. As mentioned above, there is no case that includes *the principles* in the D-chapter but not in the S-chapter. Finally, 30 agreements contain *the principles* in both chapters.

From this, we can observe two interesting properties in the mode of inclusion, *overlap* and *direction*. First, a significant number of agreements contains *the principles* in both chapters, seemingly overlapping. Second, every agreement with *the principles* in the digital trade chapter contains them in the service trade chapter as well.⁵² Based on these two properties, we can

⁴⁹J. Suh and J. Roh (2023) ‘The Effects of Digital Trade Policies on Digital Trade’, *The World Economy* 46(8), 2383–2407.

⁵⁰We use the version of 11 June 2021. For details on TAPED, see M. Burri and R. Polanco (2020) ‘Digital Trade Provisions in Preferential Trade Agreements: Introducing a New Dataset’, *Journal of International Economic Law* 23(1), 187–220.

⁵¹Some trade agreements (e.g. Singapore–US FTA, China–Korea FTA, CPTPP, etc.) include *the principle* for a sector-specific article such as the financial service sector in the service chapter under the title ‘Market Access for Financial Institutions’.

⁵²For example, the Singapore–US FTA specifies *the principles* along with the imposition of no customs duty in the article of ‘Digital Products’ in the digital trade chapter and does *the principles* in the articles of ‘local presence’ and ‘national treatment’ in the service chapter. It also includes a sector-specific clause mentioning *the principles* under the title ‘Market Access for Financial Institutions’ in the service trade chapter.

develop a simple index of how an agreement includes *the principles*, and call it *ND* (*Non-Discrimination*). That is, depending on whether *the principles* are included in any chapter, we can assign the value of 1 if they are included and 0 otherwise. According to the direction property, this is actually a classification method depending on whether it is an S-chapter or not. We can further develop this index by disaggregating it into two sub-indexes, *ND both* and *ND S-only*. *ND both* has 1 if *the principles* included are overlapping (or in the D-chapter due to direction property in our sample) and 0 otherwise. *ND S-only* has 1 if they are only in the S-chapter and 0 otherwise. Note that we can restore *ND* with these two sub-indexes, that is, $ND = ND\ both + ND\ S-only$. In the sense that overlapping inclusion will work in a manner that reduces uncertainty about the applicability of *the principles*, such a disaggregated index allows us to observe the intensity of how an agreement includes *the principles*.

Consequently, we focus on the disaggregated approach initially and then discuss later whether our main results change depending on whether we combine, or separate, the indexes.

3.1.3 Digital Trade Barriers

Discriminatory treatments are materialized in the form of various kinds of domestic measures. To capture this, we use the OECD digital services trade restrictiveness index (*DSTRI*), which is an overall index to measure how a country has a digital trade restrictive environment. It is a composite index that is based on all the domestic laws or regulations recognized as trade barriers to digital trade through scoring, weighting, and aggregation.⁵³ Its value ranges between 0 and 1, and the higher value implies a more restrictive digital trade environment. The original dataset covers the period from 2014 to 2021 for 74 countries, but we use the dataset up to 2019 to cope with the digital trade flow data.

According to the policy areas, *DSTRI* can be broken down into five sub-indexes, namely ‘Class 1 (Infrastructure and connectivity)’, ‘Class 2 (Electronic transactions)’, ‘Class 3 (Payment systems)’, ‘Class 4 (Intellectual property rights)’, and ‘Class 5 (Other barriers)’.⁵⁴ To scrutinize digital trade barriers in depth, we pay our attention to Class 1, especially. It is not only because it is the most important policy area in constructing the overall *DSTRI*, in which the highest weight of 0.55 is assigned to it, but also because it is relevant to the discriminatory treatment. As discussed before, most discriminatory perceived digital trade barriers are related to cross-border data flow restriction or data localization issues that are categorized into Class 1. For example, the policies recognized as discriminatory measures by the USTR NTE report (such as ‘Article 37 of the Cybersecurity Law’ of China, and ‘Article 16 of Act on Establishment, Management of Spatial Data’ of Korea) are listed in the regulatory measures consisting of Class 1.⁵⁵ To distinguish this from the overall index, *DSTRI*, we denote it as ‘*DSTRI 1*’ as a variable name in our empirical analysis.

3.2 Empirical Model Specification

The main interest of our empirical analysis is to test how the inclusion of *the principles* in a trade agreement affects digital trade flows. To see this, we introduce a panel gravity model with the

⁵³Scoring involves transforming qualitative information into quantitative data. Weights balance the relative importance of measures. Aggregation is the final step to calculate the cumulative index as a weighted average of the scores. See J. Ferencz (2019) ‘The OECD Digital Services Trade Restrictiveness Index’, OECD Trade Policy Papers 221, OECD Publishing, for a detailed explanation on the categorized framework of OECD Digital STRI.

⁵⁴The Digital STRI framework is categorized as following. ‘Class 1 – Infrastructure and connectivity’ is a measure affecting cross-border data flows. ‘Class 2 – Electronic transactions’ is a measure affecting electronic transactions. ‘Class 3 – Payment systems’ is a measure affecting the payments made through electronic means. ‘Class 4 – Intellectual property rights’ is a measure of domestic policies related to the protection and enforcement of trademarks, copyright and related rights. ‘Class 5 – Other barriers’ is a measure of barriers to trading in digitally enabled services that do not fall under the previous policy areas (e.g. performance requirements, limitations on downloading and streaming, or restrictions on online advertising).

⁵⁵USTR NTE 2022, <https://ustr.gov/about-us/policy-offices/press-office/press-releases/2022/march/ustr-releases-2022-national-trade-estimate-report-foreign-trade-barriers>.

following regression equation.

$$IM_{ij,t} = \alpha + \beta_1 ND_{ij,t} + \beta_2 DSTRI_{ij,t} + \beta_3 ND_{ij,t} \times DSTRI_{ij,t} + \beta_4 X_{ij} + I_{it} + I_{jt} + \varepsilon_{ij,t}$$

The dependent variable ($IM_{ij,t}$) is the imports of digital trade from country i to country j in year t . Our key independent variable, ND , captures whether the pair of countries, i and j , have a trade agreement with a non-discrimination clause. This is sometimes broken down into two sub-index variables, ‘*ND both*’ and ‘*ND S-only*’, as explained before. It is expected that its coefficient β_1 will be positive if there exists the trade promotion effect of *the principles*. When we use sub-indexes instead of ND as a whole, we expect that the coefficient of *ND both* is greater than that of *ND S-only*, that is, the acceleration effect.

As the main control variable, we use $DSTRI$ but in a bilateral form, $DSTRI_{ij,t} = DSTRI_{i,t} \times DSTRI_{j,t}$. The reason why we do not directly use each country’s $DSTRI$ is to control the time-varying unobservable multilateral resistance which is required to be theoretically consistent.⁵⁶ To fulfill this, we introduce the country-year fixed effect model, in which I_{it} and I_{jt} are the dummy variables for importer-year and exporter-year, respectively. Under these, all the country-year varying variables are absorbed by these fixed effect variables, including $DSTRI_{i,t}$ or $DSTRI_{j,t}$. To overcome this issue as well as to consider the $DSTRI$ aspect, we use their interaction term and interpret it as the restrictiveness of the regulatory environment the pair of countries have between them. We expect that its coefficient β_2 will be negative, which implies that a more digital trade-restrictive regulatory environment will dampen the digital trade flow. Furthermore, to estimate the marginal effect of ND given $DSTRI$, we also introduce an interaction term between two, $ND_{ij,t} \times DSTRI_{ij,t}$. If the sign of its coefficient β_3 is positive, it will mean that the ND inclusion has the mitigation effect against the negative effect from trade barriers on the digital trade flow. Having a greater magnitude will imply a greater mitigation effect against a more restrictive regulatory environment. Finally, the other typical time-invariant bilateral trade cost variables in the gravity model of international trade literature are denoted by X_{ij} . This includes ‘distance’, ‘contiguity’, and ‘common language’ and is sourced from the CEPII gravity data.

Taking logarithms is often used in a gravity model, but it makes zero trade flows drop out of the estimations. In that zero trade flows can be informative if they are due to prohibitive trade costs, useful information can be lost when zero trade flows drop out of the estimations. To handle this issue, we use the Poisson Pseudo Maximum Likelihood (PPML) estimation, which enables us to avoid dropping zero trade flows out of the estimations because it is applied to the levels of trade.⁵⁷

3.3 Empirical Results

Our main empirical results are presented in Tables 2 and 3. We first examine whether (H1.1, Trade promotion effect) holds or not.⁵⁸ In Table 2, all the coefficients of ND have a positive sign and they are statistically significant and this implies that once *the principles* are included in a trade agreement, they are helpful to promote the digital trade flow.⁵⁹ As expected, the coefficients of digital trade barriers have a statistically significant negative sign in columns (2) and (3),

⁵⁶J. Anderson and E. Van Wincoop (2003) ‘Gravity with Gravitas: A Solution to the Border Puzzle’, *American Economic Review* 93(1), 170–192.

⁵⁷J. Santos Silva and S. Tenreyro (2006) ‘The Log of Gravity’, *The Review of Economics and Statistics* 88(4), 641–658.

⁵⁸Given that our digital trade agreement related variables were made based on the effective date, it is understood that these trade promotion effects take into account the effects on digital trade after the entry into force of the agreements.

⁵⁹One may wonder whether this is because countries with relatively liberal approaches and more data flows find it easier to agree to ambitious digital trade commitments, including non-discrimination. However, such causal issue of whether an agreement containing provisions related to digital trade itself contributes to digital trade flows has been empirically tested and validated in another study by Suh and Roh, supra n. 49, which showed that there is no reverse causality as the aforementioned argument.

Table 2. Empirical results of ND in any chapters

Imports in digital trade	(1)	(2)	(3)	(4)	(5)
ND	0.375***	0.219***	0.226***	0.418***	0.426***
DSTRI		-5.095**			
DSTRI 1			-13.125***		
STRI computer				-2.885	
STRI telecommunications					-1.178
In distance	-0.680***	-0.599***	-0.600***	-0.668***	-0.670***
Contiguity	0.046	0.024	0.023	0.015	0.012
Common language	0.199***	0.274***	0.272***	0.179**	0.182***
Country-time fixed effect	Yes	Yes	Yes	Yes	Yes
Obs.	74,559	7,068	7,068	7,704	7,704
R ²	0.858	0.882	0.882	0.875	0.875

Note: *denotes statistical significance at the 10%, ** at the 5%, ***, and at the 1% level.

Table 3. Empirical results of ND overlap

Imports in digital trade	(1)	(2)	(3)	(4)	(5)
ND S-only	0.316***	0.227*	0.567***	0.243**	0.481***
ND both	0.389***	0.216***	0.049	0.219***	0.171*
DSTRI		-5.092**	-6.183***		
ND S-only × DSTRI			-9.612**		
ND both × DSTRI			12.318***		
DSTRI 1				-13.189***	-18.596***
ND S-only × DSTRI 1					-23.519*
ND both × DSTRI 1					19.868***
In distance	-0.681***	-0.599***	-0.612***	-0.600***	-0.606***
Contiguity	0.046	0.024	0.001	0.023	0.015
Common language	0.199***	0.274***	0.288***	0.272***	0.273***
Country-time fixed effect	Yes	Yes	Yes	Yes	Yes
obs.	74,559	7,068	7,068	7,068	7,068
R ²	0.858	0.882	0.883	0.882	0.882

Note: *denotes statistical significance at the 10%, ** at the 5%, *** and at the 1% level.

implying that digital trade barriers basically impede digital trade flows. In columns (3), we can see that a more discriminatory trade barrier (DSTRI1) has a stronger negative effect than overall barriers (DSTRI) in column (2).

To check whether DSTRI is a proper measurement for digital trade barriers, we also consider OECD STRI for the relevant sectors, computer and telecommunications. In columns (4) and (5), the signs of their coefficients are negative but statistically insignificant. This may imply that DSTRI is certainly a more targeted index to digital trade compared to a typical STRI

measurement.⁶⁰ As the distance decreases and a common language is used between the parties, the digital trade flows also increase statistically significantly. However, ‘contiguity’ is not statistically significant, meaning that we could not find evidence that sharing the same border between two countries increases digital trade flows.

Next, we conduct a similar analysis with the finer measures of ND, *ND S-only* and *ND both*, and the results are summarized in Table 3. Similar to the previous results, it confirms the positive effect of ND (for both variables) while the negative effect of DSTRI (as well as DSTRI1) on digital trade flow. Other trade cost variables still show the expected signs as well. However, there are also several new observations. First, the coefficient of ‘*ND both*’ is larger than that of ‘*ND S-only*’ in our baseline model, column (1), which implies that defining ND in both chapters affects digital trade to a greater extent than defining ND in the service chapter only. However, this does not appear in columns (2) and (4), which consider only the direct effect of ND on the digital trade flow under the existence of DSTRI. Second, when we take the indirect effect of ND against DSTRI into account as well, we can see how clarification on ND mitigates the negative effect of digital trade barriers on the digital trade flow (H1.3, Trade barrier mitigation effect). Columns (3) and (5) show that the interaction term between *ND both* and DSTRI as well as that between *ND both* and DSTRI1 are positive and statistically significant, respectively. It means that *ND both* has a greater trade barrier mitigation effect on digital trade and it is more effective under a more restrictive digital trade environment. Column (5) shows that this tendency is more apparent against more discriminatory barriers, DSTRI1. *ND S-only* has a positive sign with a greater magnitude coefficient than *ND both* at a glance but such a seemingly advantageous effect disappears when we consider its indirect effect against DSTRI. With a negative sign for its interaction term with DSTRI, *ND S-only* easily loses its positive role to help the digital trade flow against digital trade barriers. It suggests that stipulating *the principles* clearly, even if they overlap, can help to easing digital trade barriers (H2, Acceleration effect).⁶¹

4. Discussion

In this section, we consider other relevant aspects of the results from our above analysis. First, in that the empirical results in Section 3 focused only on the effects of *the principles*, we further discuss cases when other related provisions of the agreement are also considered. Also, we discuss what policy implications can be based on the issues and empirical results from Sections 2 and 3.

Indeed, besides *the principles*, there can be other provisions in the trade agreement which may affect digital trade flows. Since the purpose of this study is not which clause affects digital trade flows more (or the most) than the others, we do not consider the effect of every single component of the trade agreement here. Instead, we further examine the effect of other provisions which are expected to influence the digital trade flow as well as being closely associated with ND, that is provisions on data flow and no data localization. To identify the trade agreement that includes the provisions on data flow and no data localization, we also use the TAPED.⁶²

⁶⁰This result makes sense in that the policy variables constituting DTRI appropriately cover digital trade specific elements that are not in STRI (e.g. electronic transactions, payment system, intellectual property rights, and other barriers affecting trade in digitally enabled services).

⁶¹It is worth noting that these results are based on the ‘final values’ (the result of the estimations and adjustment procedures used to ensure complete consistency of the dataset) from BaTiS rather than the ‘reported values’ (the trade as reported by the relevant statistical authorities), so there is a risk of recovering the gravity type coefficients that are used to estimate the missing values by default. To address this point, we conduct the same analysis using the ‘reported values’ and find similar results, only quantitatively different. That is, we can find that the effect of NDs on digital trade flows is positive and statistically significant even under the dataset with reported values and a moderating effect for DSTRI. Also, other gravity variables show similar statistical significance and signs of coefficients. One caveat is that the coefficient on DSTRI itself is negative but statistically insignificant, which is likely because the standard deviation of DSTRI for countries that report trade flows in services is about twice as low as that for countries that do not.

⁶²We re-construct the variables of ‘data flow’ and ‘no data localization’ based on the TAPED. According to the TAPED codebook, ‘data flow’ (TAPED variable # 1.28.1) is coded based on whether the e-commerce chapter include provisions on

Table 4. Empirical results of provisions on data flow and data localization

Imports in digital trade	(1)	(2)	(3)	(4)	(5)
ND			0.228***	0.212***	0.224***
Data flow	0.062		-0.023		-0.039
No data localization		0.122		0.05	0.069
DSTRI	-5.475***	-5.769***	-5.015**	-5.303**	-5.242**
In distance	-0.600***	-0.601***	-0.601***	-0.597***	-0.600***
Contiguity	0.027	0.026	0.023	0.025	0.023
Common language	0.264***	0.262***	0.274***	0.274***	0.273***
Country-time fixed effect	Yes	Yes	Yes	Yes	Yes
obs.	7,068	7,068	7,068	7,068	7,068
R ²	0.881	0.881	0.881	0.882	0.882

Note: *denotes statistical significance at the 10%, ** at the 5%, *** at the 1% level.

Table 4 below shows the effect on digital trade flows when ‘data flow provision’ and ‘no data localization provision’ are separate and together with ND. While the sign of ND is positive and statistically significant, those of other provisions are mixed but all are insignificant. In that there are not many observations yet,⁶³ it may be too early to conclude that these provisions do not affect the digital trade flow. In any case, it confirms that including *the principles* has a relatively stable and substantial effect.⁶⁴

We found that *the principles* in trade agreements have the effect on digital trade flow. This effect works well even in a situation where the subject of *the principles* is not completely clear, and the more densely stipulated *the principles* are in more areas, even if they are partly overlapped, the more effective they are. However, such an *ad hoc* and overlapping approach has limitations in its effectiveness in that it inevitably produces a new loophole as the technology keeps developing. Even when *the principles* are partly overlapped, the emergence of new digital trade could open up another new dimension of ambiguity in which field *the principles* could be applied in actual cases as long as we do not have a clear definition and scope of digital trade. A representative example must be the recent debate over tech giants’ in-app billing systems.⁶⁵ In 2021, the Amendment Bill to

data flows, and ‘no data localization’ (TAPED variable # 1.28.4) on whether a trade agreement has provisions to prohibit the use of data localization requirements. It is worthwhile to note that there is no case for ‘imposing data localization requirement’ (TAPED variable # 1.28.3) since our study covers up to 2019. TAPED Codebook, chrome-extension://efaidnbmninnibpcjpcglcdefindmkaj/https://www.unil.ch/fileadmin/fakultaeten/rf/burri/TAPED/2020_06_08_TAPED_Burri_Polanco_Codebook.pdf.

⁶³Compared to the ‘ND’ (‘no ND’ obs. 24 and ‘ND’ obs. 73), 21 out of 97 agreements include the provisions on ‘data flow’, 7 agreements of which also include the provision on ‘no data localization’. There are no agreements that include only ‘no data localization’ without ‘data flow’. In addition to 7 agreements including both ‘data flow’ and ‘no data localization’, additional 13 agreements including only ‘data flow’ also have ‘ND’.

⁶⁴One may argue that examining a small number of provisions may not be sufficient to ascertain the effectiveness of *the principles*. And it makes sense especially considering the correlated structure of clauses in trade agreements. It is often that when one clause is included in a trade agreement, other related clauses tend to be included at the same time. And such correlation structure of clauses makes it difficult to distinguish the effect of a particular clause from others. To address this concern, we conduct the principal component analysis in the Appendix. Over every relevant variable in TAPED, we constructed principal components (PCs), and found that PC containing ND provision is one of the major components and the PC actually shows a positive sign on digital trade flow.

⁶⁵According to the *Wall Street Journal* 31 August 2021, the law amends South Korea’s Telecommunications Business Act to prevent large app-market operators from requiring the use of their in-app purchasing systems. It also bans operators from unreasonably delaying the approval of apps or deleting them from the marketplace—provisions meant to head off retaliation against app makers.

the current Telecommunications Business Act, the world's first attempt to prohibit large application (app) market operators from allowing third party payment systems, was announced in Korea, and similar bills have appeared in other countries lately. However, despite the opinion that in-app payments should be regulated in terms of a fair competition perspective, controversy over the violations of *the principles* from the international economic law perspective has cropped up. The US criticized this Amendment Bill because the Korean Government appears to specifically target US service providers.⁶⁶ The US has raised complaints on these discriminatory measures, but it seems unclear as to from which Chapter under the Korea-US FTA the US would like to quote *the principles*.

Even though explicit and independent provisions of *the principles* are stipulated under Chapter 15 (Electronic Commerce)⁶⁷ of the Korea-US FTA, the US seems to choose *the principles* under Chapter 12 (Trade in Services) by priority. Korea should abide by *the principles* under Chapter 12 (Trade in Services), avoiding discriminatory treatment towards US application market operators. The Amendment Bill adopts non-biased terms to ban app market operators from enforcing app developers to use in-app purchasing systems and thus, this Bill does not seem to violate the *de-jure* non-discrimination principle. However, based on the fact that the market share of the US based multinational tech-giants is over 80%,⁶⁸ we cannot exclude any single possibility of a *de-facto* violation. The Korea-US FTA, a legal base on the aforementioned debate, contains *the principles* not only under Chapter 12 but also under Chapter 15. Nevertheless, it is likely not to precisely quote which *principles* between Chapter 12 and Chapter 15 should be applied.⁶⁹ It is also difficult to clarify whether 'digital products' defined in *the principles* of Chapter 15 is applied to the in-app purchasing system. To make matters worse, even though *the principles* of Chapter 12 are quoted at the moment, it is still vague whether to apply this clause to the newest services such as application market operators.

This shows that *the principles* under trade-in-services alone are not enough to foster fair competition for digital goods or services produced by the ever-changing digital technology, and that separate non-discrimination principles much more tailored and detailed for digital trade are absolutely necessary. Of course, as aforementioned, the current non-discrimination principles in digital trade are far from complete. It is expected that adding the clearer definition and scope of digital trade can enhance the effectiveness of *the principles* on digital trade by clearing up the gray areas that are not completely covered by *the principles* under trade-in-services only.

5. Conclusion

Despite the common perceptions in many countries of the importance of digital trade, it is still controversial among countries whether the subject of digital trade is classified as 'goods', 'services', or 'tertium quid'. The absence of a clear definition of digital trade makes *the principles* of digital trade a non-trivial issue. This is because it is hard to determine what a discriminatory measure is without defining 'likeness', a core factor of the traditional interpretation on *the principles*. And 'likeness' is a non-separable concept from what digital trade really is. A temporary solution might be to apply the traditional classification approach to digital trade. However, there might be a loophole whereby *the principles* in trade-in-services alone cannot completely respond to discriminatory practices in digital trade. After explaining how *the principles* in digital trade may promote digital trade and mitigate related trade costs even when the subject of *the principles* is completely clarified, we found the following empirical analysis results. First, the inclusion

⁶⁶The National Trade Estimate Report on Foreign Trade Barriers (NTE) 2021, p. 333.

⁶⁷Article 15.3 (Digital Products).

⁶⁸In a report of the inspection on the government office by the Korean National Assembly 2021, according to Korean news article, the market share of Google and Apple app stores was revealed during the parliamentary inspection of the administration (2021.09.15).

⁶⁹According to this news article, USTR raised the possibility of the violation on the national treatment obligations under WTO GATS and the Korea-US FTA.

of *the principles* in trade agreements is more likely to increase digital trade flows. This is true whether *the principles* are set out independently for digital trade or as a part of the trade-in-services chapter, or both. Second, though digital trade barriers decrease digital trade flows, this negative effect can be mitigated when *the principles* are more clearly defined in the trade agreements, even if there are overlapping parts between the chapters.

With the progress of the digital economy and its irreversibility, it is expected that more countries will pursue digital trade liberalization in the near future. Accordingly, *the principles* for digital trade will also be specified and generalized. Nevertheless, the reality is that a number of countries are still concerned about a rapid opening up through the application of *the principles*. In this sense, the deepening of the digital economy may exacerbate these differences in positions between countries. In this study, we only highlighted the most fundamental aspect of *the principles*, that is, their trade promotion effect. There may be another side to the effects of *the principles* making a group of countries to be reserved. A more balanced study is thus needed, which will also address the other side and suggest how to handle it in future studies.

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Appendix

Under the structure of correlations between the elements of an agreement, we use the principal component analysis method to examine the effect of a specific element. To proceed with this method, we take the following three-step approach. That is, we (1) construct a variable which is closely related to *the principles*, one reflecting the commitment to ‘data flow’ or ‘no data localization’ requirement, (2) calculate the principal components, which are independent vectors that linearly combine the provision variables of the digital trade agreement classified on the TAPED, and then (3) estimate how principal components representing the key provisions affect the digital trade flow.

STEP 1. Constructing free data flow provision variable

As explained in footnote 61, variables directly related to the commitment to data flow or no data localization requirement, are TAPED #1.28.1 and #1.28.4. Considering the relationship between these clauses, ‘Data flow only’ is defined as giving 1 if only TAPED #1.28.1 is greater than 1 and 0 otherwise. ‘No data localization only’ is defined as giving 1 if only TAPED #1.28.4 is greater than 1 and 0 otherwise. ‘Data flow & No data localization’ is defined as giving 1 if both TAPED #1.28.1 and #1.28.4 are greater than 1 and 0 otherwise. The cross-frequency among the principles, data flow, and no data localization is shown in Table A1 below.

Table A1. Cross-frequency among key provisions in DTAs

	no ND	ND	total
Neither	23	53	76
Data flow only	1	13	14
No data localization only	0	0	0
Data flow & No data localization	0	7	7
total	24	73	97

STEP 2. Calculating the principal components with provisions in digital trade agreements

For the principal component analysis, 43 variables classified as ecommerce data flow related clauses in the TAPED are used, excluding non-essential or redundant variables such as dummy of digital trade provision inclusion, and dummies of US type or EU type, etc.⁷⁰ For more details on the variable information, please refer to the Codebook Big Data Trade Agreements.⁷¹ below summarizes the top 10 provisions which consist of each principal component.

⁷⁰For this purpose, we exclude #1.3, #1.4, #1.8.1, #1.8.3, #1.28.1, #1.28.3, and #1.28.4 in terms of TAPED variable number. The first four variables are used for generating the ND variable, and the last three variables are sub-clauses of data flow.

⁷¹TAPED Codebook, [chrome-extension://efaidnbmninnbpcjpcgclefindmkaj/https://www.unilu.ch/fileadmin/fakultaeten/rf/burri/TAPED/2020_06_08_TAPED_Burri_Polanco_Codebook.pdf](https://www.unilu.ch/fileadmin/fakultaeten/rf/burri/TAPED/2020_06_08_TAPED_Burri_Polanco_Codebook.pdf).

Table A2. Top provisions for each principal component

PC	Rank	Variable #	Correlation	PC	Rank	Variable #	Correlation	PC	Rank	Variable #	Correlation
pc1	1	1.23	0.882	pc4	1	1.11.2	0.838	pc7	1	1.27	0.724
	2	1.2	0.877		2	1.36.5	0.817		2	1.13.3	0.714
	3	ND	0.876		3	1.18.1	0.653		3	1.18.1	0.327
	4	1.8.3	0.860		4	1.36.6	0.498		4	1.36.7	-0.265
	5	1.24	0.856		5	1.33	-0.433		5	1.11.2	-0.243
	6	1.36.1	0.856		6	1.26	-0.424		6	1.13.4	0.199
	7	1.11.1	0.850		7	1.36.7	0.351		7	1.33	-0.193
	8	1.3	0.845		8	1.5	-0.311		8	1.18.2	-0.174
	9	1.36.3	0.843		9	1.18.2	-0.289		9	1.36.4	-0.159
	10	1.12.1	0.834		10	1.28.2	-0.273		10	1.26	-0.136
pc2	1	1.36.4	0.500	pc5	1	1.5	0.520	pc8	1	1.34	0.633
	2	1.22	0.478		2	1.12.2	-0.463		2	1.35	0.523
	3	1.13.4	0.473		3	1.13.1	-0.457		3	1.36.7	-0.488
	4	1.244	-0.472		4	1.26	0.454		4	1.18.1	0.274
	5	1.33	0.467		5	1.33	0.434		5	1.18.2	0.258
	6	1.36.6	0.463		6	1.18.2	0.387		6	1.36.2	-0.194
	7	1.245	-0.462		7	1.6	0.352		7	1.36.6	0.174
	8	1.26	0.460		8	1.36.4	0.349		8	1.13.3	-0.138
	9	1.242	-0.445		9	1.15	-0.321		9	1.5	-0.130
	10	1.13.2	0.441		10	1.21	-0.293		10	1.15	0.130
pc3	1	1.13.2	0.757	pc6	1	1.22	0.560	pc9	1	1.36.7	0.536
	2	1.29	0.753		2	1.12.2	0.422		2	1.35	0.523
	3	1.25	0.697		3	1.13.1	0.418		3	1.34	0.387
	4	1.13.4	0.697		4	1.7	-0.387		4	1.36.6	-0.307

(Continued)

Table A2. (Continued.)

PC	Rank	Variable #	Correlation	PC	Rank	Variable #	Correlation	PC	Rank	Variable #	Correlation
	5	1.13.1	0.523		5	1.14	0.372		5	1.13.3	0.282
	6	1.12.2	0.518		6	1.1	-0.323		6	1.18.1	-0.169
	7	1.28.2	-0.480		7	1.28.2	-0.285		7	1.27	0.159
	8	1.36.6	0.412		8	1.9	-0.272		8	1.36.2	0.155
	9	1.6	-0.401		9	1.25	-0.236		9	1.18.2	0.153
	10	1.1	-0.366		10	1.29	-0.235		10	1.29	-0.139

We can observe that the non-discrimination principle clause is highly correlated with the first principal component (pc1). So, we may interpret pc1 as a proxy variable of the non-discrimination principle. A free data flow related clause is also included in pc1, but its ranking (26th) is not so high. There is no principal component that contains the non-discrimination clause variable within the top 20 or even the top 30. It is similar to the free data flow clause. The only exception is the sub-ordinated principal component (PC5) which contain it in the 16th place. This does not necessarily imply that the free data flow is not important, but it may be because there are not many observations that contain the related clauses yet.

STEP 3. Estimating the effect of principle components on digital trade flow

Table A3 below shows the results of estimating the effects of digital trade flows as in the previous analysis, using the principle components calculated above as explanatory variables. It shows that pc1 has a significant positive effect on digital trade flow. Though this result does not tell us much about how exactly the principle interacts with other provisions (incl. free data flow ones), at least it confirms that the non-discrimination principle still matters even after considering other provisions together at the same time.

Table A3. Empirical results of data flow provisions grouped by principal components

VARIABLES	(1)	(2)	(3)	(4)
pc1	0.0169* (0.00888)	0.0167* (0.00887)	0.0188* (0.00980)	0.0194* (0.0101)
pc2	0.0493*** (0.0166)	0.0471*** (0.0164)	0.0357** (0.0169)	0.0339** (0.0171)
pc3	-0.0399*** (0.00996)	-0.0363*** (0.0112)	-0.0300*** (0.0112)	-0.0292*** (0.0110)
pc4	-0.0159 (0.0118)	-0.0151 (0.0115)	-0.00459 (0.0119)	-0.00434 (0.0119)
pc5	-0.0515*** (0.0173)	-0.0501*** (0.0173)	-0.0548*** (0.0179)	-0.0538*** (0.0181)
pc6		0.00774 (0.0177)	0.0162 (0.0190)	0.0170 (0.0190)
pc7			0.00281 (0.00978)	0.00356 (0.00984)
pc8			0.00612** (0.00288)	0.00868 (0.00788)
pc9				-0.00303 (0.00871)
DSTRI	-3.946* (2.151)	-3.854* (2.211)	-3.240 (2.289)	-3.179 (2.290)
ln distance	-0.547*** (0.0297)	-0.547*** (0.0297)	-0.550*** (0.0298)	-0.549*** (0.0301)
Contiguity	0.0401 (0.0542)	0.0389 (0.0543)	0.0338 (0.0544)	0.0332 (0.0545)
Common language	0.300*** (0.0849)	0.302*** (0.0852)	0.307*** (0.0851)	0.308*** (0.0858)

(Continued)

Table A3. (Continued.)

VARIABLES	(1)	(2)	(3)	(4)
obs.	7,068	7,068	7,068	7,068
R^2	0.884	0.884	0.884	0.884

Note: *denotes statistical significance at the 10%, ** at the 5%, ***, and at the 1% level.