



Research Article

Regional Digital Trade Rules and Digital Service Exports

Junbo Zhao* 

School of Customs and Public Economics, Shanghai Customs University, Shanghai, China

Abstract

This study selected 44 countries worldwide as the research sample from 2005 to 2021. Based on the TAPED database, the depth index of regional digital trade rules was quantified, and an empirical test was conducted to examine the impact effect of regional digital trade rules on bilateral digital service exports. The study found that the improvement of the depth of regional digital trade rules significantly promoted the scale of bilateral digital service trade exports, and this conclusion remained valid after a series of robustness tests. From the perspective of the impact path, this promoting effect was mainly achieved through export diversification. Heterogeneity analysis revealed that the data-related clauses, market access clauses, and trade promotion clauses had the most significant trade-promoting effect on digital services; compared with capital-intensive sectors, regional digital trade rules had a more significant trade-creation effect on technology-intensive sectors, while they had a certain inhibitory effect on knowledge-intensive sectors. This study is of great significance for all countries to promote digital economic development through institutional openness and to facilitate the transformation of international digital trade rules from fragmented bargaining to inclusive governance.

Keywords

Regional Digital Trade Rules, Digital Service Trade, Clause Heterogeneity

1. Introduction

The disruptive iterations of digital technology and the global digitalization process are driving digital service trade to rise from a marginal supplement to a structural pillar of the global trade system. Unlike traditional trade forms, digital service trade, as a new type of business with dual attributes of economic growth and cultural infiltration, not only reshapes the global value chain division through knowledge-intensive services such as cloud computing and digital finance, but also reconfigures the competition landscape of national soft power through platform economy and digital content. According to data from the United Nations Conference on Trade and Development (UNCTAD), from 2005 to 2023, the global scale of digital service exports has soared from 0.86 trillion to 4.25

trillion US dollars, with an average annual growth rate of 9.2%, accounting for over 54% of the total service trade, highlighting its crucial role as a core growth driver. However, the conflict between the demand for data cross-border free flow and the privacy regulations of sovereign states, the competition over digital tax collection rights and the fragmentation of technical standards, reflect the strategic trade-offs between trade liberalization benefits and the transfer of digital sovereignty. Especially in the context of the diminishing effectiveness of the WTO multilateral framework, how to construct a rule system that is both efficient and secure has become a core issue in resolving the "rule competition dilemma" in global digital governance.

*Correspondence: Junbo Zhao (0320250107@m.shcc.edu.cn)



Currently, regional trade agreements (RTAs) have replaced the multilateral framework as the dominant vehicle for the construction of digital rules due to their flexible contracting mechanisms and deep institutional integration. Since the "cross-border data flow" clause first appeared in the US-Jordan FTA in 2000, according to WTO statistics, as of June 2022, a total of 379 regional trade agreements have come into effect globally, among which 138 RTAs contain digital trade-related provisions, and 106 RTAs include dedicated digital trade chapters. Moreover, nearly 50% of these RTAs feature South-North country contracting characteristics (such as the US-Mexico-Canada Agreement and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership). These regional rules significantly reduce the institutional transaction costs of digital service trade by eliminating data localization barriers and unifying electronic certification standards, thereby shaping a "club-like" export distribution pattern. Based on this, this paper uses data from 44 countries from 2005 to 2021 to deeply explore how the depth of rules drives the expansion of digital service exports, providing scientific evidence for identifying the mechanisms of rule depth, clause heterogeneity, and resilience to shocks.

In the context of the global digital governance system transitioning from a multilateral framework to a regional one, regional trade agreements have gradually become the core carriers for the formulation of digital trade rules. However, the diversity and complexity of the rule governance system have led to extensive academic discussions on the classification [4], effects, and mechanisms of regional digital trade rules. Aaronson divided RTA digital trade rules into two major templates based on disputes over key clauses such as cross-border data flow and data localization [1]. The American template, relying on the United States' dominance in digital technology and institutional leadership, continuously promotes the formulation of digital trade rules under its leadership to safeguard its strategic interests. In contrast, the European template, anchored by the EU's General Data Protection Regulation (GDPR), has constructed a defensive rule system with "privacy sovereignty and cultural exception" as its two pillars [3]. Although both models attempt to dominate the global digital governance discourse, their inherent flaws and intensified paradigm competition have exacerbated the fragmentation and institutional friction in global governance [14]. Relevant studies explore the characteristics of digital trade rules through policy analysis and qualitative research [13], and test the policy effects of the agreements in the form of dummy variables. However, considering the obvious flaws in the homogeneity assumption of the rules, it is impossible to further explore the degree of differentiation in the content of the rules at the clause level.

The possible marginal contribution of this article is as follows: Firstly, in terms of indicator construction and quantification, this article breaks away from the traditional practice of simply treating digital trade terms as dummy variables. Based

on the differences in the characteristics of rule terms, this article uses the TAPED database released in January 2022 to construct four sub-item term heterogeneity indices and a total depth index to depict the differentiated impacts of different sub-items of terms on digital service exports. Secondly, this article explores the heterogeneous trade effects of digital trade rules from the perspectives of term classification and industry classification, broadening the analytical perspective of digital trade rules. Furthermore, this article identifies and examines the transmission paths from the perspective of export diversification, deeply revealing the internal logic of rule depth driving digital service exports. This provides decision-making references for all countries to further promote high-level opening-up, accelerate the alignment with international high-standard digital trade rules, and deeply participate in the construction of the global economic and trade rule system.

2. Construction of the Heterogeneity Index for Regional Digital Trade Clauses

The original data for the quantitative analysis of the regional digital trade rules in this article is sourced from the TAPED database established by Burri and Polanco from the University of Lucerne in Switzerland. As of November 2023, this database has included 432 digital trade-related agreements. Based on the characteristics of the rules, this article divides the RTA digital trade rule provisions into four According to the above standards, referring to the classification criteria of Abbot & Snidal for the binding and non-binding commitments of RTA texts [2], specific digital trade terms are assigned values based on the strength of their legal binding force. This paper classifies the important terms according to their rule attributes, and each term is categorized into the corresponding three-level indicators (see Table 1). When calculating the sub-index of regional digital trade rules, each specific digital trade term is classified into soft terms, mixed terms, and hard terms according to the size of its legal binding force, and is assigned values of 1, 2, and 3 respectively. Soft terms are "legal arrangements that significantly weaken one or more dimensions such as legal obligations, rule precision, and authorization", and have the characteristic of non-mandatory enforcement; while hard terms refer to precise obligations with legal binding force, which are mandatory. These commitments require one party to comply with a certain regulation or principle, and if not complied with, the other party can submit claims to the dispute resolution mechanism of the agreement; mixed terms refer to a treaty that contains both soft commitments and hard commitments. If a certain term is not included, it is assigned a value of 0. The higher the score, the higher the commitment level of the contracting parties to cross-border data flow and the deeper the rules. If two economies do not have digital trade rules, the score is 0. Heterogeneous indica-

tors, specifically including: (1) Data-related provisions, consisting of cross-border data flow, data localization, and disclosure of data source code. (2) Market access provisions, including non-discriminatory treatment, e-commerce tariffs, and consistency with international law. (3) Trade promotion provisions, consisting of whether they include encouraging small and medium-sized enterprises to participate, trade facilitation, electronic certification, and dispute resolution mechanisms. (4) Consumer protection provisions, including online consumer protection, unsolicited commercial electronic information, personal data protection, and liability of online intermediary platforms.

3. Influence Mechanism and Research Hypothesis

The purpose of signing regional digital trade rules is to lower the market access threshold for importing countries, enabling participating countries to receive positive impacts, gain greater economic benefits in value chain trade, and promote the sustainable development of digital service trade. The aspects covered have gradually shifted from superficial content to deeper provisions [11]. Among them, data-related provisions significantly reduce restrictions on cross-border data flow and enhance market transparency. By weakening unilateral or bilateral restrictive factors, it achieves the free allocation of digital service products globally and improves the efficiency of supply and demand matching, reduces the marginal cost of digital product foreign trade, strengthens the attraction of value-added trade between bilateral countries. Market access provisions and trade promotion provisions help eliminate trade discrimination, lower market entry thresholds, simplify trade approval and supervision, and simplify trade procedures, alleviate information asymmetry in enterprises' participation in international trade processes, further expand the trade scale of exporting countries, and promote the optimization of the trade chain [12]. RTA digital trade rules establish unified rules and standards for bilateral countries, provide a key institutional engine for resolving disputes, and by shortening the institutional distance between contracting countries, significantly reduce the information costs and trade costs of importers and exporters, significantly enhance the overall competitiveness of digital service products of exporting countries, further expand the scale of digital service trade. Based on this, this article proposes:

Hypothesis 1: Regional digital trade rules facilitate the growth of bilateral digital service trade exports.

The signing of regional digital trade rules helps diversify export products. The intellectual property protection-related provisions in the RTA provide a favorable institutional protection for enterprises' innovative activities, reducing the political risks and rule uncertainties in trade participation due to institutional differences among countries, and thereby stimulat-

ing enterprises' investment in research and development, alleviating the risks of innovation obstacles and investment uncertainty faced by enterprises, and further enhancing the innovation and diversification levels of export products [15]. Moreover, under the framework of the RTA, through unified standards and norms of the rules, export enterprises can deeply integrate into the global digital service industry chain. By leveraging the replicability of data elements, they can better obtain support from upstream research and design stages, achieving marginal output and scale return growth as well as the expansion of product functions and improvement of product quality, and expanding the differences and diversity of export products [5, 6]. This paper proposes the following research hypotheses:

Hypothesis 2: Regional digital trade rules promote the growth of bilateral digital service trade export volume through the effect of export diversification.

4. Model Variables and Data Description

4.1. Model Construction

Based on the expanded trade gravity model, this paper uses cross-national panel data of 44 economies worldwide from 2005 to 2021 to analyze the impact of RTA digital trade rules on bilateral digital service trade. The empirical model is set as follows:

$$\ln Export_{ijt} = \beta_0 + \beta_1 Depth_{ijt} + \beta Controls + \lambda_i + \lambda_j + \lambda_t + \varepsilon_{ijt} \quad (1)$$

The indices i , j , and t in the variables represent the importing country, the exporting country, and the year respectively. The explained variable $Export_{ijt}$ represents the digital service export volume of country j to country i in year t , and it has been logarithmically transformed in this study. $Depth_{ijt}$ serves as the core explanatory variable, reflecting the depth index of RTA digital trade rules between the two countries; $Controls$ represents the set of control variables, which specifically include the economic size of the importing country (GDP_{it}), the economic size of the exporting country (GDP_{jt}), the difference in demand preferences ($PGDP_{ijt}$), the geographical distance between the two countries ($Dist_{ij}$), the existence of border contact ($contig_{ij}$), the common language ($comlng_{ij}$), the difference in internet penetration (ICT_{ijt}), and the difference in property rights protection (PR_{ijt}); at the same time, λ_i and λ_j are used to represent the fixed effects of the importing country and the exporting country respectively, and λ_t is used to represent the time fixed effect to control factors that do not change over time and economic shock impacts in a specific year; β_0 is the intercept term, and ε_{ijt} is the random disturbance term.

4.2. Variable Description and Data Source

4.2.1. The Dependent Variable

The dependent variable in this study is the bilateral digital service export trade volume ($Export_{ijt}$) of 44 economies worldwide from 2005 to 2021, selected from the OECD database. This study classifies the digital service industry based on EBOP into 6 sub-sectors, and further categorizes these six sub-sectors according to the industry's factor intensity into capital-intensive, technology-intensive, and knowledge-intensive digital service industries, and the total data of digital service exports of each country is obtained by summing up the service export volumes of the three heterogeneous industries.

4.2.2. Core Explanatory Variable

The core explanatory variable is the total depth of regional digital trade rules ($Depth_{ijt}$), which mainly includes four categories of clauses: data-related clauses ($data_{ijt}$), market access clauses ($access_{ijt}$), trade promotion clauses ($prom_{ijt}$), and consumer protection clauses ($consumer_{ijt}$). After assigning values to the specific clauses, the secondary indicators can be obtained through the weighted average of the tertiary indicators' indices. Based on this, five primary indicators can be calculated, and the overall depth of regional digital trade rules ($Depth_{ijt}$) can be obtained. The construction of specific indicators is shown in Table 1. If there is more than one digital trade rule in effect between two countries, the maximum value is taken to avoid duplicate calculations. The arithmetic average method is used, and the calculation methods of each level of indicators are as follows:

$$Depth_H = \frac{\sum_{i=0}^n Index_{Li}}{n(Index_L)} \quad (2)$$

In Equation (2), $Depth_H$ represents the depth of the high-level indicators, $n(Index_L)$ represents the number of corresponding sub-level indicators, and $Index_{Li}$ indicates the depth of the digital trade terms of the i -th low-level indicator contained within the corresponding high-level indicator.

4.2.3. Control Variables

(1) Domestic and foreign gross domestic product (GDP_{it} ,

GDP_{jt}) of the importing and exporting countries: This paper incorporates the GDP of the home country and the trading partner country to control the economic scale of the two countries. All calculations are based on the constant price US dollars of 2010 as the base period, and the data are selected from the World Bank database. (2) Bilateral demand preference difference ($PGDP_{ijt}$): This paper uses the absolute value of the logarithmic difference of the bilateral per capita GDP of member countries ($PGDP_{ijt} = |\ln PGDP_{it} - \ln PGDP_{jt}|$) to measure. (3) Geographical distance between the two countries ($Dist_{ijt}$): The transportation cost of icebergs will decrease as the geographical distance between the two countries gets closer [9, 10]. This paper uses the population-weighted geographical distance between the importing and exporting countries as a representative of the variable trade cost. Compared with the traditional geographical distance, introducing the population factor for weighting can better capture the actual economic connection intensity between the two places. Regions with a higher population density have a larger market size and greater economic activity. This data is sourced from the CEPII database. (4) Difference in Internet penetration (ICT_{ijt}): Good network infrastructure conditions help promote the development of digital trade [8]. This paper uses the absolute value of the difference in the percentage of individual users using the Internet in the two countries to represent the difference in the Internet levels between the two countries. (5) Difference in property rights protection (PR_{ijt}): The difference in the level of intellectual property protection between the importing and exporting countries will create institutional barriers, which are not conducive to bilateral digital service trade exchanges. This paper uses the level of intellectual property protection in the Global Economic Freedom Index released by the Heritage Foundation of the United States as the property rights protection level of the two countries, and takes the absolute value of the difference in the property rights protection levels as the measurement indicator of the property rights protection difference. (6) Whether there is border contact ($contig_{ijt}$): Border contact, as a supplement to geographical distance, can serve as a marker for bilateral spatial distance and cultural distance. If the two countries are bordering, the value is 1; otherwise, it is 0. (7) Whether there is a common language ($comlng_{ijt}$): The same language between the two countries has the effect of improving the communication efficiency of the trading parties. If there is a common language between the two countries, the value is 1; otherwise, it is 0. Descriptive statistics of the variables are shown in Table 1.

Table 1. Descriptive statistics of major variables.

Variable	Obs	Mean	Std.dev	Min	Max
$Export_{ijt}$	10064	18.320	3.1226	0	24.739
$Depth_{ijt}$	10064	3.9154	3.261	0	10.39
GDP_{it}	10064	26.911	1.471	22.31	30.78

Variable	Obs	Mean	Std.dev	Min	Max
GDP _{jt}	10064	26.911	1.471	22.31	30.78
PGDP _{ijt}	10064	1.2625	1.0201	0.0009	4.284
Dist _{ij}	10064	8.1095	1.085	4.9519	9.846
ICT _{ijt}	10064	22.326	18.9072	0	85.004
PR _{ijt}	10064	24.151	20.124	0	85
contig _{ij}	10064	0.0811	0.2723	0	1
comlng _{ij}	10064	0.122	0.3269	0	1

5. Analysis of Empirical Results

5.1. Baseline Regression

Table 2 presents the benchmark regression results of bilateral digital service trade based on the depth of regional digital

trade rules. In the (1) column, the coefficient of the core explanatory variable is significantly positive at the 1% level. This indicates that, without including any control variables, an increase in the depth of rules has a significant positive promoting effect on the digital service industry. As control variables are gradually added, the significance of the coefficient of RTA digital trade rules remains robust, suggesting that for the digital service sector, an increase of 1 unit in Depth leads to an increase of 1.88% in digital service export volume.

Table 2. Baseline regression.

Variable	Export _{ijt}			
	(1)	(2)	(3)	(4)
Depth _{ijt}	0.0475***(6.92)	0.0465***(6.83)	0.0136**(2.17)	0.0188***(2.99)
_cons	18.13***(590.27)	-9.622***(-3.63)	-6.767***(-2.90)	-7.637***(-3.27)
Importing	Yes	Yes	Yes	Yes
Exporting	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
N	10064	10064	10064	10064
R ²	0.815	0.817	0.843	0.844

Note: ***, ** and * indicate that the variable coefficients are statistically significant at the 1%, 5% and 10% levels respectively. The values in parentheses are the t-statistics. The table below is the same.

5.2. Robustness Test and Endogeneity Issue

5.2.1. Change the Regression Method

This paper employs the Poisson pseudo-maximum likelihood estimation (PPML) model for robustness testing to confirm the reliability of the conclusions. The PPML estimation can avoid the problem of logarithmic linearization when some trade volumes are zero, which would lead to sample loss. The

result in column (1) of Table 3 shows that the coefficient of the core explanatory variable remains significantly positive and the promoting effect on digital service trade remains robust.

5.2.2. Other Robustness Tests

First, the core explanatory variable is lagged by one period. The signing of regional digital trade rules and their generation of effects often require a certain amount of time, and there is a

certain lag. This paper processes the explanatory variable "regional digital trade rules" by lagging it by one period. The result in column (2) of Table 3 shows that the coefficient of the lagged explanatory variable is significantly positive at the 1% level, and the size of the coefficient is not significantly different from that of the baseline regression. Second, changing the sample time. To eliminate the possible influence caused by the epidemic, the data of 2020 and 2021 in the sample were removed and a new regression was conducted. The analysis in column (3)

of Table 3 shows that the robustness of the conclusion of this paper has been further verified. Third, excluding the EU. Due to the characteristic of EU regional economic integration, which may cause certain impacts on trade among member states, this paper excluded all the countries whose import and export partners are all EU members. The results show that the coefficient of the independent variable in column (4) is significantly positive at the 1% level, and the result is still robust.

Table 3. Robustness test.

Variable	Replace PPML (1)	One period behind schedule (2)	Reduce the time (3)	Excluding the European Union (4)
Depth	0.0103**(2.48)	0.0169*** (2.59)	0.0236*** (3.37)	0.0184*** (2.78)
Controls	Yes	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes	Yes
N	10064	9472	8880	6970
R ²	0.9490	0.845	0.845	0.803

6. Mechanism Verification and Heterogeneity Analysis

6.1. Mechanism Analysis

The export diversification index is calculated by measuring the absolute deviation between the trade structure of the exporting country and the global structure. This index is constructed based on the approach of Finger & Kreinin [7], and the specific formula is as follows:

$$ED_{jt} = \frac{\sum_k |h_{jk} - h_k|}{2} \quad (3)$$

Here, ED_{jt} represents the export diversification index of country j in year t . h_{jk} indicates the proportion of product k 's export volume in the total export volume of country j , and h_k represents the proportion of product k 's export volume in the total world export volume. Product k is selected from the relevant products in the three-digit category of the International Trade Commodity Classification (SITC3). The export diversification index ranges from 0 to 1. The closer the value is to 0, the smaller the difference from the world model. The regression results in columns (1) and (2) of Table 4 show that, regardless of whether control variables are included, the coefficient of regional digital trade rules is significantly positive at the 1% level. This indicates that the signing of the

rules helps to promote the diversification of enterprises' product exports.

Table 4. Mechanism analysis.

Variable	(1) ED	(2)
Depth	0.0383*** (3.10)	0.0524*** (4.37)
Controls	No	Yes
Fixed effect	Yes	Yes
N	10064	10064
R ²	0.976	0.978

6.2. Heterogeneity Analysis

6.2.1. Industry Heterogeneity

Due to the varying impacts of the RTA digital trade rules on different digital service sectors, this paper further classifies the EBOP classification of the digital service industry based on the degree of factor intensity into three types: capital-intensive, knowledge-intensive, and technology-intensive. The columns (1) to (3) in Table 5 present the regression results of the sub-samples of these three types of digital service industries. The regression results show that,

except for the knowledge-intensive industry, the RTA digital trade rules have a significant trade growth effect on the capital-intensive and technology-intensive industries in the digital services sector. Among them, the promoting effect of the technology-intensive industry is the most significant. This may be because the products of this industry are more likely to benefit from the spillover effects of non-discriminatory digital trade rule provisions. The reason for the negative trade creation effect of the knowledge-intensive industry may be due to the influence of the anti-globalization wave and the rise of trade protectionism. The particularity of this industry makes it easier to launch unfair competition in this field. Countries have set certain restrictions on the cross-border transfer and licensing of knowledge-intensive digital service products, and have adopted more stringent privacy protection measures during the exchange and storage of data, thereby having an inhibitory effect on the trade of related products.

6.2.2. Clause Heterogeneity

Currently, the regional digital rules provisions exhibit characteristics of diversity and fragmentation. Table 5 (columns 4

to 7) presents the sample regression results of these four rule provisions. Among them, the market access provisions and trade promotion provisions are both significantly positive at the 1% level, and the deep regression coefficient of the trade promotion provisions is 0.0804, which is higher than the coefficient of the market access provisions, confirming that the depth of the trade promotion provisions has a more significant effect on the trade creation effect of the digital service industry. Secondly, the data correlation provisions are positively significant, indicating that they still have a certain promoting effect on the digital service exports. However, the coefficient of the consumer protection provisions is not significant but positive. This might be due to the fact that, as represented by the EU, "privacy protection" and "audio-visual exceptions" are regarded as crucial human rights and consumer rights, which is a key reason for the difficulty in reaching consensus in the current rule signing (taking TISA as an example). Most trading members have failed to reach a consensus on the consumer protection-related provisions.

Table 5. Heterogeneity analysis.

Variable	Industry heterogeneity			Clause heterogeneity			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Capital	Techn	Knowl	Export			
Depth	0.0189*(1.74)	0.0196*** (2.72)	-0.046***(-3.23)				
data				0.049**(2.16)			
access					0.053*** (3.10)		
prom						0.080*** (3.39)	
consumer							0.0367 (1.46)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	10064	10064	10064	10064	10064	10064	10064
R2	0.767	0.823	0.684	0.844	0.844	0.844	0.844

7. Conclusions and Recommendations

This study is based on the bilateral digital service trade panel data of 44 countries worldwide from 2005 to 2021 in the OECD database, combined with the regional digital trade rule heterogeneity index constructed by the TAPED database. Using the extended gravity model framework, it systematically examines the promoting effect of regional digital trade rules on digital service exports. The study finds: Firstly, the depth

of the rules is significantly positively correlated with the expansion of trade scale. That is, the signing of regional digital trade rules significantly promotes the bilateral digital service export scale, and this promoting effect increases with the increase in the depth of the rules. Secondly, the mechanism test reveals that the total depth of regional digital trade rules enhances digital service trade exports through the effect of export diversification. Furthermore, the heterogeneity of terms leads to differentiated digital trade effects. Among them, the promotion effects of data-related terms, market access terms,

and trade promotion terms are significantly higher than those of consumer protection terms. Additionally, the signing of rules has the highest trade creation effect on technology-intensive sectors, followed by capital-intensive sectors, while it has a certain inhibitory effect on knowledge-intensive sectors. Based on the above research conclusions, this paper proposes the following policy recommendations:

Firstly, focus on the core effectiveness layer of the rules, and enhance the leading role of the rules' depth. Comprehensively improve the depth and overall level of the digital trade rules provisions in the region. Incorporate more forward-looking and comprehensive provisions into regional trade agreements to ensure that the rules can not only meet the current digital trade demands but also lead the future development trends.

Secondly, activate multilateral collaborative governance to bridge the gap of clause heterogeneity. Address the efficiency clauses such as data flow and market access, as well as the institutional capacity gap of developing countries.

Furthermore, improve the "digital development compensation mechanism" by means of technical assistance and digital infrastructure joint construction, to narrow the "North-South rule income gap". Additionally, address the challenge of structural differentiation and implement a gradient development strategy.

Abbreviations

TAPED	Trade Agreement Provisions on Electronic Commerce and Data
UNCTAD	United Nations Conference on Trade and Development
RTA	Regional Trade Agreement
OECD	Organization for Economic Co-operation and Development

Author Contributions

Junbo Zhao: Conceptualization, Data curation, Writing – original draft, Project administration, Funding acquisition, Writing – review & editing

Funding

This work was supported by the 2025 Graduate Research and Innovation Program of Shanghai Customs College under the project "How Does Rule Depth Drive Digital Service Exports? Evidence from Regional Digital Trade Rules" (Grant No. 2026YJSCS018).

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Burri M, Polanco R, 2020. Digital Trade Provisions in Preferential Trade Agreements: Introducing a New Dataset [J]. *Journal of International Economic Law*, 23(1): 187-220. <https://doi.org/10.1093/jiel/jgz044>
- [2] Aaronson S A, 2016. The Digital Trade Imbalance and Its Implications for Internet Governance [J]. *Global Commission on Internet Governance*, (25): 1-40. <https://doi.org/10.2139/ssrn.2813392>
- [3] Anderson, J. E., and E. van Wincoop, 2003. Gravity with Gravitas: A Solution to the Border Puzzle [J]. *American Economic Review*, 93(1), 170-192. <https://doi.org/10.1257/000282803321455214>
- [4] Meltzer J P, 2016. Maximizing the Opportunities of the Internet for International Trade [C]. *ICTSD and World Economic Forum*.
- [5] Malkawi B, 2019. Digitalization of Trade in Free Trade Agreements with Reference to the WTO and the USMCA: A Closer Look [J]. *China and WTO Review*, 5(1): 149-166. <https://doi.org/10.14330/cwr.2019.5.1.07>
- [6] Abbott K W, Snidal D, 2000. Hard and soft law in international governance [J]. *International Organization*, 54 (3): 421-456. <https://doi.org/10.1162/002081800551280>
- [7] LAWRENCEZ R, 1996. Regionalism, Multilateralism and Deeper Integration [M]. Washington, DC: Brookings Institution.
- [8] Li N, Li R, Wiemer C. A study on the impact of Regional Trade Agreement digital trade rules on global innovation network [J]. 2026. <https://doi.org/10.1016/j.asieco.2026.102144>
- [9] Novy D, 2013. Gravity redux: measuring international trade costs with panel data [J]. *Economic Inquiry*, 51(1): 101-121. <https://doi.org/10.1111/j.1465-7295.2011.00439.x>
- [10] Chen K, Xie J. Digital trade and corporate ESG performance—evidence from China [J]. *International Review of Economics & Finance*, 103 [2026-07-15]. <https://doi.org/10.1016/j.iref.2025.104417>.
- [11] DUVAL Y, UTOKTHAM C, KRAVCHENKO A, 2018. Impact of Implementation of Digital Trade Facilitation on Trade Costs [R]. ARTNe T Working Paper Series.
- [12] Krugman, P, 1991. Increasing Returns and Economic Geography [J]. *Journal of Political Economy*, 99(3): 483-499. <https://doi.org/10.1086/261763>
- [13] Kuang Z, Yu J, Gao Q, et al. The mystery of the sluggish upgrade of Japan's trade structure: An explanatory perspective on the deepening of digital trade rules [J]. *International Review of Economics & Finance*, 2026, 106: 104983. <https://doi.org/10.1016/j.iref.2026.104983>
- [14] Freund C L, 2004. Weinhold D. The Effect of the Internet on International Trade [J]. *Journal of International Economics*, 62(1): 171-189. [https://doi.org/10.1016/S0022-1996\(03\)00059-X](https://doi.org/10.1016/S0022-1996(03)00059-X)

- [15] FINGER J M and M E KREININ, 1979. A Measure of Export Similarity and its Possible Uses [J]. The Economic Journal, 89: 905-912. <https://doi.org/10.2307/2231506>