

Cross-Border Data Flow Restrictions and Digital Services Trade under RCEP: A Legal and Empirical Analysis

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ABSTRACT

In the context of the rapid expansion of the digital economy, digital services trade has become a key driver of global trade growth. At the same time, an increasing number of countries have introduced regulatory restrictions on cross-border data flows, motivated by concerns related to national security, data sovereignty, and personal data protection. While such measures serve legitimate public interests, they may also impose legal and economic constraints on cross-border digital services trade. Focusing on member states of the Regional Comprehensive Economic Partnership (RCEP), this paper empirically examines the regulatory effects of cross-border data flow restrictions on digital services exports using panel data from 2014 to 2022. The results indicate that, overall, stricter data flow restrictions are associated with a significant reduction in digital services exports. The negative impact is more pronounced in developing economies and in jurisdictions that adopt data localization – oriented regulatory frameworks. Further analysis shows that improved digital infrastructure and participation in trade agreements can partially mitigate the trade-restrictive effects of data flow regulations. Heterogeneity analysis reveals that the impact of data flow restrictions varies according to regulatory design and levels of economic development. The findings remain robust across a series of robustness checks. From a legal and regulatory perspective, the results highlight the importance of adopting differentiated and proportionate approaches to cross-border data governance. Enhancing regulatory cooperation and aligning data flow rules within trade agreements such as RCEP may help reconcile data protection objectives with the facilitation of digital services trade.

KEYWORDS

Cross-border data flow restrictions; Digital services trade; Regulatory heterogeneity; RCEP; Trade law

1 Introduction

In the digital economy, data have emerged as a critical factor of production, and the cross-border movement of data has become essential to the development of digital services trade. According to the United Nations Conference on Trade and Development (UNCTAD), global digital services exports reached USD 3.94 trillion in 2022, accounting for more than 60 percent of total services trade. The growing reliance of digital services on cross-border data flows has made data mobility a central issue in contemporary international trade.

At the same time, an increasing number of countries have introduced regulatory measures that restrict cross-border data flows in order to safeguard national security, protect personal data, and maintain data sovereignty. These measures include data localization requirements, conditional transfer regimes, and sector-specific data control rules. While such regulations pursue legitimate public policy objectives, they may also function as a new form of non-tariff barrier in digital trade by raising compliance costs and limiting market access for digital service suppliers. As a result, cross-border data flow restrictions have become a key legal and regulatory issue at the intersection of commercial law, digital trade governance, and international economic regulation.

The Regional Comprehensive Economic Partnership (RCEP), which entered into force in 2022, constitutes the world's largest free trade agreement and provides a unique institutional setting for examining the trade effects of cross-border data flow restrictions. RCEP member states exhibit substantial variation in their approaches to digital services trade and data governance, ranging from relatively open data flow regimes to more restrictive data localization – oriented frameworks. This diversity offers an ideal empirical context for assessing how different regulatory approaches to data flows affect digital services exports within a common trade agreement framework.

Existing studies on cross-border data flow restrictions have largely focused on advanced economies, particularly the United States and the European Union, while systematic empirical analysis of RCEP countries remains limited. Drawing on trade cost theory and economies of scale theory, this paper employs panel data from RCEP member states to empirically examine the mechanisms and heterogeneous effects of cross-border data flow restrictions on digital services exports. The contributions of this study are threefold. First, it provides a quantitative assessment of the differentiated impacts of various types of data flow restriction policies. Second, it incorporates digital infrastructure development as a moderating factor in evaluating regulatory effects. Third, it offers empirical evidence to inform policy coordination and regulatory alignment on data governance among RCEP member states.

2 Current Situation Analysis

2.1 Scale of Digital Services Exports

In 2022, digital services exports from RCEP member countries accounted for more than 30 percent of the global total. Among them, China, Japan, and Singapore were the major exporting economies, while developing member countries exhibited notably higher growth rates. As shown in Figure 1, global digital services exports continued to expand over the period 2011–2022, with the growth rate accelerating after 2020.

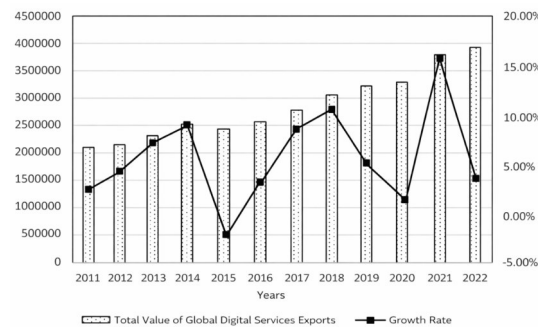


Figure 1

2.2 Level of Cross-Border Data Flow Restrictions

Based on calculations using the ECIPE database, China and India exhibit relatively high levels of cross-border data flow restrictions among RCEP member countries, with restriction index values exceeding 0.6, while Japan and Singapore show much lower levels, with index values below 0.3. As reported in Table 1, directly restrictive regulatory measures—such as data localization requirements—account for approximately 40 percent of all data flow restriction policies.

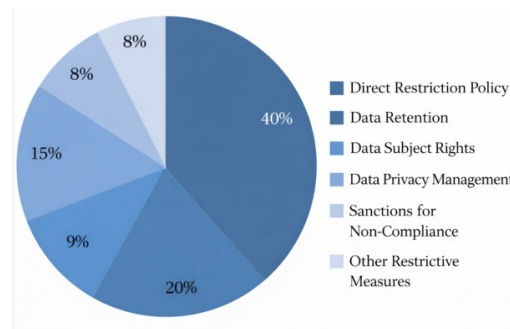


Figure 2

3 Empirical Analysis

3.1 Theoretical Framework and Research Hypotheses

The free flow of cross-border data constitutes a fundamental pillar of digital services trade. This study develops its analytical framework primarily based on trade cost theory and economies of scale theory.

According to trade cost theory, any barrier that increases transaction costs is expected to reduce trade flows. Cross-border data flow restrictions—such as data localization requirements, mandatory security assessments, or restrictions on data transfers abroad—directly raise firms' compliance and operational costs. Digital service providers may be required to invest in or lease local data storage facilities in destination markets, navigate complex regulatory approval procedures, and face efficiency losses resulting from data fragmentation. These regulatory burdens function as a new form of non-tariff barrier in digital trade and are therefore expected to suppress digital services exports.

On this basis, the following hypotheses are proposed:

H1: Cross-border data flow restriction measures exert a significant negative effect on digital services exports in RCEP member countries.

H2: The trade effects of data flow restrictions vary by regulatory type, with data localization requirements producing the strongest negative impact.

H3: Digital infrastructure development—proxied by internet penetration—can mitigate the negative impact of cross-

border data flow restrictions on digital services exports.

3.2 Model Specification, Variables, and Data

3.2.1 Model Specification

To test the above hypotheses, this paper employs a two-way fixed effects panel model specified as follows:

$$\ln DigitalExport_{it} = \alpha + \beta \cdot DLI_{it} + \gamma \cdot X_{it} + \mu_i + \lambda_t + \varepsilon_{it}$$

where i denotes the country and t denotes the year. The dependent variable $\ln DigitalExport_{it}$ represents the natural logarithm of digital services exports of country i in year t . The key explanatory variable DLI_{it} measures the level of cross-border data flow restrictions. X_{it} is a vector of control variables. Country fixed effects μ_i control for time-invariant national characteristics such as geography and long-term institutional conditions, while year fixed effects λ_t capture global shocks, including business cycles and technological trends. ε_{it} is the error term.

3.2.2 Variable Definitions and Data Sources

3.2.2.1 Dependent Variable: Digital Services Exports

Data on digital services exports are obtained from the United Nations Conference on Trade and Development (UNCTAD) database. The measure aggregates the digitally deliverable components of *computer and information services*, *charges for the use of intellectual property*, and *other business services*. The variable is logarithmically transformed to address heteroskedasticity.

3.2.2.2 Key Explanatory Variable: Cross-Border Data Flow Restriction Index (DLI)

The cross-border data flow restriction index is derived from the Digital Trade Restrictiveness Index (DTRI) compiled by the European Centre for International Political Economy (ECIPE), specifically its sub-index on cross-border data flow restrictions. This index evaluates national legal and regulatory frameworks—including data localization laws, data export security assessment requirements, and restrictive provisions in personal data protection legislation—and assigns standardized scores ranging from 0 to 1, with higher values indicating stricter restrictions. The reliability and validity of this index have been widely recognized in international empirical studies.

3.2.2.3 Control Variables

To isolate the effects of data flow restrictions, the following control variables are included:

Economic development level: measured as the natural logarithm of GDP per capita (current USD), capturing overall market size and demand conditions.

Digital infrastructure: measured by the percentage of internet users in the total population, reflecting a country's capacity to support digital services trade.

Human capital: proxied by the gross tertiary enrollment ratio, controlling for a country's potential to supply advanced digital services such as software development and R&D.

Institutional quality: measured by the *Regulatory Quality* index from the World Bank's Worldwide Governance Indicators, capturing the overall business regulatory environment.

Participation in deep digital trade agreements: a dummy variable equal to 1 if a country has entered into trade agreements with high-standard cross-border data flow provisions—such as agreements with the United States, the European Union, or CPTPP members—in a given year, and 0 otherwise. This variable controls for the effect of international regulatory coordination.

3.2.2.4 Data Sources and Sample Construction

The sample includes annual data for all 15 RCEP member countries from 2014 to 2022, forming a balanced panel dataset. This sample period is chosen because RCEP negotiations were initiated in 2012, digital trade issues gained prominence after 2014, and relevant data coverage becomes more comprehensive in this period. Data are sourced from UNCTAD, the World Bank's World Development Indicators (WDI), the ECIPE database, and the WTO Regional Trade Agreements database. Missing observations are supplemented using linear interpolation where necessary.

Table 1 Descriptive Statistics of Main Variables

Variable	Symbol	Observations	Mean	SD	Minimum	Maximum
Log of Digital Services Exports	lnExport	135	22.15	2.08	17.89	26.01
Data Flow Restriction Index	DLI	135	0.42	0.21	0.12	0.87
Log of GDP per Capita	lnGDP_pc	135	9.43	1.32	6.78	11.62
Internet Penetration Rate (%)	Internet	135	74.32	20.55	24.10	99.00
Gross Tertiary Enrollment Ratio (%)	Edu	135	52.87	24.31	16.12	95.32
Regulatory Quality Index	Reg	135	0.35	0.89	-1.19	1.89
Deep Digital Trade Agreement Dummy Variable	DTA	135	0.31	0.46	0	1

3.3 Baseline Regression Results

Table 1 reports the baseline regression results. As control variables are gradually added, the coefficient of the key explanatory variable DLI remains significantly negative at the 1% level across all specifications. In the full model (Column 5), the estimated coefficient of DLI is -0.153 . This indicates that a 0.1 increase in the data flow restriction index is associated with an average decrease of approximately 1.53% in digital services exports, thereby supporting Hypothesis H1.

Among the control variables, the coefficients of internet penetration and the gross tertiary enrollment ratio are significantly positive, highlighting the critical roles of digital infrastructure and human capital. The dummy variable for participation in deep digital trade agreements also exhibits a positive coefficient, suggesting that international regulatory coordination contributes to the expansion of digital services exports.

Table 2 Baseline Regression Results

Variable	(1)	(2)	(3)	(4)	(5)
DLI	-0.162*** (0.029)	-0.158*** (0.030)	-0.155*** (0.030)	-0.154*** (0.030)	-0.153*** (0.030)
Log of GDP per Capita		0.112 (0.085)	0.105 (0.085)	0.098 (0.085)	0.094 (0.085)
Internet Penetration Rate (%)			0.011*** (0.003)	0.010*** (0.003)	0.010*** (0.003)
Gross Tertiary Enrollment Ratio (%)				0.008** (0.003)	0.007** (0.003)
Deep Digital Trade Agreement Dummy Variable					0.089** (0.042)
Constant Term	22.231*** (0.133)	21.124*** (0.805)	20.345*** (0.804)	19.987*** (0.803)	19.845*** (0.802)
Country/Year Fixed Effects	是	是	是	是	是
Observations	135	135	135	135	135
R ²	0.685	0.692	0.712	0.723	0.731

Robust standard errors are reported in parentheses. ***, **, and * denote statistical significance at the 1%, 5%, and 10% levels, respectively. For brevity, the estimates for some control variables are not fully reported.

3.4 Heterogeneity Analysis

3.4.1 Heterogeneity by Policy Type

Data flow restriction measures are classified into three categories: data localization requirements, conditional data transfer regimes, and data retention requirements. The regression results (Columns 1 – 3 of Table 2) show that data localization policies exert the strongest suppressive effect on digital services exports, with a coefficient of -0.211 . This is because such measures directly fragment global data value chains and substantially increase firms' compliance and operational costs. The negative impact of conditional data transfer regimes is comparatively smaller (coefficient -0.118), while data retention requirements exhibit the weakest effect. These findings confirm Hypothesis H2, indicating that the more rigid the regulatory design, the greater the trade-distorting effect.

3.4.2 Heterogeneity by Level of Economic Development

Subsample regressions (Columns 4–5 of Table 2) reveal that the negative impact of data flow restrictions is significantly larger in developing economies (coefficient -0.183) than in developed economies (coefficient -0.097). This disparity can be attributed to weaker compliance capacity among firms in developing countries, relatively underdeveloped digital infrastructure, and a higher dependence on global markets, which makes them more sensitive to cross-border regulatory barriers.

3.4.3 Moderating Effect of Digital Infrastructure

After introducing the interaction term between internet penetration and the data flow restriction index (DLI) (Column 6 of Table 2), the coefficient of the interaction term is significantly positive. This result suggests that well-developed digital infrastructure can effectively mitigate the negative impact of restrictive data flow policies, thereby supporting Hypothesis H3. For instance, higher levels of internet connectivity and cloud computing adoption enable firms to maintain operational efficiency through technical solutions such as hybrid cloud architectures while remaining compliant with regulatory requirements.

Table 3 Heterogeneity Analysis and Moderating Effect Tests

Variable	(1) Data Localization	(2) Conditional Data Transfer	(3) Data Retention	(4) Developing Countries	(5) Developed Countries	(6) Moderating Effect
Key Explanatory Variable	-0.211*** (0.040)	-0.118** (0.047)	-0.082* (0.045)	-0.183*** (0.039)	-0.097* (0.051)	-0.432*** (0.124)
Internet Penetration Rate	0.010*** (0.003)	0.010*** (0.003)	0.010*** (0.003)	0.009** (0.004)	0.012*** (0.004)	0.008** (0.004)
DLI × Internet Penetration Rate						0.005* (0.003)
Control Variables	YES	YES	YES	YES	YES	YES
Country/Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	135	135	135	81	54	135
R ²	0.735	0.728	0.726	0.752	0.815	0.738

All models include the control variables from the baseline specification. Robust standard errors are reported in parentheses. *, **, and *** denote statistical significance at the 10%, 5%, and 1% levels, respectively.

4 Conclusions and Policy Implications

4.1 Conclusions

Cross-border data flow restrictions exert an overall suppressive effect on digital services exports, with the negative impact being particularly pronounced in developing economies. However, improvements in digital infrastructure can partially mitigate this adverse effect. In addition, cooperation under the RCEP framework helps reduce the trade costs associated with data flow restrictions and facilitates digital services trade.

4.2 Policy Implications

For national governments: Adopt a differentiated approach to data governance by promoting orderly cross-border data flows while ensuring national security and data protection, and increase investment in digital infrastructure.

For the RCEP framework: Enhance policy coordination among member states and explore the establishment of a data flow “whitelist” mechanism to facilitate compliant cross-border data transfers.

For firms: Strengthen compliance capabilities and make use of technological solutions—such as cloud computing—to reduce the costs associated with data localization requirements.

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