

# Impact of Data Flow Restrictions on China's Information and Communications Technology Industry Exports

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**Abstract.** Against the backdrop of the digital transformation of global industries and the trend of data localization, this paper examines the impact of data flow restrictions on the bilateral export value of China's information and communication technology services industry using national industry-time panel data. It is found that: (1) data localization has a significant inhibitory effect on the export value of the information and communications technology (ICT) services industry; higher trade openness has a significant promotion effect on the trade of digital services, especially in the telecommunication industry, which mitigates the effect of data flow restrictions. (2) The mediation effect test shows that the data flow restriction policy can have a hindering effect on the export of digital services through the increase of trade costs. The conclusions of this paper provide a basis for balancing data security and trade openness, which is of great significance for the effective formulation of China's digital trade policy and participation in the negotiation of bilateral and multilateral digital trade rules.

**Keywords:** Data localization, Trade in services, Trade barriers.

## 1. Introduction

Driven by globalization and digitization, data, as a core strategic resource in the 21st century, is driving cross-border flows as a key driver of economic growth, but it is also in structural contradiction with national data localization policies. This contradiction is transmitted to the industry level through a dual path: on the one hand, cross-border data restrictions directly raise enterprise compliance costs, for example, China's Measures for Security Assessment of Data Exit Requirements require the information and communications technology (ICT) industry to set up in-country data centers, resulting in compliance costs accounting for 8%-15% of revenues, which is significantly higher than the financial industry's 3-5%; on the other hand, the Declining data transmission efficiency triggers technical synergy barriers, and the EU GDPR review increases response latency of cloud computing services in China by 20%, while it has less impact on low-tech data processing services, confirming industry differentiation dominated by differences in technology intensity.

The above impacts further exhibit multidimensional heterogeneity. From the industry dimension, the ICT industry is hit much harder than traditional services, with data localization policies leading to a 12.5% drop in China's cloud computing exports, while financial data services fall by only 4.3%. From the rules dimension, divergence in regulatory standards exacerbates friction, with differences in privacy protection and data classification between China and Europe increasing the cost of matching ICT services by 30%, but regional agreements (e.g., RCEP) can weaken the negative effect by 40% through rules convergence. Notably, this heterogeneity is even more pronounced at the country level: developing countries' ICT service delivery delays are 1.8 times more severe than those in the EU due to weak digital infrastructure, leading to an export disincentive intensity of 2.3 times that of developed countries.

Systematically analyzing the above mechanisms has a dual value for policymaking. At the practical level, clarifying industry heterogeneity can guide differentiated governance and the implementation of data hierarchies for the ICT industry; at the rule level, quantifying the regulating effect of regional agreements can provide empirical support for China's participation in negotiations on digital agreements such as DEPA, and ultimately build a dynamic balancing path between data sovereignty and globalization.

## 2. Literature Review

Existing studies generally agree that cross-border data flow restrictions have a significant dampening effect on China's information and communication technology (ICT) service exports. Based on the Heckman two-stage model, Qi Junyan and Qiang Huajun find that cross-border data flow restrictions reduce the probability of exporting digital services by 18.7% and the size of exports by 24.3%, and that the negative impact on data-intensive industries is particularly pronounced [1]. Zhou Nianli et al. further point out that exporting countries' own regulatory measures on cross-border flow of data have a stronger dampening effect on the binary margin (breadth vs. depth) of ICT services exports, through mechanisms that include higher compliance costs (30% increase) and deterioration of the Internet environment (20% increase in delay) [2]. Lin Xueqin's cross-country empirical study shows that data localization measures reduce the international competitiveness of Chinese firms by limiting the efficiency of cross-border data transmission, which directly leads to longer ICT service delivery cycles [3].

As a highly data-dependent industry, the export performance of ICT services is affected by the significant amplification effect of data flow restrictions. OECD-DSTRI data show that this industry is 1.8 times more sensitive to data policies than other business services, due to the fact that its technological realization relies on real-time data transmission and cross-border collaborative development. An empirical study by Qi Junyan and Qiang Huajun shows that data flow restrictions not only reduce the probability of exporting digital services, but also shrink the scale of exports, with cross-border data restrictions having a stronger negative impact than domestic data use restrictions [4]. The complementary study by Zhang Xiying and Wang Yihuan, further reveals that data flow restrictions reduce the technical complexity of China's Information and communications technology industry services exports by 12.4 percent, but the dampening effect on financial and intellectual property services is even stronger, illustrating industry heterogeneity [5]. It is noteworthy that the level of digital infrastructure plays a key buffer role in this process: for every 1% increase in ICT penetration, the dampening effect of data restrictions on exports can be reduced by 0.3%, a mechanism that is verified in the cross-country trade data study by Zhou Nienli et al., who found that when trading with countries with high levels of digital infrastructure, such as Singapore, Chinese firms are able to optimize their network environments and cut trade costs to enhance cost pass-through. Cost Enhancement Cost Pass-Through [2]. In contrast, the study by Sen Huang et al. shows that the synergistic promotion of digital infrastructure and financial system reform can reduce the inhibitory effect by an additional 0.15%. In terms of the transmission path, data flow restrictions inhibit exports mainly through the triple mechanism of trade cost effect (e.g., 7-15% increase in multi-jurisdictional compliance costs), technology effect (20% reduction in software development efficiency), and configuration effect (blockage of real-time data interactions) [6]. Among them, the inverted U-shaped relationship model proposed by Xiao Yan and Wang Shuxuan reveals that when the data limitation index breaks through the 0.266 critical value, its negative impact on high data intensity services such as cloud computing and AI will be non-linearly enhanced [7]. In particular, Wang Tuo and Xu Ran emphasized that electronic payment barriers and differences in intellectual property protection can further undermine export competitiveness by amplifying the above mechanisms [8]. These findings provide a quantitative basis for policy making, such as Qi Junyan and Qiang Huajun. suggesting that coordinating digital rules through regional agreements such as RCEP can reduce the cost of ICT services trade by 9%, while suggesting the need to balance data security regulation and digital infrastructure investment to achieve a dynamic equilibrium between short-term risk prevention and control and long-term international competitiveness enhancement [1].

Existing studies have revealed the dilemma of data flow constraints on China's service exports and its functioning mechanism, while pointing out the hedging potential of the level of digital infrastructure. However, there is a lack of research on industry segments, especially the ICT industry, which is generally considered to have the greatest impact, this paper focuses on this segment to provide theoretical support for the construction of a balanced "security-efficiency" data governance system.

### 3. Research Design

#### 3.1. Sample Selection and Data Source

This paper takes a sample of bilateral trade between 18 countries and China in three digital services trade industries (telecommunication services, computer services, and information services) from 2019-2023 as the initial research object, and the sample countries include developed and developing countries with a high degree of development of digital services trade, which has a good explanatory strength. According to the World Trade Report 2019, trade in digital services conforms to the gravity model of classical economics and is affected by a variety of factors such as national income per capita, physical distance, dependent countries, trade openness, and digital technology. Therefore, the four control variables selected for the synthesis are national income per capita, trade openness, ICT penetration and physical distance. The explanatory variable selected in this paper is the export value of ICT industry, and the data is from World Bank database. The core explanatory variable is the cross-border data flow restrictiveness index of heterogeneous industries, and the data is selected from Digital STRI of OECD database, multiplied by the industry input-output table to realize the industry segmentation. The physical distances required in this paper are from EPIC database, and the data on the size of Internet users are taken from Statista database and Data.ai database; the data on GDP per capital and population are taken from the World Bank database.

#### 3.2. Model and Variable Definition

In this paper, the author uses the gravity model as a benchmark to do a panel data regression (1), which is used to test the extent to which data localization specifically affects the export value of each industry [1].

$$\ln(\text{export})_{i,t,j} = \beta_1 \text{ind\_DSTRI}_{i,t,j} + \beta_2 \text{ind\_DSTRI}^2_{i,t,j} + \beta_3 \text{control}_{i,t,j} + \beta_0 + \varepsilon \quad (1)$$

$\ln(\text{export})_{i,t,j}$  measures the trade export value of China and country  $i$  in industry  $j$ , (where  $i$  denotes time, the same below), denotes the digital services trade restriction index of country  $i$  in industry  $j$ ,  $\text{ind\_DSTRI}_{i,t,j}$  denotes the square of the digital services trade restriction index of country  $i$  in industry  $j$  [7];  $\text{control}_{i,t,j}$  includes: national income per capita (GDP), i.e. the ratio of GNI to total population; trade openness (open), expressed as a percentage of countries' total trade as a share of GDP, with higher trade openness tending to result in larger exports [9]; Penetration of communication technology facilities (ICT) and physical distance (DIST).

#### 3.3. Descriptive Statistics

Table 1 presents the results of descriptive statistics for the main variables. It can be observed that the different data span a wide range, indicating a wide sample, covering closed and highly open, developing and developed economies.

**Table 1.** Descriptive statistics of variables

	export	ind_DSTRI	GDP	open	ICT	DIST
Mean	149.67	0.05	15100000	31.16	6.49	403533.4
Sd.	354.62	0.11	14600000	33.83	1.20	197731.2
Min	0.00005	0.01	551000	3.58	4.03	32167.22
Max	2222.86	0.65	51200000	168.797	8.22	1071927

### 4. Empirical Results

#### 4.1. Regression

The estimation results of the impact of cross-border data flow restrictions on the exports of digital services in different industries are shown in Table 2, and the results of the quadratic term of data flow

restrictions are positive, indicating that the cross-border data flow restrictions of the sample countries show a “U-shape” relationship with the exports and imports of digital services trade of the countries. Before crossing the inflection point, data flow restriction and digital service trade import and export are negatively correlated, and countries with higher data flow restriction are unfavorable to the development of information and communication industry trade; while after crossing the inflection point, data flow restriction and digital service trade are positively correlated, and a high degree of data flow restriction promotes the development of information and communication industry trade. With the advancement of science and technology and the rapid development of communication infrastructure, it can be found from the results that the higher trade openness (Open) has a significant promotion effect on the trade of digital services, especially the telecommunication industry, which alleviates the role of data flow restrictions.

**Table 2.** Benchmark regression results

Variables	export					
	(1)	(2)	(3)	(4)	(5)	(6)
ind_DSTRI	-79.5*	-394.96***	-413.28***	-405.84***	-405.05***	-394.14***
ind_DSTRI2		594.187***	617.1817***	623.4724***	622.2683***	602.1945***
GDP			3.10E-06***	3.18E-06***	1.93E-06***	1.22E-06***
open				0.930***	0.901***	0.791***
ICT					0.056***	0.055***
DIST						-0.0000982***
constant	153.43***	160.36***	114.10***	83.50***	137.90***	169.91***
controls	YES	YES	YES	YES	YES	YES
R	0.512	0.597	0.675	0.739	0.782	0.901

Note: \*\*\*, \*\*, \* denote significant at 1%, 5%, and 10% levels, respectively.

**4.2. Intermediary Effect**

This paper constructs a mediation effect model with TC trade costs as the mechanism variable to reveal the important intermediate channels through which data flow restriction policies affect the export trade of digital services [10]. The model is set up as follows:

$$Ln(export)_{i,t,j} = \beta_1 ind\_DSTRI_{i,t,j} + \beta_2 control_{i,t,j} + \beta_0 + \varepsilon \tag{2}$$

$$Ln(TC)_{i,t,j} = \beta_1 ind\_DSTRI_{i,t,j} + \beta_2 control_{i,t,j} + \beta_0 + \varepsilon \tag{3}$$

$$Ln(export)_{i,t,j} = \beta_1 ind\_DSTRI_{i,t,j} + \beta_2 LnTC_{i,t,j} + \beta_3 control_{i,t,j} + \beta_0 + \varepsilon \tag{4}$$

**Table 3.** Mediating variable test

Variable	(1) export	(2) TC	
		LnTC	export
ind_DSTRI	-394.14***	-342.0615***	-176.0637***
LnTC	—	-	0.498783***
Control Variables	Yes	Yes	Yes
Soble statistic	—	Z=-3.65, Z>0.97	
mediating effect	—	0.7850×0.1620/1.6066=7.74%	
Controls	Yes	Yes	Yes
Number	236	236	236

Note: \*\*\*, \*\*, \* denote significant at 1%, 5%, and 10% levels, respectively.

The results of the benchmark regression in column (1) in Table 3 are consistent with the findings of the previous study. Column (2) for the test results of the trade cost effect: from the test can be seen, data flow restrictions significantly increase the export trade costs of digital services trade, LnTC and

ind\_DSTRI variable coefficients are estimated at the 1% level significantly negative, but the absolute value of the coefficients of the ind\_DSTRI variable declined from -394.14 to -176.0637 and the Soble test value is -3.65, indicating the existence of intermediary effects of trade costs, the intermediary effect accounted for 7.74%. However, the absolute value of the coefficient of ind\_DSTRI decreases from -394.14 to -176.0637, and the Soble test value is -3.65, which indicates that there is an intermediary effect of trade costs, and the intermediary effect accounts for 7.74%.

## 5. Conclusion

This study examines the impact of data flow on the industry's export volume, and draws the following conclusions: (1) the inhibitory effect of data localization on the export of ICT services, data flow restriction policies (such as data localization) have a significant negative impact on China's export volume of ICT services, and the higher the degree of trade openness, the higher the trade in digital services trade in particular, the telecommunication industry has a significant role in promoting the trade in digital services, which eases the role of data flow restrictions. This finding is consistent with the observation that data localization measures increase the cost of data utilization, reduce the gains from digital trade, and in particular create a greater disincentive to productivity and export size in data-intensive industries (e.g., information services). Trade openness mitigates the impact caused by restrictions on cross-border data flows and facilitates cross-border delivery of digital services. (2) The mediating effect, where data flow restrictions dampen ICT services exports by raising trade costs (e.g., compliance costs, technology adaptation costs).

This impact effect derived from this study contributes at both the practical and theoretical levels. At the practical level, this study provides specific strategic recommendations for China to respond to the trend of data localization by strengthening digital infrastructure and technological innovation, increasing investment in new infrastructures such as 5G and edge computing, and at the same time promoting the application of technologies such as data desensitization and privacy computing, and lowering the cost of compliance; at the theoretical level, this study enriches the literature in the field of data localization by breaking down into industries and deepening the understanding of data localization by segmenting into industries, deepening the impact of specific segments of data localization, and providing new perspectives and ideas for subsequent related research.

What's more, this study has some limitations. The sample focuses on the ICT industry, which can be expanded to more data-intensive fields such as finance and healthcare in the future; the methodology is based on regression analysis, and the dynamic effects of specific policies can be quantified through double-difference models (DID) in the future. In addition, topics such as the long-term restructuring effect of data localization on the global value chain and the compliance cost transfer mechanism still need to be explored in depth, so as to provide more comprehensive theoretical support for the high-quality development of China's digital services trade.

## References

- [1] Qi Junyan & Qiang Huajun. Data flow restrictions, data intensity, and digital service trade. *Modern Finance and Economics (Journal of Tianjin University of Finance and Economics)*, 2022, 42 (07): 3-19.
- [2] Zhou Nianli, Yao Tingting, & Huang Ning. Empirical study on the binary marginal impact of cross-border data flow barriers on digital service trade. *International Economic and Trade Exploration*, 2022, 38 (02): 4-21.
- [3] Lin Xueqin. *Research on the Impact of Cross-border Data Flow Restrictions on Digital Service Trade*, Nanjing University. 2021.
- [4] Qi Junyan, & Qiang Huajun. Has the restriction measures on digital service trade affected service exports? Empirical analysis based on the digital service industry. *World Economic Research*, 2021, (09): 37-52+134-135.
- [5] Zhang Xiyang, Wang Yihuan. Cross-border data flow restrictions, institutional quality, and technological complexity of digital service exports. *Price Monthly*, 2023, (01): 86-94.

- [6] Nianli Zhou, Tingting Yao, Ning Huang. Empirical study on the binary marginal impact of cross-border data flow barriers on digital service trade. *International Economic and Trade Exploration*, 2022, 38 (02): 4-21
- [7] Huang Sen, Bi Jing, and Guo Xiaoming. Research on the Impact of Cross-border Data Flow Restrictions on Digital Service Trade between China and RCEP Countries. *Investment Research*, 2024, 43 (01): 4-25.
- [8] Xiao Yan, Wang Shuxuan. Research on the Relationship between Cross-border Data Flow Restrictions and Digital Service Trade. *Theory and Practice*, 2023, (07): 183-186.
- [9] Wang Tuo, Xu Ran. Research on Restrictive Measures for Digital Service Trade and the Opening of China's Digital Service Market. *Guangxi Social Sciences*, 2022, (09): 136-144.
- [10] Hu Zongbiao, Qin Yuanliang, and Li Xin. How cross-border data flow restrictions affect the cost of international service trade: an analysis based on cross-industry data in the service industry. *International Trade Issues*, 2024, (11): 87-105.