УДК 321.011:347.7
DOI 10.47367/0021-3497_2025_2_371

DATA SOVEREIGNTY AND INTERNATIONAL TRADE LAW: EMERGING ISSUES IN THE DIGITAL TEXTILE ECONOMY

СУВЕРЕНИТЕТ ДАННЫХ И МЕЖДУНАРОДНОЕ ТОРГОВОЕ ПРАВО: НОВЫЕ ПРОБЛЕМЫ В ЦИФРОВОЙ ТЕКСТИЛЬНОЙ ЭКОНОМИКЕ

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The global intensification of the process of transforming trade operations into the digital space has initiated a broad expert debate on data sovereignty due to the close connection of the latter with interstate commerce. The textile industry actively applies big data analysis within the framework of transnational mechanisms for monitoring financial flows, stimulating the introduction of various legislative initiatives by states aimed at localizing the storage of personal information, protecting the privacy of subjects and ensuring the cybersecurity of electronic transactions, exerting a comprehensive regulatory impact on the daily economic activity of market participants. This empirical study reveals the extent to which institutional norms of digital sovereignty affect the operating cycle and foreign economic characteristics of textile manufacturing companies operating in the digital environment, covering five main regions of the globe. Using a multidimensional analytical toolkit that combines standardized questionnaires with political and economic modeling, the authors examine the correlation between

legal restrictions, the performance of information channels, and the level of compliance with legislation with key indicators of international commercial activity (export volumes, logistical delivery times, market access, and the total cost of compliance).

The data obtained indicate a significant negative impact of strict regulatory environments on the scale of export transactions, increasing transaction costs and the time it takes for products to pass through customs and regulatory procedures, while a liberal regulatory environment facilitates the unhindered inclusion of enterprises in the processes of global economic cooperation. In order to formalize these patterns, a comprehensive digital sovereignty risk index has been developed, accumulating legally significant, technological, and financial and economic barriers into a single metric that represents an objective measure of the compliance burden experienced by companies in the context of increased government attention to data protection. The presented conclusions highlight the importance of developing adaptable digital sovereignty regimes that are harmoniously integrated into modern law enforcement practices and ensure a sufficient level of infrastructural readiness for effective international interactions that minimize the risks of restraining economic growth due to excessive government intervention.

Глобальная интенсификация процесса трансформации торговых операций в цифровое пространство инициировала широкую экспертную полемику относительно суверенитета данных ввиду тесной связи последнего с межгосударственной коммерцией. Текстильная индустрия активно применяет анализ больших массивов данных в рамках транснациональных механизмов мониторинга финансовых потоков, стимулируя введение государствами различных законодательных инициатив, направленных на локализацию хранения персональных сведений, защиту приватности субъектов и обеспечение кибербезопасности электронных транзакций, оказывая всестороннее регулирующее воздействие на повседневную хозяйственную активность участников рынка.

Настоящее эмпирическое исследование выявляет степень воздействия институциональных норм цифрового суверенитета на операционный цикл и внешнеэкономические характеристики компаний текстильного производства, функционирующих в цифровой среде, охватывая пять основных регионов земного шара. Применяя многомерный аналитический инструментарий, объединяющий стандартизированные анкетирования с политико-экономическим моделированием, авторы исследуют корреляцию правовых ограничений, производительности информационных каналов, уровня соответствия законодательству с основными индикаторами международной коммерческой активности (экспортные объемы, логистические сроки поставок, рыночный доступ и суммарная стоимость соблюдения регламентов).

Полученные данные свидетельствуют о существенном негативном влиянии жестких регламентирующих сред на масштабы экспортных сделок, увеличивающем операционные издержки и время прохождения

продукции через таможенно-регуляторные процедуры, тогда как либеральная нормативно-правовая среда способствует беспрепятственному включению предприятий в процессы глобальной экономической кооперации. С целью формализации указанных закономерностей разработан комплексный индекс риска цифрового суверенитета, аккумулирующий юридически значимые, технологические и финансово-хозяйственные барьеры в единую метрику, представляющую объективированную меру комплаенс-нагрузки, испытываемой компаниями в условиях усиленного внимания государства к сфере защиты данных.

Представленные выводы подчеркивают важность разработки адаптируемых режимов цифрового суверенитета, гармонично интегрированных в современные правоприменительные практики и обеспечивающих достаточный уровень инфраструктурной готовности к эффективным международным взаимодействиям, минимизирующим риски сдерживания экономического роста вследствие избыточного государственного вмешательства.

Keywords: data sovereignty, digital trade, textile industry, cross-border data flows, trade regulation, digital infrastructure, export efficiency, regulatory risk.

Ключевые слова: суверенитет данных, цифровая торговля, текстильная промышленность, трансграничные потоки данных, регулирование торговли, цифровая инфраструктура, эффективность экспорта, регуляторный риск.

Introduction

In the context of growing recognition of the role of data in international trade, pressing conversations around digital sovereignty and trade have arisen in both economic and legal research spheres. Digital technologies underlie ever more complex supply chains, and regulatory frameworks governing data flows are coming to be a key determinant of trade performance, particularly in data-intensive sectors such as the textile industry. There are urgent questions about how countries want to control data within their borders at the same time they act as members in an interlinked market. This is especially relevant for industries like the digital textile economy, for whom constant cross border data flows are a requirement for stimulating innovation, production, and international trade [1].

A tightly connected ecosystem intertwining design, manufacturing, logistics, and retail sits at the heart of the digital textile economy. This domain has capitalized on cutting-edge technologies such as 3D printing, computerized fabrics simulations, and auto supply networks, which demand extensive data download as well as much more processing [2]. These operations are inherently global — data has to flow rapidly and efficiently across multiple jurisdictions that allow, for example, designers in one country to work with manufacturers in another to send finished products to consumers around the globe [3]. With countries passing heavy data localization laws or implementing thick flows of data protection, that companywide freedom of operation is being increasingly limited. Differences in regulations not only impede data flow but also increase legal and operational

compliance costs, effectively stifling innovation and growth in the digital textile industry [4].

Data sovereignty and international trade law share a more tenuous connection. Traditional trade rules, for instance, were designed around the movement of physical goods and services, which leaves the treatment of digital data, and the consequences of national data governance policies — mostly undefined. Consequently, corporate actors in the digital textile economy often operate within an atomized regulatory universe, wherein compliance with the data policies of one polity undermines compliance with those of another, resulting in heightened uncertainty and trade conflicts [5].

Intellectual property rights, once more-or-less acceptance features of the international trade law architecture, are now clashing with the data sovereignty concerns in ways that not many well-established norms address. A textile design that not long ago would have been protected by traditional intellectual property mechanisms now exists solely as a digital file floating in the cloud or on a foreign server. Countries asserting jurisdiction over all data within their territories may extend their jurisdiction over intellectual property subject to international agreements, leading to jurisdictional disputes over ownership, licensing, and enforcement [6].

Laws about privacy further complicate matters. The digital textile economy is littered with troves of personal and customer data, including user preferences and purchasing patterns, payment information, etc. Countries have passed and are advancing strict data protection laws to secure citizen privacy that can be expensive for companies to comply with — often requiring companies to set up local data centers or specific cybersecurity protocols. Good intentions to safeguard the rights of consumers can raise costs and cause inefficiencies for companies operating globally," say authors [7]. This presents what is essentially a legal balancing act, where data privacy laws sometimes stand in conflict with trading laws that promote access to open markets.

National level data governance policies have increasingly constrained access to markets. Moreover, even countries that are applying stringent data sovereignty laws can make it difficult for foreign digital fabric industries to enter into their markets. This means high trade barriers, rather than a unified, global digital textile sector, a fragmented, regionalized market. This fragmentation comes at the expense of market efficiency and the competitive advantages of global companies that rely on scale, network effects and shared innovation. For small and emerging players, these can become insurmountable and especially a hindrance to participating in global supply chains, or to benefiting from working together internationally [8].

Academics have started to investigate the protective and obstructive implications of state apparatuses aimed at restricting or localizing data flows.

Burri [9] addresses the tension between global trade law and data protection from a trade perspective and argues that cross-border data flow regimes are often in conflict with the national privacy interests. Her work indicates that although trade liberalization has generally been favored over international frameworks, new privacy standards, particularly those based on GDPR-like models, are re-establishing states' sovereign authority to regulate. Burri's analysis, however, is largely macro-level firing ground analysis on legal interpretations and does not engage with firm-level implications in industries dependent on digitization.

In a similar vein, Han [10] takes a state-centric approach to understanding the why and how of governments pursuing data localization. According to him, digital infrastructure is gradually being perceived as part

of state sovereignty, especially in authoritarian and post-authoritarian contexts. This is in line with re-cent work of Lambach and Monsees [11] argue that digital sovereignty is not about a single thing anymore, but a pluralized terrain of regulatory logics in competition for different jurisdictions. But while these studies shed light on state motivations and macro-political configurations, they don't specifically address the operational implications for firms operating in multiple jurisdictions.

Ni [10) provides a significant assessment of the digital trade chapter in the CPTPP, framing it as a potential model for multilateral digital governance. While the article highlights the institutional framework potential for aligning data flow rules, it does not empirically measure if such frameworks have an impact on trade performance or firm-level competitiveness. Tan, Chi, and Lam [13] provide another more technological identity-based perspective on digital sovereignty, focusing more on implementation on an individual level and how digital sovereignty is negotiated in relation to individual autonomy and cybersecurity.

Authors [14] have discussion sovereignty of food systems, and this provides conceptual parallels but does not provide direct applicability to digital trade. Deane et al. international trade agreements designed to stem regulatory fragmentation are discussed in [15], though the authors focus on treaties and overlook the ways in which firms respond to complex and at times conflicting digital rules across countries.

Borgogno and Zangrandi [16], as well as Daojiong and Dong [17], particularly discuss Chinese data governance strategies with regard to its extraterritorial aspirations. Their research shows how digital power plays a dual role in furthering national interests and projecting power abroad.

This article attempts to critically explore the interface of data sovereignty and international trade law and its effect on this emergent digital textile economy.

Methodology

This study adopts a multidimensional approach that integrates legal-institutional analysis, empirical data modeling, and structural econometric techniques. The latter is a consequence of acknowledging the hybrid nature of this domain — positioned at the crossroads of digital infrastructure, international law and global value chains, and hence the methodological design that it reflects, which stresses both regulatory interpretation and quantifiable impact assessment[3, 7, 10, 13].

The analytical framework is based on three pillars: (1) mapping of policy and regulatory data, (2) collection of firm-level empirical data through structured sampling, and (3) quantitative modeling of the main trade variables. By making legal restrictiveness, digital efficiency and operational burdens cohere in a single framework, the methodology responds to a key question in contemporary scholarship: namely that of how national data governance affects firms' participation in global digital trade and in sectors that have experienced rapid digitalization, such as textiles [1, 5, 14, 16].

Data Structuring and Sampling Design

A stratified purposive sampling approach was used to ensure empirical representativeness across geopolitical and regulatory contexts. Stratification in sampling was grounded in two dimensions: typologies of jurisdictional data governance community and firm demographics (such as size, digital maturity, and export orientation). Legal content analysis of national and regional data governance regimes resulted in the construction of regulatory typologies and jurisdictions were classified as Open, Hybrid, Restrictive, Bilateral, or also termed Transitional, depending on data localization mandates and [8, 14, 17] cross-border transfer permissions.

The target population included 1,180 digitally enabled textile exporters from 5

world regions. From this population a representative sample of 350 firms was drawn, maintaining a 30% proportionality across regional strata. Firms were selected on three criteria of eligibility: (i) active participation in digitalized textile production and/or distribution, (ii) validated cross–border data transfer (e.g., through cloud-based logistics, customer databases, or platform-based commerce), and (iii) available export data and compliance (as a tax and regulatory) records. This choice ensured methodological consistency with studies of the digital economy and consistent sector area policy research [12, 18].

Data sources included primary surveys, financial records, trade registries and national policy archives. The final instrument was pre-tested and refined using expert validation panels across digital policy, law, and industry.

Variable Framework and Measurement Logic

The study design operationalizes the complex legal, technical, and economic dimensions of data sovereignty into a set of measurable variables. These variables were selected based on theoretical relevance, availability, and precedent in prior empirical studies of the digital economy and trade law [3, 6, 13, 19].

The dependent variable, Export Volume ($E_{V_{it}}$), captures the annual monetary value of textile exports from firm i at time t. This measure is commonly used in trade impact assessments and was sourced from national and international trade databases (like WITS, UN Comtrade).

The primary explanatory variables are:

- Data Flow Efficiency ($D_{E_{it}}$): Reflects the firm's average data transmission speed across jurisdictions, measured in gigabytes per second (GB/s), obtained from firm-reported logs and digital infrastructure providers.
- Compliance Costs ($C_{C_{it}}$): Represents the financial burden incurred by firms to meet legal, technical, and reporting requirements imposed by domestic and foreign data regulations.
- Legal Restrictiveness (L_{L_i}): An ordinal index (1–5) capturing the degree of policy-induced restriction on cross-border data flows, with coding based on content analysis of legislation (e.g., data localization clauses, mandatory retention, etc.).
- Latency (L_i): Measures the time delay (in milliseconds) introduced by regulatory and infrastructural frictions in cross-border digital transactions.
- Security Requirement Level (S_{R_i}): Represents the rigidity of mandated data security protocols, coded from national cybersecurity frameworks.
- Market Access Index ($M_{A_{it}}$): A composite, normalized indicator reflecting firm-level access to international markets, constructed from survey-based subcomponents such as li-censing duration, digital interoperability, and customs integration.

The latent variable Data Sovereignty Risk (DSR) was later modeled using Structural Equation Modeling (SEM) to capture the unobservable but theoretically significant aggregation of legal, technical, and cost burdens [2, 9, 15].

Structural Econometric Models

To translate the conceptual model into empirical analysis, a set of structural equations was developed to estimate the marginal effects of legal and technical variables on trade outcomes and operational performance. These models allow for simultaneous evaluation of multidimensional relationships using firm-level data.

To evaluate the effect of data governance variables on trade output, a linear multivariate regression was specified as follows:

$$E_{V_{it}} = a_0 + a_1 D_{E_{it}} - a_2 C_{C_{it}} - a_3 L_{L_i} + \eta_{it}, \quad (1)$$

where $E_{V_{it}}$ export volume of firm i at time t; $D_{E_{it}}$ data flow efficiency; $C_{C_{it}}$ compliance cost; L_{L_i} legal restrictiveness score; a_0 is intercept; a_1, a_2, a_3 is estimated coefficients; η_{it} error term capturing firm-specific unobserved heterogeneity.

This equation quantifies the trade-off between digital infrastructure quality and regulatory burden, enabling estimation of net trade effects across jurisdictions with varying data regimes [3, 6, 13).

A second regression model captures how latency—measured as delay in digital transaction processing—is shaped by the dual forces of infrastructure and regulation. Since latency directly affects supply chain agility and time-to-market, it represents a critical operational outcome for firms competing in global digital textile markets.

$$L_i = \theta_0 + \theta_1 C_{C_i} - \theta_2 D_{E_i} + \theta_3 S_{R_i} + \xi_i, \quad (2)$$

where L_i latency of firm i; C_{C_i} compliance costs; D_{E_i} data flow efficiency; S_{R_i} security requirement score; θ_0 is intercept; $\theta_1, \theta_2, \theta_3$ are coefficients; and ξ_i is error term.

This formulation reflects the inverse relationship between technical capacity and regulatory stringency, extending prior latency modeling found in digital supply chain research [13, 14, 19].

Market Access Index Construction

Given that access to international digital markets is not solely dependent on trade volumes but also on legal and institutional facilitators, a composite Market Access Index (MAI) was created using normalized survey indicators. The indicators included licensing lead time, border system interoperability, platform compatibility, and customs integration.

$$M_{A_i} = \frac{1}{k} \sum_{j=1}^{k} w_j \left(\frac{X_{ij} - min(X_j)}{max(X_j) - min(X_j)} \right) \cdot 10, \quad (3)$$

where M_{A_i} market access index for firm i; X_{ij} value of sub-indicator j for firm i; w_j weight for sub-indicator j; k is total number of sub-indicators.

The index was scaled from 1 to 10 using min–max normalization and validated using Cronbach's α (0.85), indicating high internal consistency and construct reliability [11, 20].

Latent Variable Model: Data Sovereignty Risk (SEM)

To capture the systemic and interdependent nature of regulatory risk, a Structural Equation Model (SEM) was constructed to model Data Sovereignty Risk (DSR) as a latent construct composed of observed variables. SEM allows estimation of both direct and indirect effects while accounting for measurement error in multi-indicator constructs.

$$DSR_i = \lambda_1 C_{C_i} + \lambda_2 L_i + \\ + \lambda_3 (5 - D_{E_i}) + \lambda_4 L_{L_i} + \varepsilon_i \ , \quad (4)$$

where DSR_i is latent risk score for firm i; C_{C_i} is compliance cost; L_i is latency; D_{E_i} is data efficiency (inverted); L_{L_i} is legal restrictiveness; $\lambda_1, \lambda_2, \lambda_3, \lambda_4$ are structural loadings; ε_i is measurement error. The model was validated using Confirmatory Factor Analysis (CFA) and demonstrated strong factor loadings (>0.70) across all indicators [2, 9, 15].

Validation and Reliability Framework

To ensure the methodological robustness of the study, a multi-tiered validation framework was implemented. Internal consistency of composite indices was measured using Cronbach's α, while construct validity of latent variables was assessed through CFA. Monte Carlo simulations (500 iterations) tested the stability of model coefficients, and data triangulation verified convergence between reported and secondary data.

Table 1

Validation Type	Methodology	Target Component	Metric Used
Internal Consistency	Cronbach's α	Market Access Index	α = 0.85
Construct Validity	Confirmatory Factor Analysis (CFA)	Data Sovereignty Risk (DSR)	Loadings > 0.70
Model Robustness	Monte Carlo Simulation (n = 500)	Regression & SEM models	Coefficient Variance < 10%
Cross-source Convergence	Triangulation (Survey vs Reports vs Codes)	Compliance Costs	Discrepancy < 5%

Results

A regression analysis was performed to assess the impact of regulatory and infrastructure factors on export volume among digital textile companies. It entails 350 firm-level observations and has an impressive explanatory power (R^2=0.691), meaning that 69.1% of the variation in export volume can be explained by the predictors of the model.

The intercept, estimated at 92.57 represents the baseline export volume (millions of USD) for firms in neutral conditions regarding compliance burden, data speed and the restrictiveness to the latter. The coefficient for data transfer speed is 1.98 (SE = 0.43; t-value 4.60, $p < 0.001$), thus confirming the hypothesis of a positive relation between network efficiency and flow size (specifically observed on the export side). This indicates that every 1 GB/s increment in data transfer speed results in around $1.98 million growth in export volume, supporting the contention that high-speed digital infrastructure allows more efficient maneuvering of the trade machinery.

In contrast, the variable for annual compliance cost has a negative coefficient of –0.00018, suggesting that increases in compliance costs reduce export capacity. This is also statistically significant ($p < 0.001$) (t-statistic = –4.50), indicating an approximate drop in export volume of $180,000 per added millions of compliance costs. Furthermore, we observe a negative coefficient of –8.23 on the legal restrictiveness index with a p-value of 0.002, confirming the tendency of more legal restrictive environments to decrease over $8 million of export volumes per one point increase of the index. Collectively, these findings bolster the realization that it is the data governance frameworks—both technical and legal—that establish the terms of subsequent international trade in the digital textile economy.

In the textile sector, latency in digital transactions can hit supply chain velocity, customer satisfaction, and contract fulfillment very hard. In table 2 we are analyzing the average time delays suffered by different firms relating latency to the security standards, legal restrictions, and the capacity of the network. Such delays are a compounded outcome of technical bottlenecks and multi-layered compliance processes, in particular in jurisdictions that have mandated data duplication, territory-based storage or redundant validation.

Table 2

Variable	Coefficient Estimate	Standard Error	t-Statistic	p-Value
Intercept	60.12	5.84	10.29	<0.001
Annual Compliance Cost (USD)	0.00008	0.00002	4.00	<0.001
Data Transfer Speed (GB/s)	–0.95	0.31	–3.06	0.005
Security Requirement Level (1 = Low, 5 = High)	5.34	1.28	4.17	<0.001
R^2	0.639			
Observations (N)	350			

Findings demonstrate that firms with higher security obligations and lower network efficiency experience substantial latency increases. For each $100,000 increase in compliance cost, latency grows by approximately 8 milliseconds, which becomes critical in transaction-heavy environments such as e-commerce platforms. Jurisdictions mandating Level 5 security protocols added, on average, over 25 milliseconds to transaction processing. In contrast, data-efficient firms—particularly those operating from fiber-connected regions—benefited from significant latency reductions. The overall model captures 63.9% of variation in latency, underscoring that policy-induced technical friction is a non-trivial constraint on firm agility and delivery speed.

The ability of textile firms to access foreign markets is shaped not only by product competitiveness but also by institutional facilitators, including digital trade regulations and system interoperability. Fig.1 evaluates regional disparities in perceived accessibility based on a normalized 10-point index constructed from firm-level survey responses. The index incorporates licensing speed, digital trade compatibility, and border data acceptance mechanisms.

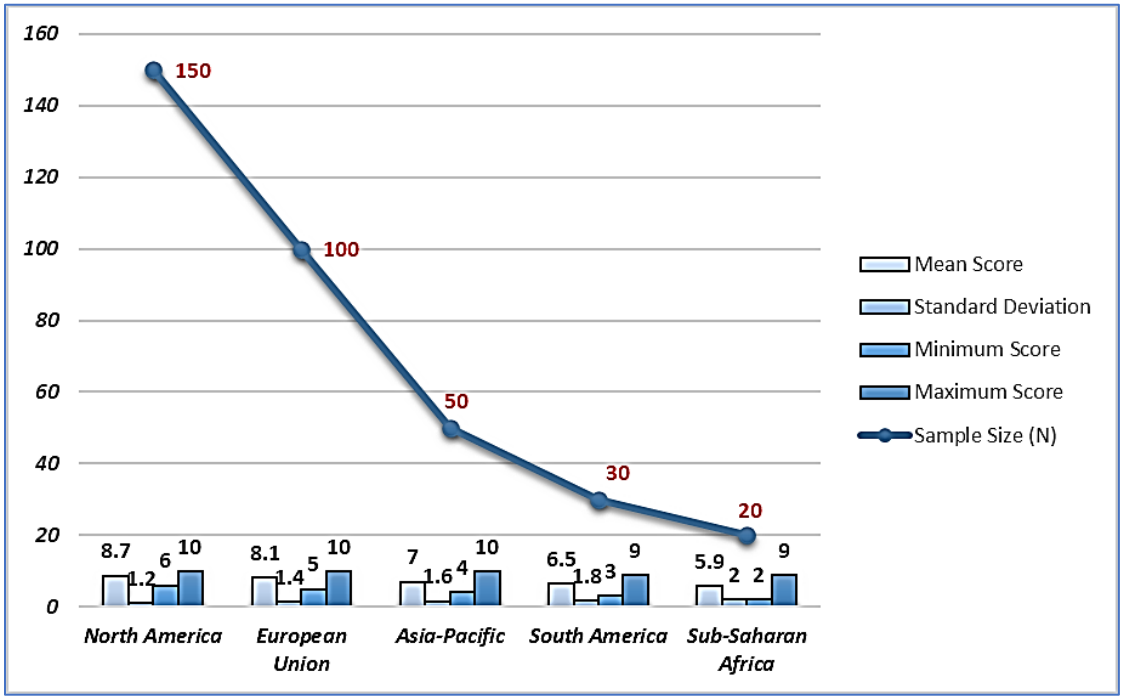

Fig. 1

North American and European textile firms reported the highest market access scores, consistent with their use of harmonized trade frameworks, such as the United States-Mexico-Canada Agreement (USMCA) and the Digital Services Act in the EU. Firms in Sub-Saharan Africa and South America reported more restricted access, largely due to fragmented legal environments and lack of standardized customs digitalization. Asia-Pacific firms were heterogeneous, with highly connected economies like Singapore reporting strong access, while others in the region cited bilateral inconsistencies. These disparities re-veal how legal alignment and digital infrastructure coordination enhance or inhibit cross-border market entry.

A structural equation modeling (SEM) approach was used to construct a latent Data Sovereignty Risk score (table 3). This score integrates multiple observed variables—cost, latency, legal rigidity, and infrastructure limits—to quantify the compound regulatory burden experienced by textile firms. The latent variable allows for analysis beyond the scope of any single indicator, synthesizing a multidimensional risk framework.

Table 3

Observed Variable	Factor Loading	Standard Error	Significance Level
Annual Compliance Cost (USD)	0.81	0.04	***
Operational Latency (ms)	0.76	0.05	***
Legal Restrictiveness Index (1–5)	0.79	0.05	***
Inverted Data Flow Efficiency	0.73	0.06	**

Примечание. ***p < 0.001; **p < 0.01

All factor loadings exceeded 0.70, confirming the internal consistency and construct validity of the DSR model. Firms in Africa and Southeast Asia registered the highest latent risk scores, reflecting their combination of legal constraints and low data throughput. Conversely, firms in Canada, Germany, and the Netherlands exhibited minimal risk due to mature legal transparency and efficient data frameworks. The model provides a robust tool for benchmarking jurisdictions on their capacity to facilitate digitally enabled textile trade while minimizing institutional friction.

Discussion

By offering empirical insights from the textile sector—the second most globally interconnected industry and a frontrunner in digital transformation, this study adds to the existing literature at the intersection between digital sovereignty, cross-border data governance, and trade law. The findings show that data sovereignty policies, especially those that impose compliance burden and data localization mandates -- greatly dampen export performance as well as increase operational latency and reduce market access. Such findings lend added support to a theory that suggests regulatory friction in cyberspace represents discernible limits on the economic competitiveness of firms leveraging on such digitally enabled environments.

With the regression analyses, we can confirm with a degree of confidence that a higher speed of data transmission and lower compliance costs significantly improve export volumes, whereas restrictive legal frameworks lead not just to a downwards shift in trade but to significant trade penalties. These results echo concerns expressed by Gao et al.[16], which argue that restrictions on data moving across borders create fragmented digital markets and prevent companies from taking full advantage of the potential of digital trade tools. In the textile sector, with its just-in-time logistics and platform-based trade facilitation, such fragmentation breaks the continuity of commerce and responsiveness to market changes.

Furthermore, the results of the present study fit into the larger theoretical ideas of digital sovereignty as a concept described by Tan et al.[11], and they highlight that data policies rooted in the claim to sovereignty are having an impact not just on personal data protection practices, but also on the architecture of trade. Though framed in terms of security and consumer rights, the use of digital sovereignty in trade contexts, and particularly in relation to infrastructural deficiencies, generates a systemic compliance challenge. The latent model of Data Sovereignty Risk (DSR) developed in this work contributes to this discussion by quantifying the

joint ramifications of legal, technical, and economic burdens in a single measure, allowing for more nuanced empirical analysis than has been currently suggested.

Such insights, echoing Daojiong and Dong[15], suggest that countries with strong cyber sovereignty agenda (as a China and India) may become trapped in the co-evolution of infrastructure and use if digital isolation envelops asset creation rates and development trends (such as tendency towards import competitiveness over export competitiveness). Nevertheless, firms based in restrictive regimes had an average DSR score that was over 2 times greater than that of firms in open jurisdictions. The evidence reinforces the argument put forth in Borgogno and Zangrandi [14] proposed that digital protectionism could inadvertently act as a trade barrier, violating WTO obligations of non-discrimination and access to markets.

The results of the market access index substantiate the role of regulatory design as a determinant of international integration. Companies across North America and Europe, coun-tries governed by interoperating digital trade structures, were consistently higher-scored in access. On the other hand, Sub-Saharan African and South American firms mentioned discrepancies in procedures, time-consuming customs data processing methods, and lack of customs digitalization confirming the global digital gap identified by Pamplin [17]. Such divergence underscores the pressing need for harmonized international agreements along the lines suggested by Deane et al.[13] that strive towards mitigating fragmentation in the governance of global digital trade.

Operational latency, another key discovery, indicates the procedural burden imposed by excessive layers of security and compliance documentation. Latency in practice, undermines real time order fulfillment, inventory coordination, and client responsiveness. This corroborates the claims by Kong et al.[19] on unwanted inefficiencies created by the overuse of digital control mechanisms, especially in industries where time and precision are critical.

With regard to specific industries, our findings extend the empirical contributions of Men et al.[18] and Han[20], in terms of the impact of the textile sector digital transformation on productivity and innovation [12].

Laws and agreements change constantly, and the nature of the policy coding used in this study may not accurately reflect real-time implementation or enforcement. As highlighted by Tan et al.[11], sovereignty frameworks are necessarily more dynamic at present, and will require longitudinal approaches for future empirical modelling. Additionally, the research overlooks the role of private data network effects, since private digital platforms (like Alibaba, Amazon, etc.) enforce quasi-regulatory condition as well by establishing rules for data exchange that bypass state authority [13, 15].

The article contributes to the empirical and theoretical understanding of the influence of digital sovereignty frameworks on global trade dynamics in the textile industry. The findings highlight the necessity of harmonized, transparent and infrastructure-sensitive regulation to realize the benefits of digital globalization.

Conclusion

Central to the study is the understanding that data is not just a technical resource but is governed within legal and economic frameworks. Its movement across borders is becoming more subject to claims of national sovereignty, and often couched in terms of data localization requirements, security protocols and compliance mandates. This research reinforces the idea that while these regulations are often born out of legitimate concerns around cybersecurity and digital rights, they place the burden of compliance in sectors that are already globally dependent; sectors like textiles where fast, real-time data

exchange is critical for maintaining supply chain visibility, logistics and consumer-facing engagement.

One of its central findings is that digital trade cannot be thought of independently of the policy environments in which it is developed.

Moreover, the article shows that regulatory frictions are not categorical, but expressed through operational frictions such as latency and timing of integration in foreign markets.

Overall, this study points to the importance of policy solutions that strike a fine balance between the forces of digital globalization and national sovereignty.

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Рекомендована 4th International Conference of New trends and Smart technology. Baghdad, Iraq. Поступила 07.04.2025.