Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 10, 1005-1020
2025
Publisher: Learning Gate
DOI: 10.55214/2576-8484.v9i10.10582

Institutional constraints and digital exports: Evidence from multi-country firm-level data

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Abstract: This paper examines how institutional constraints influence firms' participation in digital exports. It aims to identify which types of institutional barriers most hinder firms' ability to engage in digital trade and how these effects vary across firm characteristics. Using a novel multi-country firm-level dataset from the World Bank Enterprise Surveys, the study measures digital exports as goods sold electronically and delivered via mail or courier services. Institutional constraints are defined based on firms' self-assessments of four major obstacles: corruption, political instability, tax administration, and business licensing. To address potential endogeneity, the analysis employs the Entropy Balancing technique. The results indicate that institutional constraints significantly decrease the likelihood of firms engaging in digital exports, with political instability and business licensing emerging as the most detrimental factors. The negative effects are particularly pronounced among large and financially unconstrained firms, which are more exposed to institutional inefficiencies due to their operational scale and digital capacity. While the study draws on a large cross-country dataset, it captures firms' perceptions rather than objective measures of institutional quality. Future research could incorporate longitudinal data or complementary macro-level indicators to enhance causal inference. This study contributes to the emerging literature on digital trade by integrating institutional quality into firm-level analyses of digital exports. It provides new empirical evidence on how specific institutional barriers constrain digital export participation, offering policy insights for strengthening the institutional foundations of the digital economy.

Keywords: *Digital export, Export, Institutional constraint, International trade, Policy implication.*

1. Introduction

The digital shift in the global economy, driven by what is commonly referred to as the Fourth Industrial Revolution, has created new opportunities for firms to engage in international trade. One prominent example is digital exports. Digital exports involve the online sale of goods delivered through postal or courier services. For small and medium-sized enterprises (SMEs), this channel has become increasingly significant, as it reduces initial costs and improves access to international markets. Digital channels can lower transaction fees, broaden a firm's reach, and enable instant interaction with customers, factors that can be crucial for companies with limited financial resources [1, 2].

That said, the story is not quite as straightforward in practice. Evidence suggests that firms' involvement in digital exports looks very different depending on where they are and what resources they have. Internal strengths such as the ability to innovate, having solid digital infrastructure, or simply managers who understand online markets do matter [3]. But the bigger picture, the institutional environment, likely shapes outcomes just as much. When businesses run into red tape, inconsistent law enforcement, or shaky logistics networks, uncertainty rises. Compliance becomes costlier. And under those conditions, many firms may think twice before pushing into digital international markets [4].

This is particularly tough on SMEs and firms that already struggle with financing. They often lack the staff or the know-how to navigate complicated rules, and they can't easily absorb the risks of cross-

History: Received: 31 July 2025; Revised: 23 September 2025; Accepted: 26 September 2025; Published: 16 October 2025
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border e-commerce. Past studies have done a decent job highlighting how digital capabilities boost exports, but they rarely dig into how the wider institutional context interacts with a firm's own limits [5, 6].

That's the gap this paper tries to address. We look at how institutional constraints shape whether firms participate in digital exports, drawing on recent firm-level data from the World Bank Enterprise Surveys (WBES). The dataset covers more than 7,000 firms across 20 countries. To analyze causal effects, we build firm-level indicators of institutional constraints based on companies' own reports of the obstacles they face. Then, to address potential endogeneity and ensure fair comparisons, we apply Entropy Balancing (EB) so that the "treatment" and "control" groups align on observable characteristics.

This study contributes to the literature in several key ways. First, it provides one of the first large-scale empirical assessments of the impact of institutional constraints on digital exports, using cross-country microdata. Second, it disaggregates institutional constraints into four dimensions and shows that political instability and business licensing significantly hinder digital exports, while corruption and tax administration have limited effects in this context. Third, the study offers novel insights into firm heterogeneity by examining how these effects differ by firm size and financial constraint status. Finally, by combining firm-level insights with advanced estimation techniques, this paper bridges the gap between institutional economics and digital trade research.

The rest of the paper unfolds in a fairly standard way, though with a few twists. In Section 2, I review the existing literature, paying particular attention to what drives digital exports and how institutional barriers might come into play. Section 3 presents the data, explains how the key variables were constructed, and outlines the empirical approach. Section 4 discusses the main results, along with robustness checks and a closer examination of differences across firms and contexts. In Section 5, the findings are interpreted and linked back to broader policy debates. Finally, Section 6 summarizes the main takeaways and provides a brief conclusion.

2. Literature Review

2.1. Digital Export and its Determinants

When we talk about *digital exports*, we're really referring to international trade that's made possible by digital technologies. This doesn't just mean selling software or streaming services abroad. It can also include things like productized consulting packages, online design tools, or even revenues earned through platforms that act as middlemen between buyers and sellers. The growth of digital exports has already started to reshape how we think about trade flows, economic complexity, and even labor markets. Recent evidence suggests that these exports are much more geographically concentrated than physical goods and that they've been growing at a pace that sometimes skews the old yardsticks we use, such as the U.S. trade deficit in physical goods [7].

Technology seems to be pushing this momentum further. Advances like robotics or 3D printing don't just raise productivity on the factory floor; they also make it easier to attach new kinds of services to products, such as on-demand customization or predictive maintenance, which in turn can boost exports. Developments in logistics think AI-driven supply chain systems or smart warehousing play a similar role, lowering costs while introducing new service innovations [8].

But the impact of digital trade isn't only visible in national accounts. At the firm level, there are interesting shifts in wages and participation. Digital exports broaden opportunities for SMEs but can also exacerbate wage gaps across sectors, underscoring the uneven distribution of benefits [9]. Overall, median wages tend to creep upward, and low-wage firms become less common, but barriers still hold back even strong exporters in some cases. In China, for example, the digital economy has boosted export sophistication by encouraging spillovers of knowledge and accelerating reforms. Interestingly, much of this upgrading has happened in low-tech sectors, where the gains may not have been obvious at first glance [10, 11]. So, while the benefits are clear, new tensions, regional divides, and wage inequalities are also surfacing and may require more finely tuned policies.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 10: 1005-1020, 2025
DOI: 10.55214/2576-8484.v9i10.10582

As for what drives digital exports, the answer is complicated. There's a mix of technological, economic, regulatory, and strategic elements that interact in ways that aren't always predictable. On the technological side, global digitalization has turbocharged services trade, especially in IT and telecoms, cutting costs and improving efficiency. One estimate puts the effect at nearly a 6% increase in the growth rate of global service exports [12]. The spread of internet-based export channels platforms, online marketplaces, and even direct-to-consumer websites has widened market access, but success still depends on how well firms use these tools and whether they continue to invest in the infrastructure behind them [13].

Economic context matters just as much. Regions with better resource allocation and skilled labor seem more able to use digitalization to upgrade exports and diversify product lines [11]. Industrial clusters in digital sectors also promote innovation and strengthen information flows, which help firms expand beyond narrow product bases [14]. Still, economic potential alone won't carry firms across borders unless the rules of the game are supportive. ICT market openness, such as reduced access restrictions or improved information interconnections, has been shown to encourage digital service exports [15]. Similarly, international cooperation on digital trade rules lowers costs, especially for lower-income countries, and encourages institutions toward greater openness [16].

Finally, there are the strategic choices firms make. Those with prior export experience are usually quicker to turn digital readiness into actual export revenue [13, 17]. Cross-border e-commerce, particularly in RCEP countries, has provided firms with an additional avenue, while improvements in infrastructure and regulatory quality reinforce these gains [18]. Still, challenges remain, ranging from outdated regulations and institutional gaps to the relentless pace of technological change. The link between digitalization and export performance is, at best, context-dependent, shaped by what firms can do internally, what institutions allow externally, and how regions differ in their development paths [17].

Taken together, the evidence suggests that understanding the determinants of digital exports requires more than just a list of factors. It means recognizing how these pieces fit together and how unevenly they play out across countries, industries, and firms. For both policymakers and businesses, that nuance is likely the key to designing strategies that actually work in today's increasingly digital global economy.

2.2. Effects of Institutional Constraints on Digital Export

Institutional constraints play a significant role in shaping how digital exports unfold. They set the rules of the game regulations, access to resources, market conditions and depending on how they are designed, they can either open doors or create new hurdles. One area that stands out is the development of digital trade rules. Clear, standardized rules tend to reduce transaction costs and make cross-border operations less complicated. For lower- and middle-income countries, the gains may even be larger than for wealthier ones: harmonized rules simplify compliance, reduce the confusion caused by fragmented regulations, and expand access to global markets [16]. With interoperability across jurisdictions, firms find it easier to export digital services and integrate into global value chains.

At the firm level, especially for SMEs, the presence or absence of supportive institutions makes a significant difference. In places where rules are predictable and institutions are relatively strong, smaller firms are more willing to invest in digital tools, react faster to shifts in demand, and improve their export performance [19]. But where bureaucracy drags on or institutional support is thin, SMEs often hit walls: they may struggle to execute even well-designed digital strategies, and as a result, they lose ground in international markets [19]. Institutional transitions can be double-edged too. Reforms may spark short-term improvements but then taper off. India's Foreign Exchange Management Act (FEMA) is one case in point: it initially gave innovation-driven exporters a push, yet over time its effects faded, showing that reforms only last if they are consistent and adaptable [20]. In New Zealand, deregulation combined with ICT adoption gradually reshaped export barriers, pointing to the same lesson that outcomes depend on how institutions evolve, not just on whether they change [21].

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Regional and national contexts further influence the overall picture. Country experiences from China's digital economy cushioning policy uncertainty to Russia's limited institutional support hindering digital trade highlight the critical role of institutional quality [22, 23]. So while institutional constraints certainly create challenges, they may also point to opportunities, moments where targeted reforms could unlock new avenues for digital trade. The diversity of regional experiences makes one thing clear: there's no single institutional fix that works everywhere. Context matters. As digital trade keeps expanding, countries will likely need policies that can adjust dynamically and research that continues to track these shifts. Only then can they build institutional environments that genuinely enable inclusive and resilient growth in digital exports.

3. Data, Variables, Methodology

3.1. Data

This study utilizes recently released data from the World Bank Enterprise Surveys (WBES). After addressing data quality by eliminating observations with missing values and applying winsorization to continuous variables at the 1st and 99th percentiles to control for outliers, the final dataset comprises 7,207 firms across 20 countries, with representation from both manufacturing and service sectors. On average, about 65 percent of firms operate in manufacturing industries such as food processing, textiles, and machinery, while the remaining 35 percent are in services, including retail trade, ICT, and logistics. The country distribution is diverse: the largest shares come from Spain (7.1%), Italy (4.7%), Poland (2.7%), Korea (3.6%), and the United States (3.6%), with additional coverage across emerging economies such as Viet Nam (2.4%), China (2.6%), and several Sub-Saharan African countries. A full breakdown by country is provided in Appendix Table A1.

3.2. Variables

3.2.1. Dependent Variable: DE

The variable *DE* is a binary indicator equal to 1 if a firm exported goods directly via electronic channels and delivered them through mail or courier services, and 0 otherwise. It is important to highlight that the dataset also encompasses firms that did not engage in any export activities.

3.2.2. Independent Variable: IC

In this study, institutional constraints are defined based on firms' self-reported evaluations of the severity of obstacles affecting their business operations. We focus on four specific types of constraints: corruption, political instability, tax administration, and business licensing. A firm is classified as facing a particular constraint if it identifies that issue as a major or very severe obstacle. Conversely, if the firm rates the issue as a minor, moderate, or non-existent obstacle, it is considered not to be facing that constraint.

To address potential omitted variable bias, we incorporate a set of control variables into our model, as detailed in Table 1. These controls are informed by existing literature on the determinants of digital exports [2, 4, 24, 25] ensuring that we account for relevant factors that may influence a firm's likelihood of engaging in digital trade.

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Table 1.
Statistical summary.

Variables	Explanation	count	mean	sd	min	max
DE	A binary variable indicating whether the firm engages in digital exports, defined as the export of goods through electronic means with delivery via mail or courier.	7207	0.24	0.43	0.00	1.00
IC	Represents the level of institutional constraint, based on a firm's self-reported obstacles affecting business operations.	7207	0.38	0.49	0.00	1.00
Productivity	The natural logarithm of labor productivity, calculated as total sales divided by the number of full-time employees.	7207	13.87	2.74	9.51	21.29
Firm Age	The natural logarithm of the number of years since the firm was established up to the year of the survey.	7207	3.18	0.74	1.10	4.86
Firm Manager	The natural logarithm of the number of years of experience that the top manager has in the firm's sector.	7207	3.12	0.60	1.10	4.06
Joints tock	A dummy variable equal to 1 if the firm is publicly traded as a joint-stock company, and 0 otherwise.	7207	0.07	0.26	0.00	1.00
Innovation	A dummy variable equal to 1 if the firm has introduced a new product or production process, and 0 otherwise.	7207	0.45	0.50	0.00	1.00
Foreign tech	A dummy variable equal to 1 if the firm uses foreign technology, and 0 otherwise.	7207	0.24	0.43	0.00	1.00
Foreign	A dummy variable equal to 1 if the firm has any level of foreign ownership, and 0 otherwise.	7207	0.24	0.43	0.00	1.00
Certification	A dummy variable equal to 1 if the firm holds an internationally recognized quality certification, and 0 otherwise.	7207	0.60	0.49	0.00	1.00
Internet	A dummy variable equal to 1 if the firm is connected to the internet, and 0 otherwise	7207	0.13	0.34	0.00	1.00
Fin Constraint	A dummy variable equal to 1 if the firm was denied a loan or identified financial difficulties as a major obstacle, and 0 otherwise.	7207	0.22	0.42	0.00	1.00

3.3. Methodology

Following the existing literature on firms' digital exports [2, 25] we formulate the baseline model as follows:

$$\begin{aligned} Pr(DE_{ik} = 1) &= Pr\,(\beta_0 + \beta_1 IC_{ik} + \beta_2 CONTROL_{ik} + \gamma_{ck} + \varepsilon_{ik} > 0) \\ &= F(\beta_0 + \beta_1 IC_{ik} + \beta_2 CONTROL_{ik} + \gamma_{ck} + \varepsilon_{ik}). \end{aligned} \quad (1)$$

In this model, the subscripts i, k, and c represent the firm, sector, and country, respectively. The term γ_{ck} denotes country-sector fixed effects, which are included to control for factors that may differ across countries and industries, such as subsidy policies. Sector fixed effects capture industry-specific characteristics, including technological intensity or competitive dynamics, while country fixed effects account for cross-national variations in policies like trade regulations, subsidies, or the development of digital infrastructure. The variable DE_{ik} indicates the digital export decision of firm i in sector k, while IC_{ik} measures the level of institutional constraint faced by the firm. $CONTROL_{ik}$ represents a vector of control variables. The error term ε_{ik} is assumed to follow a normal distribution with a mean of zero and a variance of one. Since DE_{ik} is a binary variable, we use a logit model to estimate Equation (1), where Pr denotes probability and F represents the logistic cumulative distribution function. All reported results are expressed as marginal effects evaluated at the mean, with standard errors clustered at the sector-location level.

There are several potential concerns related to the specification of model (1). One key issue is endogeneity, which arises when the outcome variables may, in fact, influence the explanatory variable,

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 10: 1005-1020, 2025
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creating a risk of reverse causality. For instance, firms that are already active in digital exports may possess greater capabilities or resources to navigate and mitigate institutional constraints, rather than being hindered by them. Another concern involves omitted variable bias, where unobserved factors correlated with both institutional constraints and digital export behavior could distort the estimated relationships.

To mitigate these estimation biases, we employ the Entropy Balancing (EB) method developed by Hainmueller [26][1]. This approach reweights the sample such that the distribution of covariates is balanced between treated and control groups in this case, firms facing institutional constraints versus those that do not. Unlike traditional methods based on propensity scores, EB directly adjusts the weights of treated observations to align covariate moments (e.g., means, variances) with those of the control group. This allows for more accurate estimation of counterfactual outcomes and improves causal inference in observational settings.

$$E\left[\widehat{DE}(0)\middle|IC=1\right]=\frac{\sum_{i|DC=0} DE_i IC_i^{EB}}{\sum_{i|DC=0} IC_i^{EB}}. \qquad (2)$$

In this context, the weight assigned to each reference unit, represented as IC_i^{EB}, is calculated by minimizing a loss function that measures the divergence between the adjusted control group weights and their original values. The goal of Entropy Balancing (EB) is to minimize this divergence while ensuring that the covariate distributions between treated and control groups are balanced. This approach preserves as much information as possible from the original dataset while aligning the means (and potentially higher moments) of selected covariates. The balance constraints play a critical role in this process, as they determine which covariates are equalized across the two groups. These constraints may be derived from theoretical considerations informed by prior research focusing on variables known to affect the dependent variable or selected empirically based on the characteristics of the dataset. In this study, the minimization process is conducted under researcher-specified balance constraints. While EB is theoretically robust, the effectiveness of the weighting process depends heavily on the appropriateness of the selected balance constraints.

In our application, the covariates used for achieving balance are consistent with those employed in the one-to-one matching procedure. However, it is important to acknowledge that year- and sector-specific factors are not incorporated into this balancing framework. As shown in Table 2, the post-balancing comparison reveals no statistically significant differences in the means of covariates between the treated and control groups. This indicates that entropy balancing successfully equalized the covariate distributions across the groups. Furthermore, the robustness of our findings is confirmed by conducting sensitivity analyses in which the balance constraints were either relaxed or tightened, with no substantive changes in the results.

[1]Instrumental variable (IV) techniques are commonly employed to address endogeneity by using external instruments that are correlated with the endogenous explanatory variable but uncorrelated with the model's error term. However, identifying valid instruments can be particularly difficult—especially in contexts like this study, where suitable external factors that specifically influence digital capabilities without directly affecting digital exports are scarce. An alternative approach, propensity score matching (PSM), attempts to construct comparable treatment and control groups by matching units based on the estimated probability of receiving treatment, conditional on observed covariates. While PSM is useful in many settings, it may not always achieve adequate balance across all covariates and typically does not account for differences in higher-order moments, such as variances or distributional shape

Entropy Balancing offers a more robust solution by reweighting observations to ensure exact balance on covariate means, and optionally on higher-order moments, between treated and control groups. This method provides greater flexibility and precision in adjusting for differences between groups, thereby mitigating endogeneity and omitted variable bias more effectively. Given the complexity and diversity of the multi-country dataset used in this study, Entropy Balancing is especially well-suited for isolating the causal effects of digital capabilities on digital export performance with improved statistical reliability.

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ISSN: 2576-8484
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Table 2.
Balancing test.

	Panel A: Unmatched			Panel B: Balanced sample		
	Untreated	**Treated**	**p-value**	**Untreated**	**Treated**	**p-value**
Productivity	14.19	13.37	0.00	13.37	13.37	0.99
Firm Age	3.20	3.16	0.00	3.16	3.16	0.99
Firm Manager	3.11	3.13	0.00	3.13	3.13	0.99
Joint stock	0.08	0.06	0.00	0.06	0.06	0.99
Innovation	0.47	0.42	0.00	0.42	0.42	0.99
Foreign tech	0.23	0.25	0.00	0.25	0.25	0.99
Foreign	0.25	0.22	0.00	0.22	0.22	0.99
Certification	0.61	0.58	0.00	0.58	0.58	0.99
Internet	0.12	0.15	0.00	0.15	0.15	0.99
Fin Constraint	0.14	0.35	0.00	0.35	0.35	0.99

Note: Panel A shows statistically significant differences in covariates between treated and control groups before weighting, while Panel B confirms successful balancing after applying Entropy Balancing, as no differences remain significant.

Derived from the concept of entropy balance, our model can be expressed in the following manner:

$$Pr(DE_i = 1) = Pr\left(\beta_0 + \beta_1 IC_i^{EB} + \beta_2 CONTROL_i + \gamma_{ck} + \varepsilon_i > 0\right) = F\left(\beta_0 + \beta_1 IC_i^{EB} + \beta_2 CONTROL_i + \gamma_{ck} + \varepsilon_i\right), \quad (3)$$

where IC_i^{EB} captures the entropy balancing weight.

We begin by examining the relationship between institutional constraints and digital export performance, applying the Entropy Balancing (EB) method to address potential endogeneity issues. To further explore the heterogeneity of this relationship, we re-estimate Equation (3) on sub-samples categorized by firm size and financial constraint status, aiming to assess whether institutional constraints differentially affect digital export outcomes [27]. Finally, we conduct robustness checks using alternative indicators of a firm's institutional constraints to validate the consistency of our findings.

4. Empirical Findings

4.1. Main Results

The regression results from Equation (3) indicate a clear pattern. To facilitate interpretation, marginal effects are expressed in percentage terms. Firms operating under institutional constraints are approximately 23% less likely to engage in digital exports. This figure aligns with existing literature on trade and digitalization. Barriers such as inefficient legal systems, red tape, or weak public services may seem minor individually, but collectively they can significantly hinder a firm's ability to adopt digital strategies and access global markets. These constraints limit access to essential resources, increase compliance costs, and generate uncertainty conditions, particularly detrimental in fragile institutional environments. SMEs, which already face challenges related to financing and technology adoption, appear to be most affected. The subsequent sections will examine the specific channels through which these institutional constraints impact digital exports.

At the firm level, weak institutions often result in limited access to finance and resources necessary for digital transformation. This issue is particularly severe in middle-income countries, where already-tight financial conditions are exacerbated by regulatory inefficiencies [19, 28]. SMEs have little room to maneuver in such contexts. Many simply lack the capacity to cope with complexity and end up scaling back or dropping digital initiatives altogether [19]. That said, there is some evidence that once firms manage to adopt digital technologies, the drag of institutional barriers diminishes. In this sense, digitalization itself can act as a buffer, providing SMEs with new ways to sidestep weak institutions and sustain export activity.

Zooming out, the problem of institutional distance, the gap between regulatory systems across borders, remains a well-documented obstacle. It raises transaction costs and makes international

business environments less predictable [29]. Still, improvements in institutional quality and the growth of digital economies can strengthen resilience. In the RCEP region, for example, stronger institutional frameworks coupled with supportive digital ecosystems have boosted participation in cross-border e-commerce [18]. This suggests that reforms and infrastructure investments are not just helpful but essential both for improving firm-level competitiveness and for unlocking broader regional gains.

The analysis also highlights a positive role for productivity. In Table 3, the coefficient on productivity is positive and statistically significant: a one-unit increase in log productivity raises the probability of digital exports by approximately 5 percentage points. The reasoning is straightforward. Productive firms tend to have stronger finances, better-trained workers, and the ability to invest in digital infrastructure, all of which translate into operational efficiency and higher-quality offerings. These are obvious advantages in crowded global markets.

Several mechanisms appear to drive this link. More productive firms are quicker to adopt advanced technologies such as robotics or automated logistics, which directly enhance export potential [8]. For SMEs, digitalization itself boosts productivity, which in turn makes exporting more feasible [30]. Innovation is also central. Firms that invest in product development generally see higher productivity, which strengthens their entry into international markets [30]. At the same time, broader initiatives such as digital governance reforms can increase total factor productivity by promoting technological progress and more efficient resource allocation [31].

The interplay of other firm-level factors innovation, adoption of foreign technologies, internet access, organizational form, and financing conditions, adds further complexity. Innovation, unsurprisingly, strengthens export performance by raising product quality and efficiency [32]. Digital innovation, in particular, connects firms to global knowledge networks, helping them compete internationally [33]. Foreign technology adoption also upgrades exports, raising product sophistication, as shown in China [11]. Greater digital intensity, often linked to integrating these technologies, reduces communication and transport costs, making market entry easier [34]. Internet connectivity plays a similar role. It lowers transaction costs and risks, especially in the early phases of adoption, when firms often see marked gains in export intensity [35, 36].

Yet not all influences are positive. Joint-stock companies, for example, may be less nimble because of slower decision-making and added bureaucracy, leaving them less able to seize digital opportunities [17]. Foreign quality certificates, while signaling compliance, may impose high costs that deter some firms from going digital [17]. Financial constraints remain one of the most binding barriers. Without capital, firms cannot invest in digital infrastructure or meet quality standards abroad [17, 32]. These tensions highlight the need for targeted policy support, especially for resource-constrained or structurally rigid firms.

Interestingly, some variables traditionally considered important, such as firm age, managerial experience, and foreign ownership, do not show significant effects in the regressions. This does not mean they are unimportant; rather, their influence may be highly context-dependent or overshadowed by stronger factors like productivity and innovation.

For firm age, the effects likely shift over the life cycle. Young firms are often more agile, sometimes benefiting from concentrated ownership, while older firms may become weighed down by rigid structures [37]. Managerial experience could matter when combined with industry knowledge or local market familiarity, but without those, the impact may vanish statistically [38]. Foreign ownership is another mixed case: direct control can yield spillovers and better oversight, but minority stakes often provide little benefit. In emerging markets, ownership-control gaps can even blunt the effect altogether [39]. These nuances help explain why the variables appear insignificant in the models, despite their apparent theoretical importance.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 10: 1005-1020, 2025
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Table 3.
Estimation results.

	(1)
Variables	**DE**
IC	-0.23***
	(0.070)
Productivity	0.05***
	(0.014)
Firm Age	-0.07
	(0.046)
Firm Manager	0.01
	(0.060)
Joint stock	-0.24*
	(0.135)
Innovation	0.38***
	(0.068)
Foreign tech	0.27***
	(0.077)
Foreign	-0.01
	(0.082)
Certification	-0.22***
	(0.069)
Internet	0.24***
	(0.093)
Fin Constraint	-0.24***
	(0.079)
Constant	-1.65***
	(0.307)
Observations	7,207
pseudo-R-squared	0.019

Note: Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The same set of control variables are included.

4.2. Further Analysis

In this part of the analysis, we examine the effects of different components of institutional constraints on digital exports. Table 4 reveals that only political instability and business licensing are statistically significant, while corruption and tax administration do not appear to have a substantial impact. This pattern aligns with broader evidence on how institutional quality influences trade. Political instability, in particular, tends to generate uncertainty and increase perceived risks, which may discourage firms from engaging in cross-border digital trade. Licensing functions as a gatekeeper; the more transparent and efficient the process, the easier it becomes for firms to access foreign markets. Conversely, the limited role of corruption and tax administration in this context may indicate that their effects are mitigated by digital channels or are less central to digital exports. The subsequent subsections will explore these dynamics in greater detail.

Take political instability first. When rules and economic conditions feel unpredictable, transaction costs go up and exporters face higher risk exposure. That uncertainty alone can stop firms from investing in international digital channels or from scaling up ones they already have. China offers a case in point: high levels of policy uncertainty there have been linked to weaker export resilience. Yet there's also evidence that the expansion of the digital economy can offset some of these pressures, helping reduce transaction costs and improving firms' adaptability [23].

Business licensing tells a similar story, though in a more practical way. Long waits, unclear requirements, or overly complicated procedures can slow firms down and even block their ability to operate abroad. These barriers don't just delay market entry; they also inflate compliance costs, which smaller firms or those exporting for the first time find particularly hard to absorb. Studies have noted

that when licensing frameworks are streamlined and supported by institutions, firms face fewer credit constraints and have a smoother path into export markets [28].

Corruption, although commonly recognized as a barrier to trade, appears to have a muted impact in the context of digital exports. This may be due to the digital nature of transactions, which often bypass traditional bureaucratic processes where corruption typically occurs. Moreover, the implementation of digital governance systems has been effective in curbing corruption, while corruption itself does not significantly undermine digital governance, suggesting that digital exporters may be less vulnerable to such institutional weaknesses [40].

Tax administration, likewise, does not show a statistically significant impact on digital exports. This could be explained by the flexible nature of digital services, which allows firms to optimize tax liabilities through cross-border structuring and strategic use of favorable tax jurisdictions. Unlike traditional goods that require physical movement and customs documentation, digital products can be relocated or transacted with fewer regulatory frictions, diminishing the relevance of domestic tax complexity for digital exporters [16].

The insignificance of corruption and tax administration may reflect the nature of digital transactions, which often bypass bureaucratic procedures where corruption is most prevalent, and allow for flexible structuring that reduces exposure to complex domestic tax systems. This suggests that political stability and licensing reforms, rather than anti-corruption or tax simplification alone, are the most immediate levers for expanding digital exports.

Table 4.
Further estimation results.

	(1)	(2)	(3)	(4)
Variables	**DE**	**DE**	**DE**	**DE**
Corruption	-0.03			
	(0.090)			
Political instability		-0.28***		
		(0.072)		
Tax administration			-0.14	
			(0.092)	
Business licensing				-0.31***
				(0.097)
Constant	-1.75***	-1.69***	-1.80***	-1.76***
	(0.305)	(0.333)	(0.381)	(0.403)
Observations	7,207	7,207	7,207	7,207
pseudo-R-squared	0.0170	0.0220	0.0217	0.0312

Note: Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The same set of control variables are included.

Furthermore, we conduct regression analyses on sub-samples categorized by financial constraints and firm size to better understand how institutional constraints affect different types of firms. These sub-group analyses are motivated by both theoretical considerations and empirical findings that suggest firm characteristics such as access to finance and organizational scale can significantly moderate the relationship between institutional environments and export behavior.

Financial constraints remain one of the most significant barriers to adopting digital technologies and expanding into international markets. Firms lacking liquidity or reliable credit lines often face difficulties in investing in digital infrastructure, complying with regulatory requirements, or scaling production to meet foreign demand. Earlier studies indicate that institutional hurdles such as complex licensing procedures or unstable political environments tend to have a more substantial impact on these financially constrained firms. They lack the buffers or resources necessary to absorb shocks. Therefore, it is logical to analyze firms separately based on their financial condition: examining those with and without constraints helps to understand how institutional barriers affect each group differently.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 10: 1005-1020, 2025
DOI: 10.55214/2576-8484.v9i10.10582

Firm size tells a similar story. SMEs usually operate with leaner administrative setups, less formal structures, and weaker technological readiness. As a result, they are more exposed to licensing delays or political uncertainty. Larger firms, by contrast, can spread costs over bigger operations, draw on stronger financing networks, and rely on prior regulatory experience to cushion the impact of weak institutions. Splitting the sample by size, then, allows us to see whether institutional constraints are felt more acutely by SMEs than by larger firms.

Table 5, however, reveals a somewhat surprising result: institutional constraints have a stronger negative effect on digital exports among firms that are financially unconstrained and those that are larger in size. At first glance, this feels counterintuitive. But the finding aligns with the idea that these firms, precisely because they engage more deeply in international markets and digital activities, are also more exposed to institutional shortcomings. Firms with ample financial resources can invest heavily in digital tools and export activity, yet that very engagement makes them more sensitive to inefficiencies in the institutional environment. Similarly, large firms, by virtue of their scope and reach, are tightly enmeshed with institutional systems and thus more affected by their quality.

Financially unconstrained firms are, in theory, more resilient. They can channel resources into compliance, upgrades, and infrastructure, the nuts and bolts of digital exporting [28, 41]. They can shoulder the extra costs imposed by red tape or instability and still remain competitive. However, that flexibility also means their export outcomes are more directly influenced by how efficient or inefficient the institutions around them are.

Larger firms operate under similar dynamics. With their deeper pools of talent and capital, they are better positioned to interpret shifting rules and adjust strategies. In some cases, they may even lobby for policy change. Yet scale is a double-edged sword. Because big firms interact with institutions at multiple levels, local, national, and international, their export performance is tightly bound to the quality of those institutions [42]. Smaller firms, meanwhile, often limit their exposure abroad simply because they lack capacity. Ironically, that constraint insulates them somewhat, leaving them less directly affected by institutional weaknesses.

Table 5.
Estimation results based on the subsample by financial constraint and firm size.

	(1)	(2)	(3)	(4)
	No financial constraint	**Having financial constraints**	**SMEs**	**Large-sized firms**
VARIABLES	**DE**	**DE**	**DE**	**DE**
IC	-0.29***	-0.11	-0.14**	-1.71***
	(-0.076)	(-0.139)	(-0.07)	(-0.381)
Observations	5,611	1,596	6,741	466
pseudo-R-squared	0.0184	0.0315	0.0202	0.196

Note: Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
The same set of control variables are included.

5. Conclusions and Policy Implications

This study investigates the impact of institutional constraints on digital exports using a novel multi-country firm-level dataset from the WBES. By applying the entropy balancing method to address endogeneity concerns, the analysis reveals that institutional barriers, particularly political instability and burdensome business licensing, significantly reduce a firm's likelihood of engaging in digital exports. These effects are more pronounced for financially unconstrained and large firms, which are generally more engaged in international trade and hence more exposed to the quality of institutional environments. Conversely, corruption and tax administration show no significant impact, suggesting that the nature of digital trade may reduce reliance on or exposure to these types of institutional frictions.

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 10: 1005-1020, 2025
DOI: 10.55214/2576-8484.v9i10.10582

Moreover, the study finds that firm-level factors such as productivity, innovation, adoption of foreign technologies, and reliable internet access play a crucial role in enabling digital exports. At the same time, challenges such as joint-stock ownership complexity, compliance burdens from foreign quality certification, and financial constraints remain barriers to broader digital trade participation, especially among SMEs.

These findings have several policy implications. First, governments, particularly in emerging and developing economies, should prioritize the stabilization of political institutions and reduce regulatory uncertainty. Transparent and predictable policy environments will encourage digital export activities and attract investment in digital infrastructure. Second, simplifying business licensing procedures and enhancing transparency can remove key obstacles to digital trade. This is especially critical for SMEs, which often lack the administrative resources to navigate complex bureaucracies. Third, given their vulnerability to institutional frictions, targeted programs such as subsidized digital training, access to affordable digital tools, and simplified compliance processes can help smaller and financially constrained firms participate more actively in digital export markets. Fourth, public investment in internet infrastructure and digital service ecosystems, particularly in underserved regions, can facilitate broader participation in global digital trade. Ensuring universal and reliable connectivity is foundational for digital export readiness. Fifth, institutions must evolve to accommodate the unique characteristics of digital trade. This includes formulating coherent digital trade regulations, enforcing data privacy standards, and facilitating international cooperation on cross-border digital flows.

Taken together, the evidence suggests that stabilizing political institutions, streamlining business licensing, and expanding digital infrastructure are not only desirable but also directly responsive to the empirical constraints identified in this study. These reforms represent the clearest policy levers for enabling firms, particularly SMEs, to participate more fully in global digital trade.

While this study contributes novel evidence, several limitations should be noted. First, the analysis relies on cross-sectional data, which constrains our ability to establish long-term causal effects. Second, institutional constraints are measured through firm self-reports, which may introduce reporting bias. Third, the study covers a broad set of countries but does not fully capture sectoral differences within digital trade. These limitations point to promising avenues for future research. Longitudinal data would allow examination of how institutional reforms shape digital exports over time. Sector-specific studies could reveal heterogeneous effects across industries such as manufacturing and services. Finally, integrating additional institutional indicators such as judicial efficiency or digital governance quality would provide a more comprehensive view of the institutional foundations of digital trade.

Funding:
The authors gratefully acknowledge the financial support by the Banking Academy of Vietnam.

Transparency:
The author confirms that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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Appendix

Table A1.
List of countries.

Countries	Percent
Armenia (2024)	0.4
Azerbaijan (2024)	0.24
Bahrain (2024)	0.25
Barbados (2023)	0.35
Belgium (2024)	1.39
Benin (2024)	0.17
Bhutan (2024)	0.22
Bosnia and Herzegovina (2023)	0.89
Botswana (2023)	0.18
Bulgaria (2023)	2.53
BurkinaFaso (2024)	0.21
Cambodia (2023)	1.15

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 10: 1005-1020, 2025
DOI: 10.55214/2576-8484.v9i10.10582

Cameroon (2024)	0.54
Canada (2024)	1.83
Central African Republic (2023)	0.12
Chad (2023)	0.03
China (2024)	2.57
Colombia (2023)	0.83
Congo (2024)	0.26
Costa Rica (2023)	0.51
Croatia (2023)	1.4
Cyprus (2024)	0.6
Czechia (2024)	1.73
Côte d'Ivoire (2023)	0.72
DRC (2024)	0.18
Ecuador (2024)	0.42
ElSalvador (2023)	1.22
Equatorial Guinea (2024)	0.03
Estonia (2023)	1.6
Eswatini (2024)	0.11
Gambia (2023)	0.12
Georgia (2023)	0.97
Ghana (2023)	0.5
Greece (2023)	2.21
Hong Kong SAR China (2023)	0.47
Hungary (2023)	3.44
Iceland (2024)	0.46
Ireland (2024)	1.1
Israel (2024)	0.33
Italy (2024)	4.66
Jamaica (2024)	0.26
Jordan (2024)	2.19
Kazakhstan (2024)	1.36
Korea Republic (2024)	3.64
Kyrgyz Republic (2023)	0.51
Lao PDR (2024)	0.35
Latvia (2024)	1.05
Lesotho (2023)	0.14
Malaysia (2024)	1.1
Mali (2024)	0.26
Malta (2024)	0.43
Mauritius (2023)	0.68
Mexico (2023)	0.9
Moldova (2024)	0.53
Montenegro (2023)	0.42
Morocco (2023)	1.42
Namibia (2024)	0.19
Nepal (2023)	0.4
New Zealand (2023)	0.64
North Macedonia (2023)	1.26
Pakistan2022	1.75
Papua New Guinea (2024)	0.04
Paraguay (2023)	0.35
Philippines (2023)	0.74

Edelweiss Applied Science and Technology
ISSN: 2576-8484
Vol. 9, No. 10: 1005-1020, 2025
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Poland (2025)	2.66
Portugal (2023)	3.05
Romania (2023)	2.41
Rwanda (2023)	0.33
Samoa (2023)	0.11
Senegal (2024)	0.5
Serbia (2024)	2.03
Seychelles (2023)	0.03
Sierra Leone (2023)	0.07
Singapore (2023)	0.58
Slovak Republic (2023)	1.42
Slovenia (2024)	1.89
South Sudan (2024)	0.01
Spain (2024)	7.08
Sweden (2024)	2.51
Taiwan China (2024)	3.55
Tajikistan (2024)	0.14
Tanzania (2023)	0.5
Togo (2023)	0.46
Tonga (2024)	0.03
Trinidad and Tobago (2025)	0.04
Tunisia (2024)	2.19
Turkiye (2024)	1.46
Turkmenistan (2024)	0.33
United Kingdom (2024)	1.23
United States (2024)	3.64
Uruguay (2024)	0.53
Uzbekistan (2024)	0.69
Viet Nam (2023)	2.37
West Bank And Gaza (2023)	0.61

Edelweiss Applied Science and Technology
ISSN: 2576-8484
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DOI: 10.55214/2576-8484.v9i10.10582