

**Unclassified****English - Or. English**

1 April 2025

**TRADE AND AGRICULTURE DIRECTORATE  
TRADE COMMITTEE****Working Party of the Trade Committee****The digitalisation of trade documents and processes – Going paperless today,  
going paperless tomorrow**

*Purpose:* Enabling greater digitalisation of trade documents and processes has the potential to benefit firms of all sizes and economies at all levels of development. Bringing together insights from the Trade Committee's core databases (OECD Trade Facilitation Indicators - TFIs, Digital Services Trade Restrictiveness Index - DSTRI, Index of Digital Trade Integration and Openness - INDIGO), this paper explores the regulatory environment needed to support a paperless ecosystem, its impacts on trade, and the policy options for moving forward. The report incorporates comment and feedback from the June 2024 and the March 2025 Working Party of the Trade Committee (WPTC) meetings. The paper was declassified at the 13-14 March 2025 meeting of the WPTC.

*Background:* This work falls under the Item 3.1.1.2.2 (Impacts and opportunities of digital trade) of the Trade Committee's 2023-24 Programme of Work and Budget.

*Preparation:* This draft was prepared by Javier Lopez-Gonzalez and Silvia Sorescu (TAD/TPD). It incorporates useful comments and feedback from Andrea Andrenelli, Cemre Balaban, Koen Deconinck, John Drummond, Grégoire Garsous, Chiara Del Giovane, Alex Jaax, and Julia Nielson.

*Communications:* The paper will be formatted according to OECD publication guidelines. An accompanying communications plan will ensure that the findings are communicated to maximise awareness, usage and impact of the work.

**Contacts:**Javier Lopez-Gonzalez ([javier.lopezgonzalez@oecd.org](mailto:javier.lopezgonzalez@oecd.org))Silvia Sorescu ([silvia.sorescu@oecd.org](mailto:silvia.sorescu@oecd.org))**JT03563458**

## Table of contents

<b>Key messages</b> .....	<b>4</b>
<b>1. Introduction</b> .....	<b>5</b>
<b>2. What does <i>going paperless</i> entail and why does it matter?</b> .....	<b>6</b>
<b>3. What is the state of play in the regulatory and policy environment needed for <i>going paperless</i>?</b> .....	<b>9</b>
3.1. Key pillars of the enabling regulatory and policy environment.....	9
3.2. Progress on frameworks for conducting transactions electronically .....	12
3.3. Progress on digitalising border processes .....	15
3.4. Progress on cross-border exchange of data .....	16
3.5. What are the benefits of <i>going paperless</i> ?.....	18
<b>4. How can discussions in international fora advance the regulatory environment for <i>going paperless</i>?....</b>	<b>21</b>
4.1. Multilateral and plurilateral discussions .....	21
4.2. Trade agreements and new Digital Economy Agreements .....	22
4.3. Regional fora .....	24
4.4. Other international fora .....	26
4.5. Domestic initiatives .....	26
4.6. Private sector initiatives .....	27
<b>5. <i>Going paperless</i> tomorrow: Emerging challenges</b> .....	<b>30</b>
5.1. New sustainability-related requirements are rapidly emerging .....	30
5.2. Mechanisms for reporting, exchanging and verifying information are increasing .....	33
5.3. What do we know about how sustainability initiatives can be integrated into <i>going paperless</i> ? .....	37
<b>6. Key findings and conclusions</b> .....	<b>39</b>
<b>References</b> .....	<b>41</b>
<b>Annex A. Estimating impacts of <i>going paperless</i></b> .....	<b>44</b>
Trade flows specifications .....	44
Trade data .....	45
USITC ITPD-E database .....	45
<b>Annex B. Trade impacts of <i>going paperless</i></b> .....	<b>47</b>
<b>Annex C. G20 High-Level Principles on the Digitalization of Trade Documents</b> .....	<b>48</b>
<b>Annex D. Selected examples of country initiatives</b> .....	<b>50</b>
Developing an Ecosystem of Trust at the United Kingdom border.....	50
Simplifying Australia’s trade system .....	50
Reforms implemented .....	50
Reforms underway.....	51
<b>Annex E. <i>Going paperless</i> in agricultural and food trade: Insights from the implementation of SPS e-certificates</b> .....	<b>52</b>
<b>Annex F. Features of sustainability regulations in terms of their links to the border process</b> .....	<b>55</b>

## Tables

Table 1. Key trade documents in the context of the UN/CEFACT Buy-Ship-Pay Model	8
Table 2. Amount of standardisation of electronic and digital versions of key trade documents	29
Table 3. Examples of mandatory sustainability initiatives and their link to what happens at the border	31
Table A A.1. Sector coverage based on the ITPD-E database	46

Table A B.1. Impact of policy indicators on trade using ITPD-E database (2012-19)	47
---	----

## Figures

Figure 1. The building blocks for <i>going paperless</i> : A conceptual framework	7
Figure 2. Key pillars of the enabling regulatory environment for <i>going paperless</i>	10
Figure 3. Barriers affecting electronic payments are growing	12
Figure 4. In turn, the domestic regulatory environment is becoming increasingly supportive for electronic transactions	13
Figure 5. The international policy landscape is also gradually supportive of electronic transaction frameworks	14
Figure 6. Wider digital economy issues are increasingly relevant for electronic transaction frameworks	14
Figure 7. Progress has been achieved in key areas of trade facilitation	15
Figure 8. Mechanisms for border agency co-operation face challenges in implementation	16
Figure 9. Barriers affecting infrastructure and connectivity are increasing	16
Figure 10. Discussions affecting cross-border exchange of data are taking place across various fora	17
Figure 11. Digitalising border processes and trade documents has an important effect on exports, with additional gains where documents and processes are streamlined	20
Figure 12. Progress on automation has been one of the key areas of trade facilitation reform	21
Figure 13. There is an increasing coverage of <i>going paperless</i> elements in trade and digital agreements	23
Figure 14. Data flows as well as new digital economy issues in trade agreements can also play a role for <i>going paperless</i>	24
Figure 15. A wide range of stakeholders are involved in paperless trade initiatives	28
Figure 16. A checklist of <i>going paperless</i> issues raised by new sustainability regulations	36
Figure 17. The guidance on the relationship to the border process is limited across sustainability regulations	38

## Boxes

Box 1. OECD indicators relevant for <i>going paperless</i>	10
Box 2. Using the structural gravity model for trade analysis	19
Box 3. Elements of the WTO Agreement on E-commerce underpinning <i>going paperless</i>	22

## Key messages

### *Why is going paperless important?*

**Despite the rapid pace of digitalisation, international trade in goods remains heavily reliant on paper-based processes.** While the potential benefits of paperless trade are widely acknowledged, a comprehensive, whole-of-supply-chain approach to the policies required to enable the transition from paper-based, analogue, trade to trade that relies on digitised information and processes – a process herein defined as *going paperless* – is still missing.

***Going paperless not only promises to reduce trade costs, but is also a critical enabler of broader policy objectives, including greater visibility and resilience across supply chains, and improved compliance with international trade regulations and standards.*** In the context of evolving environmental and social sustainability requirements, digital solutions can help businesses meet new obligations more effectively.

### *What does going paperless entail?*

***Going paperless involves five key steps:*** i) digitisation of trade documents (transitioning from physical to electronic trade documentation); ii) digitalisation of trade processes (streamlining and automating the procedural steps involved in international trade); iii) adoption of digital technologies (connecting documents and processes and enhancing efficiency and security); iv) standardisation of data elements (ensuring interoperability and consistency across systems); and v) implementation of enabling regulatory frameworks (establishing the necessary legal and institutional structures for paperless trade).

### *What progress is being made in implementing regulatory frameworks?*

- ***Frameworks for enabling electronic transactions.*** The OECD Digital Services Trade Restrictiveness Index (DSTRI) and the OECD Index of Digital Trade Integration and Openness (INDIGO) show increasing adoption, with countries moving quickly to adapt their regulations to enable *going paperless*. That said, more progress is needed on electronic transferable records and domestic frameworks for e-payments.
- ***Digital tools for trade facilitation at the border.*** The OECD Trade Facilitation Indicators (TFIs) show significant improvements, especially in automated pre-arrival processing, automated risk management, electronic payment of duties and charges, and digital Single Windows. However, many of the digital tools required for border agency co-operation – such as shared risk management systems and interconnected computer systems – remain amongst those with the lowest levels of implementation.
- ***Mechanisms for cross-border data exchange.*** The regulatory environment for cross-border data flows is becoming increasingly complex, whether for personal or non-personal data, with potentially negative consequences for *going paperless*.
- ***Implementing the right regulatory frameworks can generate important benefits.*** A 10% improvement in the bilateral TFIs score for automating border processes, when accompanied by streamlining of documents and processes and increased co-operation among border agencies, delivers an increase of up to 18% in global goods exports. But the domestic and international regulatory landscape also matters: a 0.1-point reduction in the DSTRI for electronic transaction frameworks, e-payments and connectivity is associated with an increase in global exports of 37%.

### *What are the short-term challenges for going paperless?*

- **Going paperless will play an important role in helping companies meet new sustainability requirements.** Under both voluntary and mandatory initiatives, firms are increasingly asked to provide information on their environmental and social sustainability footprint across the entirety of their supply chain. This is raising new challenges about ‘what’ information is required and ‘how’ to prove compliance at the border.
- **Technical interoperability will be key to reduce transaction costs and operational inefficiencies in sharing and verifying data** across actors and borders. However, for this to be effective, it must be underpinned by the robust policy environment that supports the transition to a paperless ecosystem.
- **Analysis of selected sustainability regulations reveals that there is still an important gap in clarifying what compliance entails for border processes and for integration in the going paperless ecosystem.** While two-thirds of surveyed regulations specify border processes, only half define documentary requirements (e.g. conformity, supply chain audits) and around one-quarter specify the requirements for platforms underpinning the exchange of information. Mechanisms for border agency co-operation are rarely covered.

## 1. Introduction

Digital connectivity and digital trade policies play a key and multifaceted role in reducing international trade costs (Lopez-Gonzalez, Sorescu and Kaynak (2023<sup>[1]</sup>); Belli, Piermartini and Rubinova (2023<sup>[2]</sup>)). One important aspect is the digitalisation of trade processes and documents, which connects different actors along the supply chain and has been critical in supporting resilience in the face of emerging shocks, including, but not limited to, the COVID-19 pandemic (Sorescu and Bollig (2022<sup>[3]</sup>); UN ESCAP (2023<sup>[4]</sup>)).

The process of *going paperless* involves moving from paper-based, analogue trade, to trade based on digitised information and processes. This helps connect different actors and enables faster and more robust traceability along the supply chain, including when products cross international borders.<sup>1</sup> While it is widely understood and accepted that *going paperless* can deliver significant gains for economies and the different actors involved in trade, in practice trade processes are still at an early stage of digitalisation (International Chamber of Commerce, 2022<sup>[5]</sup>). Moreover, the potential magnitude of the benefits, and the trade policies needed to reap them across different steps of the supply chain are not well understood.

The aim of this paper is to increase the evidence base in this area with a view to enabling more informed policy discussions on *going paperless*. This can feed into ongoing domestic reforms as well as international initiatives such as the World Trade Organization (WTO) Work Programme on E-commerce, the WTO Joint Statement Initiative on E-commerce, digital trade provisions in regional trade agreements (RTAs), or emerging digital economy agreements (DEAs). The analysis identifies constraints that inhibit a near-term transition to paperless trade and the benefits of policy reform and coordination. The work is also important for discussions on the role of digital tools for supply chain resilience and for

---

<sup>1</sup> The term *going paperless* is italicised to refer to the range of activities required to effectively go paperless.

identifying policy challenges for *going paperless* to meet new regulatory requirements, including in the context of sustainability reporting.

The paper is structured as follows. The next section outlines what *going paperless* is and why it matters. The third section brings together insights from OECD databases (such as the Trade Facilitation Indicators (TFIs), the Index of Digital Trade Integration and Openness (INDIGO), and the Digital Services Trade Restrictiveness Index (DSTRI)) to identify the state of play in the regulatory and policy environment needed for *going paperless*. It also assesses the benefits of further reforms in these areas. Section 4 then identifies how existing global and regulatory initiatives can support the realisation of these benefits. Section 5 delves into the role of a *going paperless* environment in the context of evolving trade-related sustainability requirements. Section 6 concludes.

## 2. What does *going paperless* entail and why does it matter?

*Going paperless* refers to the transition from paper-based, analogue, trade to trade that relies on digitised information and processes. In this context, *going paperless* takes a broader, more holistic approach than the concept of “paperless trade”, which typically focuses on at-the-border procedures. It encompasses the full range of actors and trade-related documents and processes across the entire supply chain, ensuring that digitalisation efforts extend beyond border formalities to all stages of trade transactions.

*Going paperless* involves 5 key steps (Figure 1):

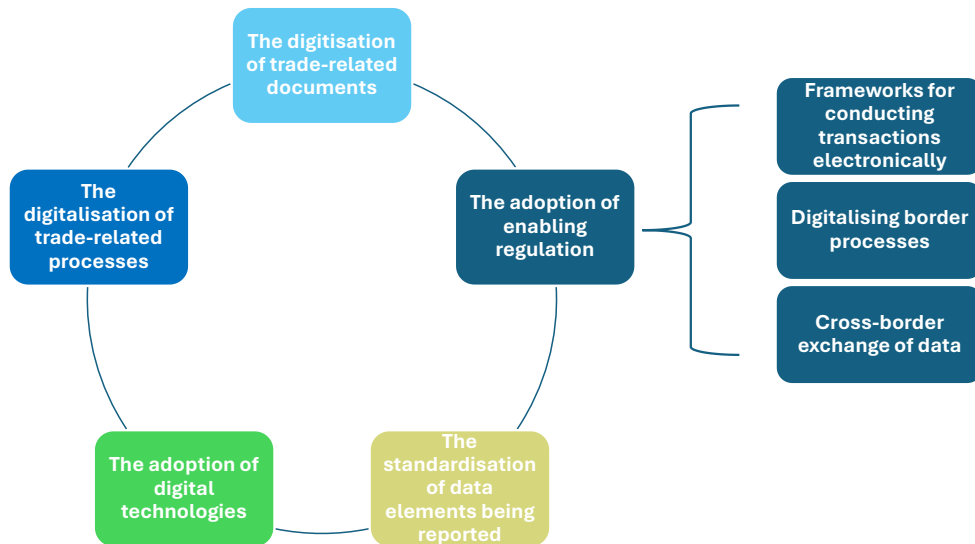
- (1) **The digitisation of trade-related documents** (see Table 1 for a comprehensive list). This involves supporting B2B transactions by enabling the use of e-invoicing or electronic Bills of Lading. It also involves supporting B2G transactions, including the use of digital customs declarations, certificates of origin, licensing certificates, certificates related to regulatory requirements or standards (environmental sustainability requirements or labour compliance).
- (2) **The digitalisation of trade-related processes**. This involves leveraging technology to streamline, automate, and enhance the efficiency of customs and other border agencies processes, ultimately impacting the release of goods at the border. It can include, for instance, pre-arrival processing (procedures that allow for the submission and processing of trade-related documentation and information before the arrival of goods at the border); risk management systems; electronic payment of duties, fees and charges; and Single Windows systems (platforms allowing traders to submit all necessary documentation and data required for import, export, and transit procedures through a single entry point).
- (3) **The adoption of digital technologies**. This includes Electronic Data Interchange (EDI) or Application Programming Interfaces (API) to automate document completion and sharing processes, reducing paper duplication and streamlining workflows. The use of new technologies, such as Optical Character Recognition (OCR), Distributed Ledger Technologies (including blockchain), Artificial Intelligence, or the Internet of Things, also contribute to *going paperless* efforts.
- (4) **The standardisation of data elements being reported**. For documents to be machine-readable by digital technologies, data elements need to be standardised. This has been enabled, for instance, by work such as that of the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT), with outputs including the UN Trade Data Element Directory (UNTED/ISO 7372), the “buy-ship-pay” data model (BSP-RDM), the Supply Chain Reference Data Model

(SCRDM), the Multi-Modal Transport Reference Data Model (MMT-RDM), and document representation standards for electronic invoicing (e-invoice) and electronic sanitary and phytosanitary (SPS) certificates (E-cert) (Atkinson, 2023<sup>[6]</sup>).

- (5) **The adoption of enabling regulation.** The process of *going paperless* also requires appropriate regulation both domestically and internationally. This includes: i) the legal frameworks for conducting transactions electronically (e.g. recognition of e-signatures, e-contracts and e-transferable records); ii) the policies supporting digitalisation of border processes; and iii) the ability to exchange data across international borders.

Together, these are the building blocks of *going paperless* initiatives. Importantly, all need to advance in parallel. Advancing on one without another can create bottlenecks that reduce effectiveness. For example, private and public sector adoption of digital documents and processes will only be effective if appropriate technologies are being used to share data, including with customs and border authorities, and if regulatory frameworks are adapted to the use of digital certificates.

**Figure 1. The building blocks for *going paperless*: A conceptual framework**



Source: Authors' elaboration.

**Table 1. Key trade documents in the context of the UN/CEFACT Buy-Ship-Pay Model**

BUY	A - Commercial Processes	<ul style="list-style-type: none"> <li>• Purchase Order</li> <li>• Commercial Invoice</li> </ul>
SHIP	B - Transport Processes	<ul style="list-style-type: none"> <li>• Shipper's Letter of Instructions</li> <li>• Packing List</li> <li>• Bill of Lading</li> <li>• Sea Waybill</li> <li>• Ship's Delivery Order</li> <li>• Air Waybill</li> <li>• Sea Cargo Manifest</li> <li>• Air Cargo Manifest</li> <li>• Rail Consignment (CIM) Note</li> <li>• Road Consignment (CMR) Note</li> <li>• Cargo Insurance Document</li> <li>• Warehouse Receipt</li> <li>• Dangerous Goods Declaration</li> <li>• Consignment Security Declaration</li> </ul>
	C - Border and Regulatory Processes	<ul style="list-style-type: none"> <li>• Export/import licence for agricultural products</li> <li>• Non-preferential Certificate of Origin</li> <li>• Preferential Certificate of Origin</li> <li>• Customs Declaration</li> <li>• CODEX Generic Model Official Certificate</li> <li>• Phytosanitary certificate</li> <li>• International Veterinary Certificate</li> <li>• CITES permit/certificate</li> <li>• Certificate of Inspection for Organic Products</li> <li>• Customs Bond</li> <li>• ATA Carnet</li> <li>• TIR Carnet</li> <li>• Transit Accompanying Document</li> <li>• Advance Ruling Application</li> <li>• Excise Guarantee</li> <li>• Administrative Documents used in the Excise Movement Control System</li> <li>• Documents of conformity</li> <li>• Certificates related to environmental sustainability requirements or labour compliance</li> </ul>
PAY	D - Financial Processes	<ul style="list-style-type: none"> <li>• Letter of Credit</li> <li>• Payment Confirmation</li> <li>• Bill of Exchange</li> <li>• Promissory Note</li> </ul>

Source: Adapted from ICC DSI (2024<sup>[7]</sup>).

Getting it right matters not only because *going paperless* contributes to reductions in **trade costs**, leading to increased **competitiveness** and more trade, but also because it contributes to other important policy objectives, such as:

- **Increasing supply chain resilience and visibility:** The COVID-19 pandemic, prolonged geopolitical tensions, and natural disasters or accidents (e.g. Suez Canal<sup>2</sup>, Port of Baltimore<sup>3</sup>) have brought to the forefront the issue of supply chain

<sup>2</sup> <https://www.bbc.com/news/world-middle-east-56505413>

<sup>3</sup> <https://www.cnbc.com/2024/03/27/cnbc-daily-open-baltimore-port-shutdown-a-major-disruption-.html>

resilience and the ability to respond to increasingly frequent shocks. Mitigating risks, adapting to new realities, rebounding, and recovering with agility requires gaining better visibility of activities across global supply chains. However, since most trade transactions remain paper-based, it is difficult to register, track, and exchange information on movements of goods in real-time.

- **Risk management:** Going paperless also provides the foundations for using diversification as a risk management strategy by creating opportunities for businesses of all sizes to better identify potential bottlenecks in their supply chains and to devise ways to minimise possible disruptions (Wirjo and Calizo, 2022<sup>[8]</sup>).
- **Meeting new sustainability regulatory requirements:** Environmental and social sustainability is increasingly important for consumers. At the same time, there are growing demands on firms for transparency and accountability (Deconinck, Jansen and Barisone, 2023<sup>[9]</sup>). Emerging voluntary initiatives and mandatory requirements require firms to track and provide information on their environmental and social sustainability performance, including across the entirety of their supply chain. Digital solutions can help businesses comply with such regulations and meet standards more effectively. For border and regulatory agencies, automated processing of information, checks and validation, enabled by the digitalisation of documents and processes, can expedite clearance of trade documents, facilitate the implementation of new requirements and reduce risks of delays and penalties (i.e. imposed by a customs administration or relevant border agency for a breach of the customs laws, regulations, or procedural requirements).
- **Levelling the playing field:** Through its cost-reducing impacts, which particularly benefit smaller actors, paperless trade can contribute to making trade more inclusive. This includes providing more opportunities for MSMEs and women traders to participate in and benefit from international trade.

### 3. What is the state of play in the regulatory and policy environment needed for *going paperless*?

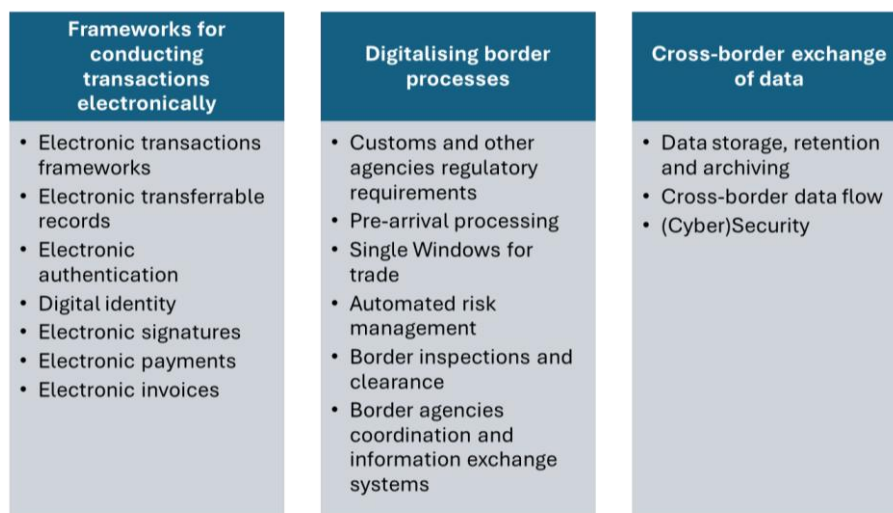
#### 3.1. Key pillars of the enabling regulatory and policy environment

The enabling regulation underlying the implementation and operationalisation of the *going paperless* ecosystem – involving the digitalisation of trade-related documents (both commercial and official documents) and trade-related processes – spans a wide range of areas. It can usefully be broken down (and summarised in Figure 2) into three categories and their underlying elements:

- *Frameworks for conducting transactions electronically.* This includes the policy and regulatory environment relevant for electronic transferrable records, e-authentication, e-signatures, e-payments, or e-invoicing.
- *Digitalising border processes.* These are trade facilitation elements such as pre-arrival processing of trade-related information, automated risk management, electronic payments of duties and charges, and digital trade Single Windows. Digital tools for border agency co-operation, such as coordination of computer systems and data requirements, are also of relevance.

- *Cross-border exchange of data.* The exchange of data between different actors which can be affected by policies on data storage, retention, and archiving, cross-border data flows, and cybersecurity.

**Figure 2. Key pillars of the enabling regulatory environment for going paperless**



Source: Authors' elaboration.

Progress across the areas covered in this conceptual framework can be tracked using OECD policy databases such as the OECD Trade Facilitation Indicators (TFIs), the Digital Services Trade Restrictiveness Index (DSTRI) and the new Index of Digital Trade Integration and Openness (INDIGO).

### Box 1. OECD indicators relevant for going paperless

#### *OECD Trade Facilitation Indicators*

The eleven TFIs are each composed of several specific, precise, and fact-based variables related to existing administrative processes at the border and their implementation in practice (e.g. the average time between publication and entry into force of new or adjusted trade-related regulations, the proportion of trade transactions that can be processed in advance to the arrival of goods at the border, or the coverage of certified trader programmes). The indicators are available since 2012 and range between 0 and 2, with 2 being the best performance that can be achieved. The TFIs selected for the analysis in this paper are available for 163 economies and include:

- TFI (G) *Automation* – aspects such as the electronic exchange of data and use of automated risk management.
- TFI (F) *Documents* – harmonisation and simplification of trade-related documents, in accordance with international standards.

- TFI (H) *Procedures* – aspects such as the streamlining of border control (inspections, clearance), implementation of trade single windows, or certified trader programmes.
- TFI (I) *Internal border agency co-operation* – institutional frameworks, mechanisms, and IT systems for domestic co-operation between various border agencies.
- TFI (J) *External border agency co-operation* – institutional frameworks, mechanisms, and IT systems for co-operation between various border agencies with neighbouring economies and other trading partners.

### ***OECD Digital Services Trade Restrictiveness Index***

Digital STRI captures cross-cutting barriers that affect cross-border digital trade activities. It is organised under the following policy areas: infrastructure and connectivity, electronic transactions, payment systems, intellectual property rights, and other barriers affecting trade in digitally enabled services. The Digital STRI is available since 2014 for 100 economies and ranges between 0 and 1, with 1 being the highest level of restrictiveness.

The DSTRI areas selected for the analysis in this paper are:

- *Infrastructure and connectivity*. This area covers measures related to communication infrastructures essential to engaging in digital trade. It maps the extent to which best practice regulations on interconnections among network operators are applied to ensure seamless communication. It also captures measures limiting or blocking the use of communications services, including Virtual Private Networks or leased lines. Lastly, this area covers policies that affect connectivity such as measures on cross-border data flows and data localisation.
- *Electronic transactions*. This area covers issues such as discriminatory conditions for issuing licenses for e-commerce activities, the possibility for online tax registration and declaration for non-resident firms, deviation from internationally accepted rules on electronic contracts, measures inhibiting the use of electronic authentication (such as electronic signature), and the lack of effective dispute settlement mechanisms.
- *Payment systems*. This area captures measures that affect payments made through electronic means. It includes measures related to access to certain payment methods and assesses whether domestic security standards for payment transactions are adopted in line with international standards. Lastly, it also covers restrictions related to Internet banking not covered in other areas.

### ***OECD Index of Digital Trade Integration and Openness (INDIGO)***

TAD/TC/WP(2024)8/FINAL details the method underlying the OECD Index of Digital Trade Integration and Openness (INDIGO) which tracks progress in international trade and non-trade discussions that matter for digital trade. The proposed scope of issues covered is based on a combination of ongoing and concluded digital trade discussions. This includes existing digital trade provisions in RTAs, discussions at the WTO, including at the JI on e-commerce, and elements covered in emerging DEAs.

INDIGO-i captures progress on non-trade related international instruments while INDIGO-t identifies trade related discussions. INDIGO is available since 2010 and

ranges between 0 and 1. For any given year, a country will score full points, 1, in its INDIGO if it has fully binding agreements or hard commitments across all areas with all partner countries. It will score zero if it has no agreement with any country. This bilateral method of aggregation enables capturing both the *depth* and the *spread* of digital trade discussions. It is also readily interpretable as the distance to full integration and openness to digital trade.

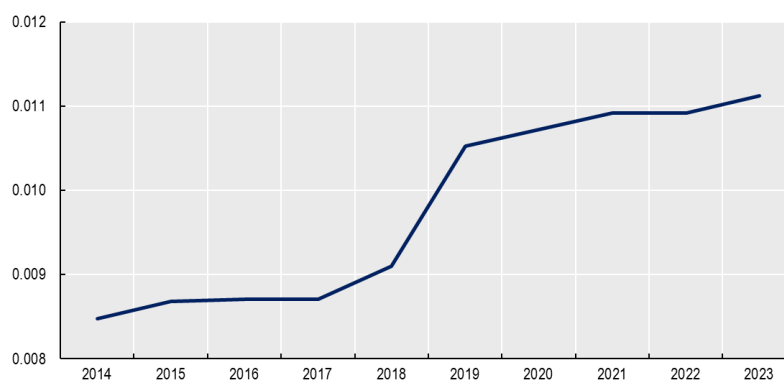
INDIGO is available for 193 economies and covers five broad ‘Policy Areas’:

- **enabling e-commerce:** including issues related to electronic transaction frameworks, electronic authentication and electronic signatures, electronic contracts, electronic invoicing, electronic payments, digitalising border processes and paperless trading.
- **openness and e-commerce:** including commitments on customs duties on electronic transmissions, access to the internet, telecommunications, ICT goods and open government data.
- **trust and e-commerce:** including online consumer protection, unsolicited commercial electronic messages, personal data protection, source code, cryptography, and cybersecurity.
- **cross-border data flows and data localisation:** including cross-border data flows and location of computing facilities.
- **wider digital economy issues:** including competition in the digital economy, digital inclusion, digital identities, artificial intelligence, taxation and FinTech.

### 3.2. Progress on frameworks for conducting transactions electronically

The OECD DSTRI highlights that, at the global level, barriers affecting digital trade have increased by 25% since 2014. This has been driven by several measures relevant for *going paperless* such as those affecting communication infrastructure and connectivity (see section 3.3 below) or electronic payments (Figure 3). The latter includes challenges in relation to accessing payment settlement methods; standards for national payment security not always being aligned with international standards; and restrictions on internet banking or insurance, all affecting the digitalisation of trade processes.

**Figure 3. Barriers affecting electronic payments are growing**

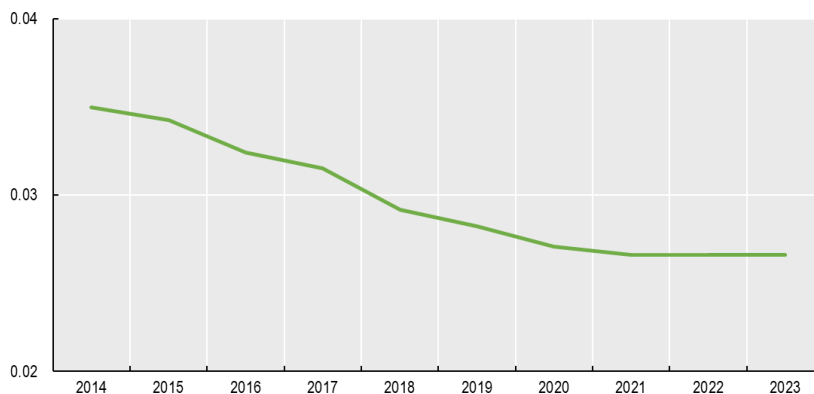


Note: The DSTRI takes values between 0 and 1, with 1 being the highest level of restrictiveness.

Source: OECD DSTRI database, 2024.

In contrast, the domestic regulatory environment has become increasingly supportive for electronic transactions over the last decade (Figure 4). This includes progress on specific domestic regulations relevant to the conditions for licenses to engage in e-commerce, national contract rules for cross-border transactions that are progressively following international standards, laws or regulations explicitly protecting confidential information, and laws or regulations affording electronic signatures equivalent legal validity with hand-written signatures.

**Figure 4. In turn, the domestic regulatory environment is becoming increasingly supportive for electronic transactions**



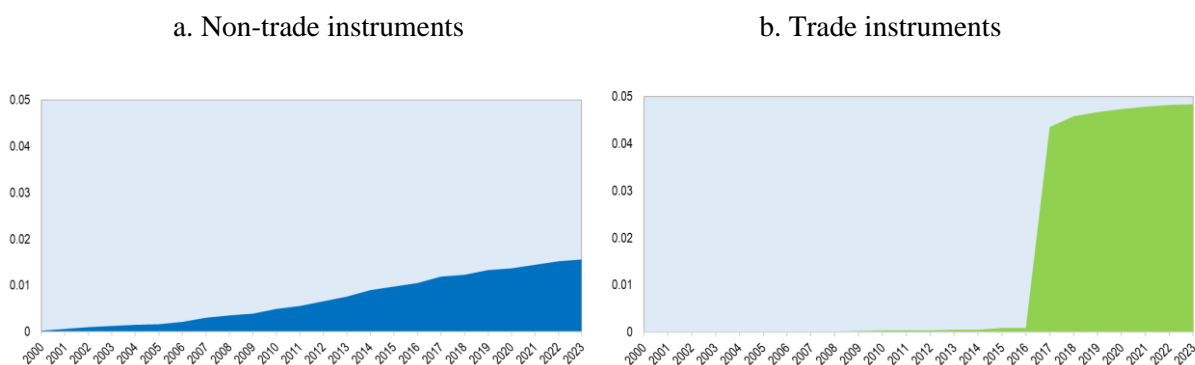
Note: The DSTRI takes values between 0 and 1, with 1 being the highest level of restrictiveness. The figure includes data for 100 economies.

Source: OECD DSTRI database, 2024.

The international policy landscape related to electronic transaction frameworks is also increasingly open, with a number of discussions in trade agreements and beyond (Figure 5). Non-trade related discussions (Figure 5a) include developments in the adoption of UN Conventions and Model Laws for electronic transactions frameworks, electronic authentication and electronic signatures, electronic contracts, electronic invoicing, and electronic payments. It also reflects continued advances in the legal framework for electronic transferrable records in recent years (through the adoption of the UNCITRAL Model Law on Electronic Transferrable Records), as well as regional instruments (such as the 2016 Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific, the 2021 G7 Digital Trade Principles, and the 2023 G20 High Level Principles on the Digitalization of Trade Documents).

Trade-related discussions reflect the entry into force of the WTO Trade Facilitation Agreement (TFA), which was a key driver of the initial efforts in paperless trading (Figure 5b). These also include developments in RTAs, as well as recent DEAs and DTAs, with customs automation and paperless trading increasingly covered under such agreements.

**Figure 5. The international policy landscape is also gradually supportive of electronic transaction frameworks**

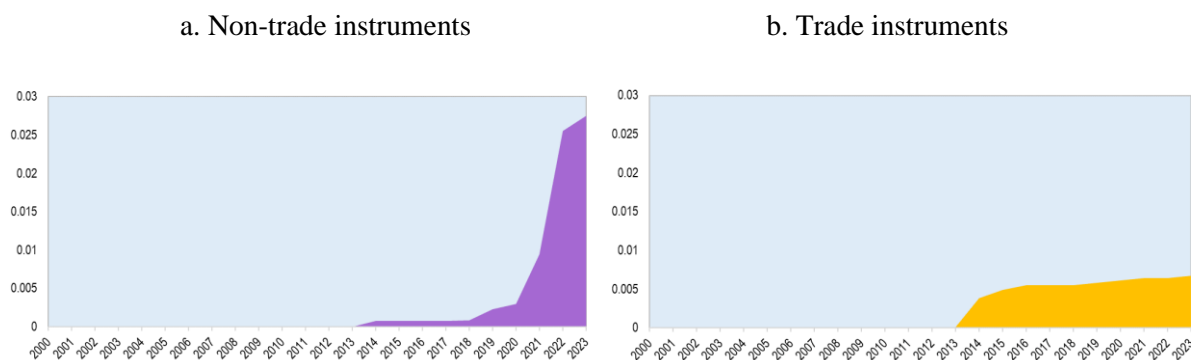


Note: The method underlying INDIGO is described in TAD/TC/WP(2024)8/FINAL. For any given year, a country will score full points, 1, in its INDIGO if it has fully binding agreements or hard commitments across all areas in ‘enabling e-commerce’ with all partner countries. It will score zero if it has no agreement with any country. This bilateral method of aggregation enables capturing both the depth and the spread of digital trade discussions.

Source: Based on OECD INDIGO, TAD/TC/WP(2024)8/FINAL.

Wider digital economy issues are increasingly relevant for the frameworks supporting electronic transactions and automation of border processes. This includes aspects such as digital identity and AI. Figure 6 shows an important spike in INDIGO for wider digital economy issues, which reflects agreements on AI at the G20, the OECD and UNESCO. Developments regarding digital identity and standards, interoperability or mutual recognition are largely taking place in trade-related discussions through RTAs, DEAs and DTAs.

**Figure 6. Wider digital economy issues are increasingly relevant for electronic transaction frameworks**



Note: The method underlying INDIGO is described in TAD/TC/WP(2024)8/FINAL. For any given year, a country will score full points, 1, in its INDIGO if it has fully binding agreements or hard commitments across all areas in ‘enabling e-commerce’ with all partner countries. It will score zero if it has no agreement with any country. This bilateral method of aggregation enables capturing both the depth and the spread of digital trade discussions.

Source: Based on OECD INDIGO, TAD/TC/WP(2024)8/FINAL.

### 3.3. Progress on digitalising border processes

The OECD TFIs highlight that, while automation of border processes has improved significantly since the onset of the COVID-19 pandemic, it remains the most challenging area in terms of streamlining formalities at the border (Figure 7). Improvements in automation have been driven by the introduction of tools such as automated pre-arrival processing, automated risk management, electronic payments of duties and charges, and digital Single Windows for trade.

It is, however, difficult to undertake border process automation without simplification of documentary requirements and streamlining of processes. The worldwide average for simplifying documentary requirements is now higher than that for automation, driven by a gradual alignment with international standards globally, as well as reviews of documentary requirements leading to simplification.

That said, progress in streamlining border processes has been more modest in recent years compared to the other two areas. This reflects challenges in the implementation of tools such as Authorised Operators (AOs), post-clearance audits and Single Windows, as well as the still low coverage in practice of transactions by pre-arrival processing and simplification of release from clearance.

#### Figure 7. Progress has been achieved in key areas of trade facilitation

TFIs database averages for areas of automation, documents and procedures, 2012-22



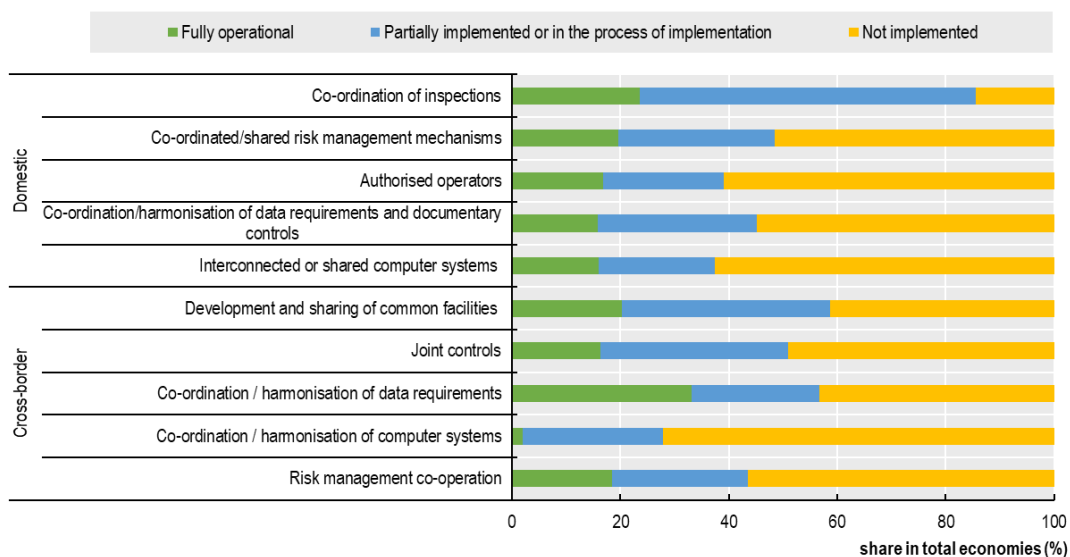
Note: The TFIs range between 0 and 2, with 2 the maximum performance that can be achieved.

Source: OECD TFIs database, 2023.

Improvements in different mechanisms for collaboration – from risk management systems, coordinated inspections, to certified trader programmes – have driven improvements in border agency co-operation (Figure 8). Digital tools for border agency co-operation, such as coordination of computer systems and data requirements, are also being enhanced. However, many of the areas that require sharing of data – such as shared risk management systems and interconnected computer systems – are among those with the lowest levels of implementation.

**Figure 8. Mechanisms for border agency co-operation face challenges in implementation**

Share in total economies (%), TFIs database, 2022

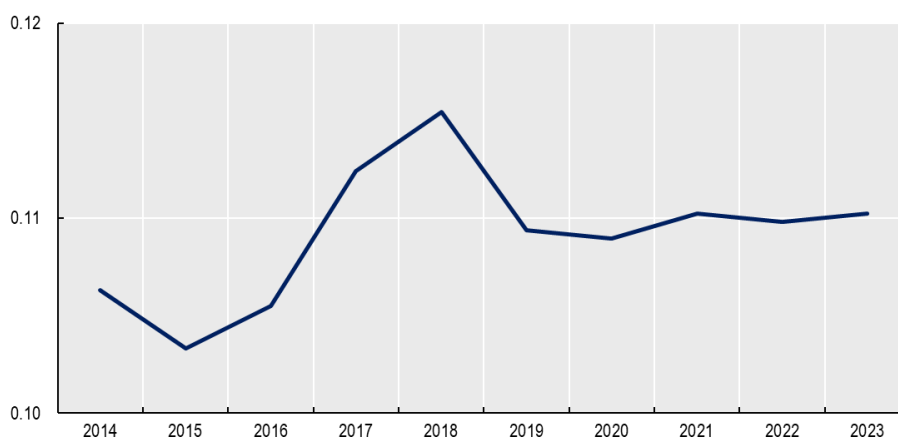


Source: OECD TFIs database, 2023.

### 3.4. Progress on cross-border exchange of data

The digital exchange of trade-related documents and the streamlining of processes underlying that exchange rest on the cross-border exchange of data, either B2B for commercial documents, B2G for official documents, or G2G in the context of co-operation amongst border agencies. The DSTRI data show that barriers related to interconnection on communication infrastructures and restrictions impacting connectivity (e.g. measures affecting cross-border data flows) are increasing (Figure 9). This is driven by limitations on cross-border data flows, data localisation requirements, and lack of pro-competitive regulations on interconnections across communications networks.

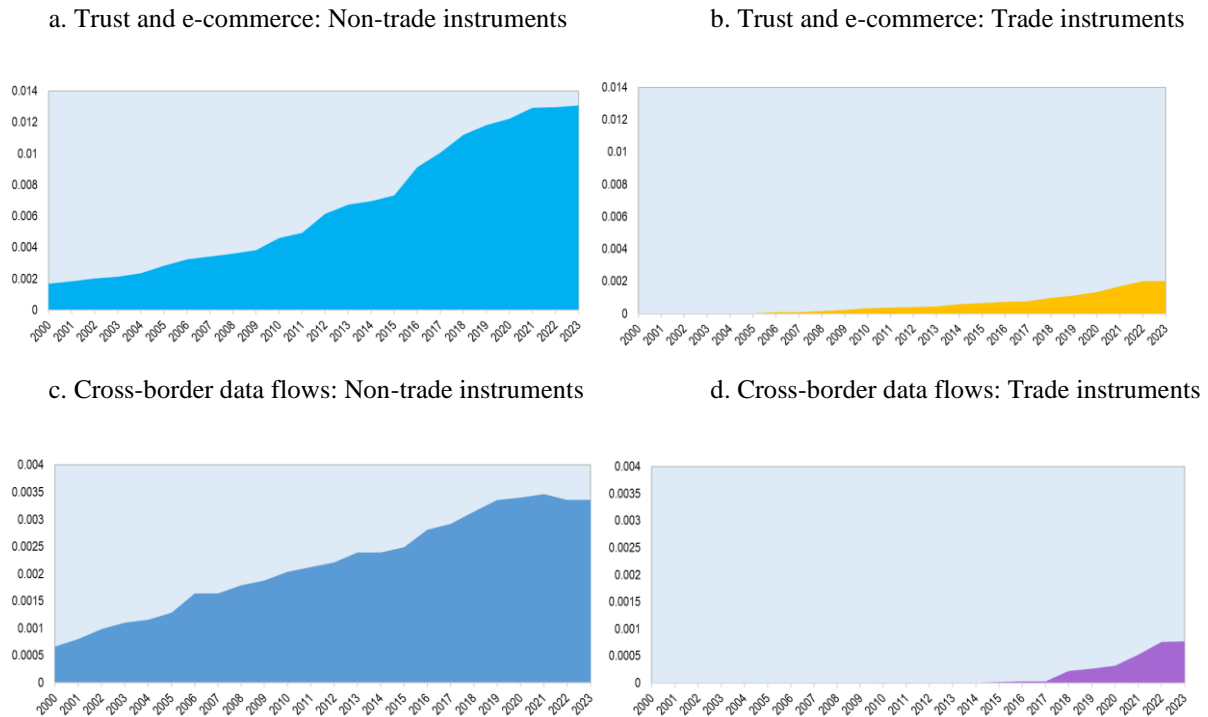
**Figure 9. Barriers affecting infrastructure and connectivity are increasing**



Note: The DSTRI takes values between 0 and 1, with 1 being the highest level of restrictiveness.  
Source: OECD DSTRI database, 2024.

In addition to domestic regulations, discussions are taking place internationally, through bilateral arrangements, regional fora, or trade agreements. Aspects fostering trust such as those relating to personal data protection, source code, and cybersecurity or concerning cross-border data flows are increasingly being covered by regional fora (e.g. OECD, G7, European Union, APEC, ECOWAS, OAS etc.), while also being covered in RTAs signed over the last 5 years (Figure 10).

**Figure 10. Discussions affecting cross-border exchange of data are taking place across various fora**



Note: The method underlying INIDIGO is described in TAD/TC/WP(2024)8/FINAL. Trust and e-commerce include aspects concerning personal data protection. Cross-border data flows and data localisation cover aspects concerning cross-border data flows and location of computing facilities. For any given year, a country will score full points, 1, in its INIDIGO if it has fully binding agreements or hard commitments across all areas in ‘enabling e-commerce’ with all partner countries. It will score zero if it has no agreement with any country. This bilateral method of aggregation enables capturing both the depth and the spread of digital trade discussions. Source: Based on OECD INIDIGO, TAD/TC/WP(2024)8/FINAL.

As the digitalisation of trade documents and processes relies largely on cross-border flows of non-personal data (NPD)<sup>4</sup>, it is important to note the linkages to this fast-evolving governance domain.<sup>5</sup> Ongoing OECD analysis on NPD highlights that, at the centre of debates on access to and free flow of NPD are issues of *trust*. For example, while governments might require access to NPD to ensure that when goods and services enter

<sup>4</sup> Ongoing analysis on NPD highlights that there is no official and widely accepted definition of non-personal data (NPD). It is generally defined by exclusion as any information that does not relate to identified or identifiable individuals.

<sup>5</sup> These issues are explored in parallel work on cross-border flows of non-personal data, which maps emerging regulation affecting their flow.

domestic markets these meet regulatory requirements, they can foster trust by ensuring that, when transferred by the private sector, NPD is appropriately safeguarded. To enable trusted transfers, they should include transparent provisions clarifying what protections will be afforded to the transferred data.

The same applies with respect to transfers of NPD between governments, which includes customs and border agencies. Key TFA provisions that facilitate NPD flows include Article 1, which requires members to publish and ensure easy access to customs procedures and trade-related regulations, and Article 7, which sets out procedures for the electronic processing of customs documents and promotes the use of NPD to expedite goods clearance. Article 10 further encourages the smooth exchange of data to complete import, export, and transit formalities, while Article 12 focuses on international co-operation between customs authorities, ensuring the secure exchange of information while maintaining confidentiality. Outside digital trade chapters in RTAs, there are many provisions in trade agreements which encourage or mandate sharing of NPD between Parties, including throughout customs co-operation chapters.

### 3.5. What are the benefits of *going paperless*?

Understanding the role that different *going paperless* policies can play in enhancing trade can help inform policy discussions. Existing empirical analysis has largely focused on the impact of specific elements of this evolving landscape.<sup>6</sup> For instance, (Carballo et al., 2022<sub>[10]</sub>) estimate the effects of the electronic Single Window in Costa Rica utilising highly disaggregated firm-level export data and taking advantage of gradual phase-in of the system across groups of products; the system is estimated to have increased exports by 56%. (OECD, 2023<sub>[11]</sub>) estimates that automation of border processes, supported by the implementation of the WTO TFA, has contributed to reducing trade costs and enhancing trade since the Agreement's conclusion in 2013 and entry into force in 2017. UNESCAP (2023<sub>[4]</sub>) estimates that a 10% increase in the implementation of reforms relating to paperless trade covered by CPTA is associated to a 0.8% reduction in trade costs. Drawing on information from the UN Digital and Sustainable Global Trade Facilitation Survey (Duval and Utoktham, 2024<sub>[12]</sub>) show that digitalising trade documents and processes in several areas beyond the TFA – such as laws and regulations for electronic transactions, electronic exchange of certificates of origin, or electronic exchange of SPS certificates – could increase global trade flows by approximately 8%.

This section aims to provide a more comprehensive and holistic analysis of the impact of different regulatory reforms on trade. Using a structural gravity model of trade (Box 2), policy indicators covering aspects of border processes, frameworks for conducting transactions electronically and the cross-border exchange of data (described in Sections 3.1-3.4), are introduced with a view to quantifying their impact on trade. The USITC ITPD-E gravity database is used to enable greater coverage of economies at different levels of development, while incorporating both domestic and international trade flows in the gravity model (see Annex A for details on the econometric specifications).

---

<sup>6</sup> Existing analysis shows that elements of paperless trade have significant potential to reduce trade costs.

## Box 2. Using the structural gravity model for trade analysis

The gravity model has become the workhorse for international trade analysis. Since its first use in (Tinbergen, 1962<sub>[13]</sub>), the gravity model has been the subject of numerous theoretical underpinnings, most notably by (Anderson, 1979<sub>[14]</sub>), (Eaton and Kortum, 2002<sub>[15]</sub>), (Anderson and Van Wincoop, 2004<sub>[16]</sub>) and (Arkolakis, Costinot and Rodriguez-Clare, 2012<sub>[17]</sub>) (see also (Head and Mayer, 2014<sub>[18]</sub>), (Yotov et al., 2016<sub>[19]</sub>), (Yotov, 2022<sub>[20]</sub>) for a summary of the literature). These theoretically derived underpinnings are collectively referred to as the structural gravity model.

At its most basic, the gravity model stipulates that trade between two countries is proportionate to their economic mass, measured as their share in world GDP, and a set of trade costs, some of which are bilateral, such as distance or specific trade policies, and others multilateral, such as how remote an economy is from others (measured by multilateral resistance).<sup>1</sup>

A number of important lessons have emerged from the empirical application of structural gravity models. The early literature, motivated by theoretical underpinnings, underscored the importance of exporter-year and importer-year fixed effects to control for multilateral resistances, and where possible country-pair fixed effects (to control for time invariant and unobservable trade costs between country pairs). Later, emphasis was placed on the use of Poisson Pseudo-Maximum-Likelihood (PPML) estimators to account for heteroscedasticity<sup>2</sup> and zero trade flows (Santos Silva and Tenreyro, 2006<sub>[21]</sub>). More recently, focus has shifted towards the use of theory-consistent ‘domestic trade flows’ in the estimation process (see Yotov et al. (2016<sub>[19]</sub>)).<sup>3</sup>

### Notes

1. Multilateral trade resistance refers to the barriers to trade that each country faces with all its trading partners.
2. If the error terms in the usual log linear specification of the gravity equation are heteroscedastic, this violates the assumption that they are statistically independent of the regressors (i.e. dependent variables used) and suggests that the estimation method leads to inconsistent estimates of the elasticities of interest.
3. Domestic trade flows are important for a number of reasons [see Borchert et al. (2022<sub>[22]</sub>), Yotov (2012<sub>[23]</sub>), Yotov (2022<sub>[20]</sub>)]. They provide solutions to the “missing globalisation puzzle”, which refers to the surprising finding that the volume of trade has become increasingly sensitive to distance. They also enable estimating the importance of international trade relative to domestic trade.

Digitalising border processes is found to matter across all sectors of the economy. First, the results emphasise that the impact of trade facilitation policies is higher not only when digitalisation of border processes is undertaken together with simplification of documentary requirements, but mostly when the underlying trade processes are streamlined and border agency co-operation is also enhanced. A 10% global improvement in the TFI average performance in these four areas<sup>7</sup> is associated to an increase in global exports of 18% (Figure 11). This indicates that there is an exponential leap in the value of digitalisation when border processes are streamlined first.

Second, there is also a strong case for domestic regulatory reform to enhance the effects of *going paperless* on export competitiveness. Controlling for reforms in the automation and streamlining of documents and border processes as captured by the TFIs, a 0.1-point reduction in the global DSTRI for electronic transaction frameworks, e-payments and

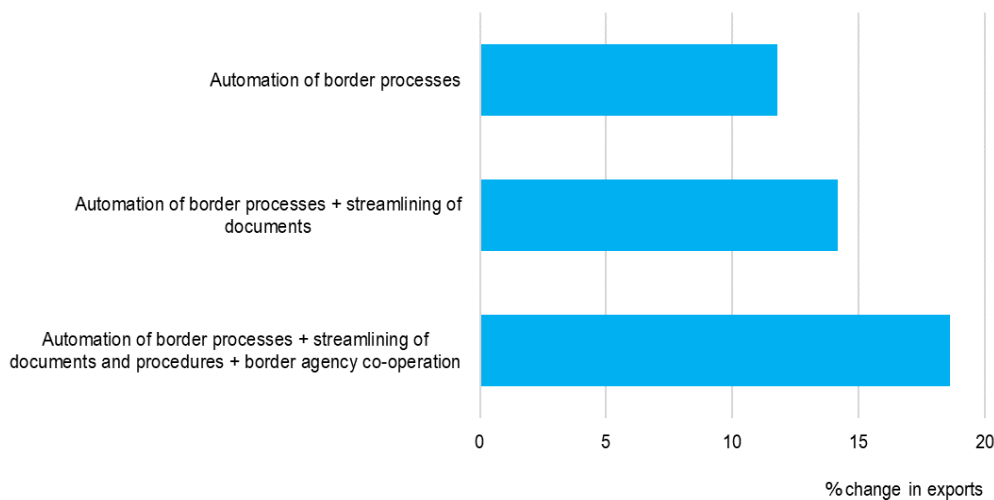
<sup>7</sup> Equivalent to the average global improvement during 2019-22.

connectivity – which depicts important domestic regulatory reforms<sup>8</sup> - is associated with an increase in global exports of 37%.

Third, the results show that the international regulatory landscape in areas supporting electronic transactions, trust, and cross-border data flows also matters,<sup>9</sup> given the important role of international co-operation in reducing frictions from regulatory differences. Against a backdrop of growing domestic barriers to digital trade, engagement in international regulatory co-operation on digital trade-related issues will also help advance the areas that underpin *going paperless*.

### Figure 11. Digitalising border processes and trade documents has an important effect on exports, with additional gains where documents and processes are streamlined

Impacts from a 10% improvement in the TFIs, by areas (%)



Note: The TFIs indicators are interacted with a border dummy. The specification including automation of border processes, streamlining of documents and procedures, and border agency co-operation also controls for the levels of DSTRI and INDIGO.

Source: Own calculations based on results in Table A B.1.

The results underscore that the regulatory environment underpinning digitalisation of trade facilitation at the border is increasingly important for the broader regulatory environment for digital trade. This highlights the importance of an enabling environment for *going paperless* across all types of documents and processes.

<sup>8</sup> A 0.1-point change in the DSTRI can entail an important regulatory reform. For comparison, a 0.08 decrease captures a move from a more to a less restrictive approach to data transfers.

<sup>9</sup> Analysis using the bilateral INDIGO-t to capture international trade-related discussions affecting digital trade (as constructed in TAD/TC/WP(2024)8/FINAL) highlights that, while controlling for selected TFIs and DSTRI elements, a 10% increase in the indicator is associated with an export increase of 7.3%. This also entails important reforms, as a successful completion of the JSI discussions would increase digital trade integration and openness by 52% (INDIGO-t would go from 0.085 to 0.129) (see TAD/TC/WP(2024)8/FINAL for further details).

## 4. How can discussions in international fora advance the regulatory environment for *going paperless*?

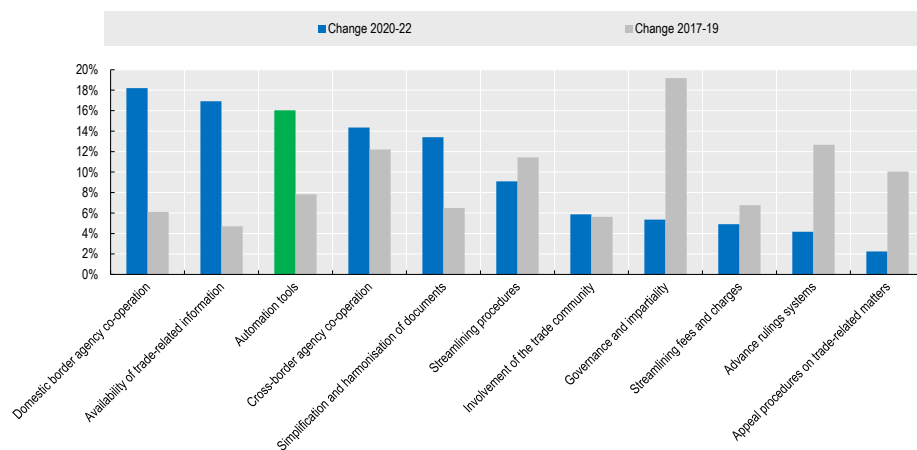
International discussions on issues that matter for *going paperless* are ongoing across different fora. This includes multilateral and plurilateral initiatives; trade agreements; regional and international organisations; and private sector led initiatives. Understanding who is doing what and where is key to understanding the complex environment in which *going paperless* needs to be implemented.

### 4.1. Multilateral and plurilateral discussions

At the **multilateral** level, the implementation of the WTO TFA has spearheaded, since its entry into force in 2017, important reforms in many areas relevant for *going paperless*. These include aspects of automating administrative procedures at the border, such as automatic pre-arrival processing of information, trade Single Windows, electronic payment of duties, taxes, fees, and charges, or electronic copies of supporting trade documents. The WTO Committee on Trade Facilitation (CTF) is increasingly exploring the linkages between the TFA and digitalisation.<sup>10</sup> As highlighted by the OECD TFIs, automation of border processes is among the top 3 areas of reforms since COVID-19 (Figure 12). However, capacities in adopting and operationalising such digital tools differ significantly across countries at varying levels of development (OECD, 2023<sup>[11]</sup>).

**Figure 12. Progress on automation has been one of the key areas of trade facilitation reform**

Improvement by TFI area (%)



Note: The 11 TFIs range from 0 to 2, where 2 is the best performance that can be achieved.  
Source: OECD TFIs database, 2023.

<sup>10</sup> Most recently, at a session for capital-based officials on the margins of the WTO CTF in October 2023 and experience sharing during the WTO CTF in April 2024.

In addition, important discussions on advancing digital tools for trade facilitation are taking place in the context of the WTO E-commerce Work Programme and, at the **plurilateral** level in the JI on E-commerce.<sup>11</sup> The “stabilised text”, which was published in July 2024 (Box 3), covers electronic transaction frameworks, electronic authentication and electronic signatures, electronic contracts, electronic invoicing, paperless trading, Single Window data exchange and system interoperability, and electronic payments<sup>12</sup>. Other areas focusing on trust and e-commerce, such as online consumer protection, personal data protection, and cybersecurity, are also relevant for the *going paperless* ecosystem.

### Box 3. Elements of the WTO Agreement on E-commerce underpinning *going paperless*

The stabilised text of the Joint Statement Initiative (JSI) on Electronic Commerce includes specific provisions aimed at facilitating trade in the digital era. This is achieved by not only aiming to enhance the efficiency of the border process through digital tools and reducing reliance on physical documentation in international trade, but also through various important elements supporting electronic transaction, openness and trust.

Section B on Enabling e-commerce includes Article 8 on Paperless trading and Article 9 on Single Windows data exchange and system interoperability. In addition, it includes Article 4 on Electronic transaction frameworks, Article 5 on Electronic authentication and electronic signatures, Article 6 on Electronic contracts, Article 7 on Electronic invoicing, and Article 10 on Electronic payments.

Other relevant articles include Article 13 on Access to and use of the Internet for Electronic Commerce in Section C on Openness and Electronic Commerce, as well as Article 16 on Personal data protection and Article 17 on Cybersecurity in Section D on Trust and Electronic Commerce.

Source: The statement and the stabilised text of an Agreement on Electronic Commerce are available at [INF/ECOM/87](https://www.wto.org/english/press/p/20240716_electronic_trade_facilitation_agreement.htm).

## 4.2. Trade agreements and new Digital Economy Agreements

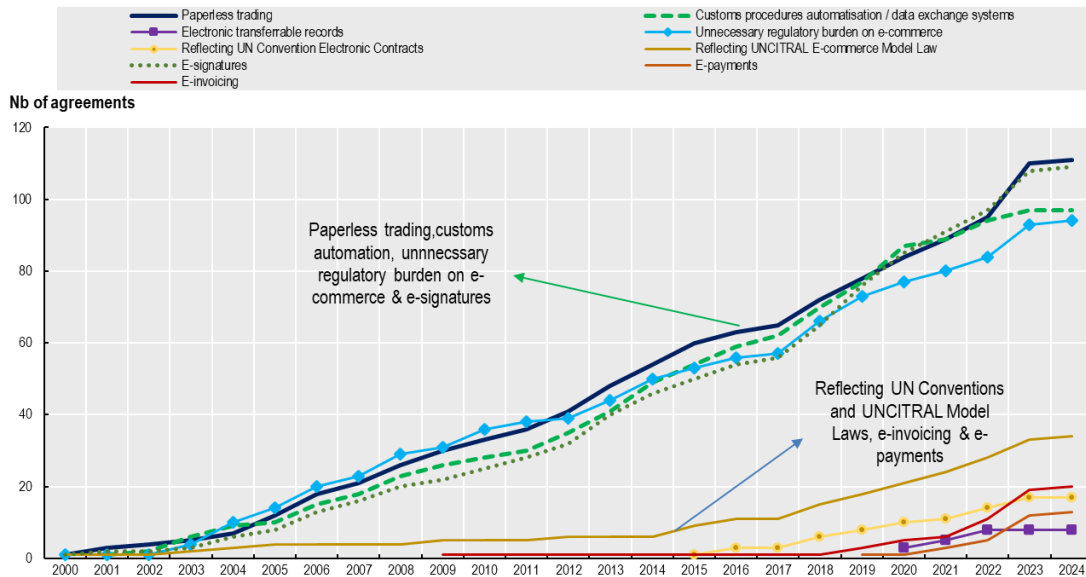
Digital trade provisions in trade agreements increasingly capture a wide array of issues that are critical for *going paperless*. There are almost 100 agreements with digital trade facilitation provisions (paperless trading and customs automation) (Burri, Vasquez Callo-Müller and Kugler, 2024<sup>[24]</sup>) (Figure 13). These are generally accompanied by provisions related to avoiding unnecessary regulatory burdens on e-commerce, e-authentication, and e-signatures. Three-quarters of agreements with digital trade facilitation provisions also include provisions covering data protection and privacy, while 31% of such agreements contain provisions on data flows in an e-commerce chapter (Figure 14).

<sup>11</sup> In March 2023, WTO members exchanged on national practices to facilitate trade and electronic transactions ([https://www.wto.org/english/news\\_e/news23\\_e/ecom\\_16may23\\_e.htm](https://www.wto.org/english/news_e/news23_e/ecom_16may23_e.htm)).

<sup>12</sup> These reflect a mix of hard and soft commitments.

**Figure 13. There is an increasing coverage of going paperless elements in trade and digital agreements**

Number of agreements where such areas are included



*Note:* The figure shows the number of agreements signed by year which contain a provision in the specific categories highlighted (paperless trading; customs automation; electronic transferrable records; unnecessary burden to e-commerce; consistency with UN Convention on electronic contracts; consistency with UNCITRAL Model Law on E-commerce; e-authentication and e-signatures; e-payments; and e-invoicing).

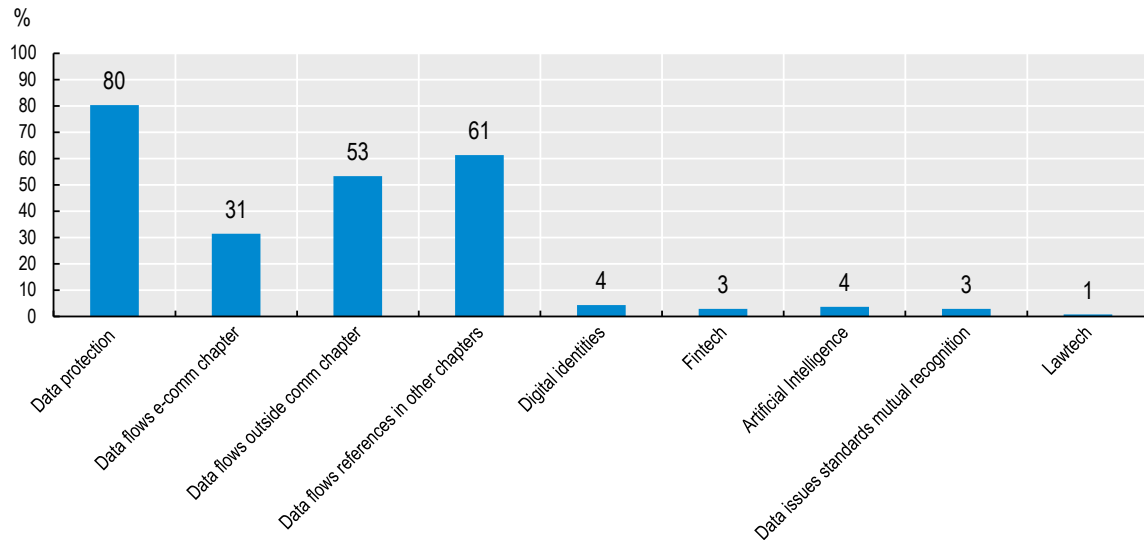
*Source:* Authors' calculations based on TAPED database (November 2024 version) (Burri, Vasquez Callo-Müller and Kugler, 2024<sup>[24]</sup>).

Other elements such as consistency with UN Conventions or UNCITRAL Model Laws for e-commerce and electronic transferrable records, e-invoicing, and e-payments, are covered albeit in a much smaller number of agreements (Figure 13). That said, countries are increasingly implementing domestic regulation that is consistent with these model laws and conventions. Moreover, the number of agreements covering these aspects has been increasing in recent years, largely due to the conclusion of broader digital trade agreements and digital economy agreements. The same is true for provisions on digital identities, artificial intelligence, or mutual recognition for data standards issues (Figure 14). However, most of these provisions are non-binding and focus on co-operation efforts seeking to promote shared values and continued dialogue.

New types of bilateral partnerships supporting paperless trade are also emerging. This includes, for instance, the European Union – Singapore Digital Partnership (concluded in February 2023) or the European Union – Japan Digital Trade Principles (concluded in June 2023). Both aim to facilitate trade through digital tools, including by work on joint projects, such as on paperless trading, electronic invoicing, electronic payments, and electronic transactions frameworks.

### Figure 14. Data flows as well as new digital economy issues in trade agreements can also play a role for *going paperless*

Share of agreements containing data flows provisions in all agreements with digital trade facilitation provisions (%)



Note: The chart includes trade agreements, digital trade agreements and digital economy agreements.

Source: Authors' calculations based on TAPED database (November 2024 version), (Burri, Vasquez Callo-Müller and Kugler, 2024<sup>[24]</sup>).

### 4.3. Regional fora

Endeavours to support *going paperless* are also taking place across various regional fora. For instance, in the *Asia-Pacific* region:

- The Framework Agreement on Facilitation of Cross-border Paperless Trade in Asia and the Pacific (CPTA) entered into force in February 2021 and is aimed at accelerating the implementation of digital trade facilitation measures for trade and development.<sup>13</sup> The CPTA includes a particular focus on cross-border mutual recognition of trade-related data and documents in electronic format.
- Within the Asia-Pacific Economic Co-operation (APEC), the *Guidelines for Paperless Trade*<sup>14</sup> issued by the Sub-Committee on Customs Procedures (SCCP) in November 2021 focus on the implementation of trade Single Windows and the data standards and border agency co-operation behind these, as well as on the digital tools that can support streamlining of border processes.<sup>15</sup>

<sup>13</sup> More information available at: <https://www.unescap.org/projects/cpta> .

<sup>14</sup> <https://www.apec.org/publications/2021/11/guidelines-for-paperless-trade>

<sup>15</sup> These include the following: electronic documents; accepting electronic certificates; submitting electronic import, export and/or transit declarations; risk assessment using post clearance audit; submitting electronic inward cargo report (air and sea); electronic application and issuance of import and export permits and licences; electronic payment for duties, taxes, fees, and charges collected by customs incurred upon importation and exportation; and electronic pre-arrival processing.

- The APEC *Guidelines* also focus on how legal frameworks for paperless trade need to be flexible, in that “economies should design regulatory regimes that are technology-neutral and flexible” and “should consider taking a principles-based approach to the legislative framework that enables border processes to respond quickly and efficiently to changes in the trade environment to enable paperless trade.”
- While the 2021 APEC *Guidelines* do not cover the issue of interoperability, a further [Analysis and Pathway for Paperless Trade Report](#) released by the APEC SCCP in March 2022 acknowledges the role and challenges of Single Window interoperability in facilitating trade. The APEC Committee on Trade and Investment (CTI) also adopted in May 2023 the [Principles for the Interoperability of Electronic Invoicing Systems in the APEC Region](#).
- In 2024, the APEC CTI undertook work on the legal gaps in APEC economies of adopting or maintaining a legal framework that considers the UNCITRAL MLETR. The analysis highlights that differences in the legal recognition of electronic documents among APEC economies are among the biggest barriers to wider use of electronic trade documentation in the region.<sup>16</sup>
- In other regional initiatives, such as the Indo-Pacific Economic Framework for Prosperity (IPEF) Supply Chain Agreement concluded in May 2023, digital tools for trade facilitation gained prominence in their potential to “make supply chains more resilient, efficient, transparent, diversified, secure, and inclusive”. The Supply Chain Agreement refers to the importance of the digitalisation of ports and upgrading the digital infrastructure. It also encourages the “development and adoption of digital standards and frameworks that support information technology interoperability and data flows among freight and logistics enterprises to enhance efficiency, transparency, and security.”<sup>17</sup>

In the ASEAN region, the negotiations to upgrade the ASEAN Trade in Goods Agreement (ATIGA) launched in March 2022 aim to further simplify the rules of origin for goods, expand the adoption of trade technologies and paperless documents, and harmonise technical regulations and standards. In addition, ASEAN also launched negotiations for the ASEAN Digital Economy Framework Agreement (DEFA) in September 2023, aiming to foster greater digital co-operation and pave the way for regional digital integration. DEFA discussions are also focusing on cross-border paperless trade, including interoperable Single Windows, expedited customs processes, and streamlined government documents, as well as facilitation for cross-border small shipments, data protection and privacy, digital identity and authentication, and digital payment and e-invoicing.

In *Central America*, the Secretariat for Central American Economic Integration (SIECA) and the Central American Integration System (SICA) launched in November 2023 the Central American Digital Trade Platform (PDCC). PDCC is a tool that aims to streamline trade processes within and outside the region and facilitate paperwork. Through the exchange of information, mutual recognition, and interoperability of national systems of

---

<sup>16</sup> [A Path to Paperless Trade: Analysing the Legal Gaps and Economic Benefit of Adopting or Maintaining a Legal Framework that Takes into Account the UNCITRAL Model Law on Electronic Transferable Records \(MLETR\)](#), February 2025.

<sup>17</sup> <https://www.commerce.gov/sites/default/files/2023-09/2023-09-07-IPEF-Pillar-II-Final-Text-Public-Release.pdf>

the Foreign Trade Single Windows, Customs, Migration, and Ministries of Agriculture, PDCC has the objective to serve as a centralised point for conducting trade transactions.

#### 4.4. Other international fora

Important progress has also been achieved in international fora such as G7 and G20. The *G7 Digital Trade Principles*<sup>18</sup> adopted in 2021 under the United Kingdom Presidency include a section on “digital trading systems”, which focuses on the role of digital trade facilitation tools across the entirety of supply chains:

- the digitisation of trade-related documents, including through means of addressing legal, technical, and commercial barriers to the digitisation of paper processes. In 2022, the G7 also endorsed under Germany’s presidency the “Principles for domestic legal frameworks to promote the use of electronic transferable records”;
- the use of government digital systems to facilitate the flow of goods along the entirety of the supply chain; and
- that trade Single Windows, developed around common standards with interoperability as a key goal, should streamline stakeholder interactions with border agencies.

Adopted during India’s 2023 Presidency, the *G20 High-Level Principles (HLPs) on Digitalization of Trade Documents*<sup>19</sup> form an Annex to the Outcome document & Chair’s Summary from the 2023 **G20** Trade and Investment Ministers Meeting.<sup>20</sup> Recognising the challenges and opportunities from the digitisation of trade documents and processes to facilitate their exchange, the G20 HLPs aim to serve as a guide for a successful transition towards a more efficient and accessible use of digital technology supporting trade-related documents. The ten HLPs focus on commercial trade documents and cover aspects of neutrality, security, trust, interoperability, data privacy, reliability, voluntary sharing of data, collaboration, scalability, and traceability (see Annex C for the detailed HLPs).

#### 4.5. Domestic initiatives

Supported by efforts at multilateral and regional levels, initiatives at enhancing paperless trade are also advancing at the national level. Examples include:

---

<sup>18</sup> <https://www.gov.uk/government/news/g7-trade-ministers-digital-trade-principles>

<sup>19</sup> The OECD was a knowledge partner together with the Indian Institute for Foreign Trade (IIFT) and UN ESCAP in support of the 2023 G20 Indian Presidency Trade and Investment Working Group ‘Logistics for Trade’ pillar.

<sup>20</sup> Available at:

[https://www.g20.org/content/dam/gtwenty/gtwenty\\_new/document/G20\\_Trade\\_and\\_Investment\\_Ministers\\_Meeting.pdf](https://www.g20.org/content/dam/gtwenty/gtwenty_new/document/G20_Trade_and_Investment_Ministers_Meeting.pdf). The Trade Documents covered by the Principles relate to international commercial transactions pertaining to transport, payments, insurance, storage, and related logistics services; the principles do not necessarily apply to government documents issued, controlled or required by a government authority for cross-border trade.

- The European Union Single Window Environment for Customs adopted in European Union law in December 2022 and the proposed European Union Customs Data Hub<sup>21</sup> to be implemented on a phased basis from 2028;
- The digital solutions under the United Kingdom's 2025 Border Target Operating Model and Ecosystem of Trust pilots (see Annex D for further details);
- Korea's e-Trade Facilitation Center;
- The US Customs and Border Protection interoperability standards test of September 2023 for supply chain transparency;
- Simplifying Australia's trade system through a whole-of-government approach to paperless trade reforms (see Annex D for further details);
- Israel's Global Gate System integrates relevant border agencies, the Standards Institution, transportation companies, ports, warehouses, and the postal service. The system connects relevant agencies to a single database and includes a digital signature component through the Smart Card authentication for traders.

#### 4.6. Private sector initiatives

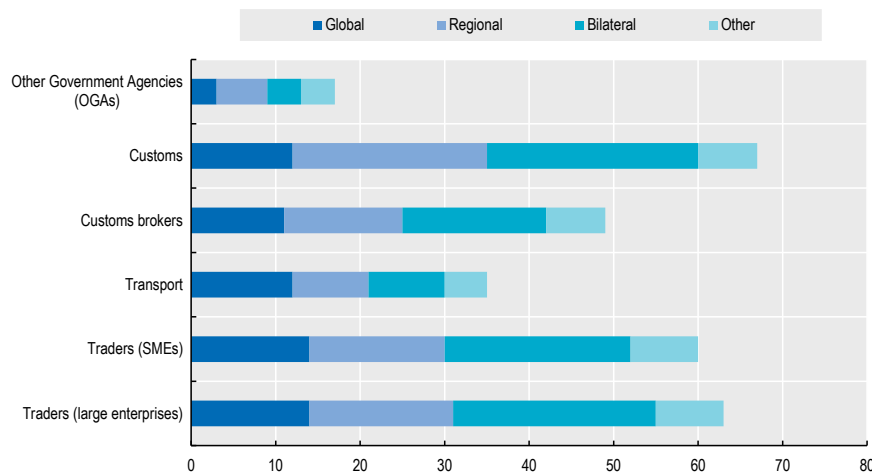
In parallel to government-led initiatives, private sector initiatives are developing at a fast pace (Figure 15). These particularly concern the digital exchange of commercial documents, such as the electronic bills of lading (eBL). Initiatives focus on the use of specific technology for creating, transferring and processing documents (e.g. CargoX blockchain technology), on standardisation (e.g. ICC Digital Standards Initiative, other private sector associations), on the connection of private and public actors by adapting to existing systems (e.g. Trade Logistics Information Pipeline), and on leveraging new technologies to streamline processes and enhance efficiency (e.g. World Economic Forum TradeTech Global initiative).

---

<sup>21</sup> The Customs Data Hub would function as the primary online platform where importers will record detailed information about their products and their supply chains. The new data hub aims to provide customs authorities with an all-encompassing view of the movements of goods and their associated supply chains. National Customs Authorities will continue to carry out national risk analysis and management, however, control recommendations will be issued by the European Union Customs Data Hub.

**Figure 15. A wide range of stakeholders are involved in paperless trade initiatives**

Number of initiatives recorded



Source: Based on ESCAP - ICC Digital Standards Initiatives, *Cross-border Paperless Trade Database 2024*.

Discussions around standards for facilitating the electronic exchange of such documents are taking place across various private sector associations<sup>22</sup> covering different modes of transport, particularly maritime transport, where the reported use of electronic documents is estimated to be much lower than in air transport. For instance, the Future of International Trade (FIT) Alliance was formed in February 2022 by BIMCO, Digital Container Shipping Association (DCSA), the International Federation of Freight Forwarders Associations (FIATA), ICC and the Society for Worldwide Interbank Financial Telecommunications (SWIFT)<sup>23</sup> with the objective to raise awareness and accelerate adoption of a standards-based electronic bill of lading across all sectors of the shipping industry.<sup>24</sup>

Other private sector initiatives such as the ICC Digital Standards Initiative have focused on mapping the data elements and standards used across key trade documents to further

<sup>22</sup> [https://www.fit-alliance.org/files/ugd/bb00df\\_e767d452142c4ca7adc6c9e7cced2120.pdf](https://www.fit-alliance.org/files/ugd/bb00df_e767d452142c4ca7adc6c9e7cced2120.pdf). Through BIMCO's "25 by 25 Pledge" and DCSA's "100% eBL by 2030" initiative, some of the world's largest bulk shippers and 9 of the top 10 ocean carriers had already committed to switch their B/Ls to eBLs within two to seven years. 26 of FIATA's Association members have adopted the eFBL (electronic FIATA bill of lading) and have begun to distribute it to their members.

<sup>23</sup> BIMCO is largest largest direct-membership organisation for shipowners, charterers, shipbrokers and agents, covering 62% of the global fleet and consisting of over 2 000 local, global, small, and large companies in 130 countries. The DCSA was founded in April 2019 by 9 global carriers (MSC, Maersk, CMA CGM, Hapag-Lloyd, ONE, Evergreen, Yang Ming, HMM and ZIM) to establish IT standards that would enable interoperability of technology solutions across the industry. The FIATA International Federation of Freight Forwarders Associations is a non-governmental organisation representing freight forwarders worldwide. SWIFT is a cooperative established in 1973 in Belgium and owned by the banks and other member firms that use its service; it provides the main messaging network through which international payments are initiated.

<sup>24</sup> Available estimates highlight that 1.2% of bills of lading in maritime transport issued (<https://safety4sea.com/hapag-lloyd-commits-to-full-adoption-of-e-bills-of-lading-by-2030/>) are electronic compared to 68% for bills of lading in air transport (<https://dcsa.org/wp-content/uploads/2020/05/20200519-DCSA-taking-on-eBL.pdf>).

promote interoperability. Of 36 documents analysed (Table 2) by the ICC DSI (ICC DSI, 2024<sup>[7]</sup>):

- 21 already have standardised electronic versions. While there are instances of multiple electronic versions of documents, these versions show high semantic and technical interoperability, meaning that multiple versions of documents should not preclude their alignment across systems, platforms, and databases.
- 6 documents have multiple standards of electronic representation, where these standards do not exhibit signs of semantic or technical interoperability at either a document or data level.
- 9 documents are in early stages of standards development, implying that the bulk of the work on standardisation remains to be done.

**Table 2. Amount of standardisation of electronic and digital versions of key trade documents**

Category	Documents
Standardised	Commercial Invoice; Bill of Lading; Sea Waybill; Ship's Delivery Order; Air Waybill; Sea Cargo Manifest; Air Cargo Manifest; Rail Consignment Note; Consignment Security Declaration; Non-preferential Certificates of Origin; Customs Declaration; CODEX Generic Model Official Certificate; Phytosanitary certificate; CITES permit/ certificate; ATA Carnet; TIR Carnet; Transit Accompanying Document; Administrative Documents used in the Excise Movement Control System; Payment Confirmation; Bill of Exchange; Promissory Note
Standards exist, but without interoperability	Purchase Order; Shipper's Letter of Instruction; Packing List; Certificate of Inspection for Organic Products; Advanced Ruling Application; Letter of Credit
Early-stage standardisation	Road Consignment Note; Cargo Insurance Document; Warehouse Receipt; International Veterinary Certificate; Dangerous Goods Declaration; Customs Bond; Export/ Import License for agricultural products; Excise Guarantee; Preferential Certificates of Origin

Source: ICC DSI (2024<sup>[7]</sup>).

The IOTA Foundation<sup>25</sup>, TradeMark Africa, the World Economic Forum, the Tony Blair Institute for Global Change, the Institute of Export and International Trade, and the Global Alliance for Trade Facilitation signed a Collaboration Agreement in February 2024 setting up the Trade Logistics Information Pipeline (TLIP)<sup>26</sup>. TLIP aims to enable data to be transmitted directly from its source with no third-party involvement and shared seamlessly, securely and at little to no cost. It provides back-end connections to allow border agencies to share information without introducing new work processes. The front end allows different actors (agencies, traders, transporters, etc.) to upload typical trade documentation such as the certificate of origin, the phytosanitary certificate, packing list or commercial invoice. TLIP is currently being tested for selected trade lanes and commodities such as flowers, fish, tea and textiles.

<sup>25</sup> IOTA is an open-source distributed ledger.

<sup>26</sup> See <https://www.tlip.io/what-is>.

## 5. Going paperless tomorrow: Emerging challenges

Progress across areas that are key for *going paperless* today will become even more important as countries and firms face the challenges of tomorrow, notably rising sustainability-related requirements.

### 5.1. New sustainability-related requirements are rapidly emerging

Sustainability requirements have, to date, been largely voluntary, with a growing number of businesses choosing to track environment and social sustainability along the supply chain to attract consumers and investors. However, new initiatives requiring mandatory reporting are underway (Table 3) (OECD-BIAC-WEF, 2023<sup>[25]</sup>) (Jaax and van Lieshout, forthcoming 2025<sup>[26]</sup>).<sup>27</sup> This “fast and furious” change in the regulatory landscape (Deconinck, Jansen and Barisone, 2023<sup>[27]</sup>) raises a number of new challenges, not least in the context of demonstrating compliance at the border.<sup>28</sup> When enforcing sustainability requirements on imports, a key issue is that checking compliance cannot be done by physically inspecting or testing the imported goods. It requires information about how the product was processed or produced abroad (Pauwelyn, 2024<sup>[28]</sup>).

---

<sup>27</sup> Measures covered by trade agreements (e.g., conditional market access based on environmental or social sustainability criteria) are outside the scope of the analysis here.

<sup>28</sup> However, bilateral agreements focused on green transition issues are also starting to incorporate elements of digitalisation in support of environmentally sustainable trade. For instance, the principles of green economy co-operation in the Australia-Singapore Green Economy Agreement include the identification of “green economy-related trade facilitation initiatives, including through digitalisation (...), paperless trade and relevant work conducted under the Singapore-Australia Digital Economy Agreement”.

**Table 3. Examples of mandatory sustainability initiatives and their link to what happens at the border**

Initiative	Description	Triggers enforcement at the border
Australia bill banning imports made using forced labour (2021)	Import ban on products made using forced labour, enforced by customs.	Yes
US Customs and Border Protection Forced Labour Trade Law (2022)	United States CBP identifies products made using forced labour and prevents them from entering the United States.	Yes
Canada BILL S-211 (2023)	Act to enact the Fighting Against Forced Labour and Child Labour in Supply Chains Act and to amend the Customs Tariff.	Yes
Mexico Forced Labour Law (2023)	Implements the obligation included in the USMCA to prohibit the importation of goods produced in whole or in part by forced or compulsory labor, including forced or compulsory child labour.	Yes
European Union ban on products made with forced labour (2024)	National authorities or, if third countries are involved, the European Union Commission, will investigate suspected use of forced labour in companies' supply chains. If the investigation concludes that forced labour has been used, the authorities can demand that relevant goods be withdrawn from the European Union market and online marketplaces, and confiscated at the borders. The goods would then have to be donated, recycled or destroyed. Goods of strategic or critical importance for the European Union may be withheld until the company eliminates forced labour from its supply chains.	Yes
European Union Corporate Sustainability Reporting Directive (2023)	Applies to large firms, listed SMEs and non-European Union firms with a large presence in the European Union. Firms need to report in line with the European Sustainability Reporting Standards.	No
United Kingdom Environment Act (2025)	Focuses on illegal deforestation in producer countries (the definition of which is left for producer countries' legislators to decide). Operators in scope include any large company (including traders) using the commodity in scope in the United Kingdom; with a turnover threshold set at GBP 50 million. Companies that are using 500 tonnes or less of each commodity per year can apply for an exemption from the obligations.	Yes
European Union Deforestation-Free Products Regulation (2023)	Any operator or trader who places commodities such as cattle, wood, cocoa, soy, palm oil, coffee, rubber, and some of their derived products (e.g. leather, chocolate, tyres, or furniture) on the European Union market, or exports from it, must be able to prove that the products do not originate from recently deforested land or have contributed to forest degradation. The extent of due diligence requirements for operators will depend on the level of risk that the country of production represents, although key requirements (e.g. geo-localisation coordinates) will apply to all countries. The European Commission is establishing a benchmarking system assessing countries or parts thereof and their level of risk of deforestation and forest degradation for in-scope commodities.	Yes

Initiative	Description	Triggers enforcement at the border
European Union Carbon Border Adjustment Mechanism (2023)	Requires importers to report on direct and indirect emissions embedded in certain goods imported into the European Union. Following a transition period, importers will have to start paying levies from 1 January 2026 on carbon-intensive imported goods equivalent to those charged to domestic goods under the European Union's Emissions Trading Scheme (ETS). Cement, electricity, fertilisers, iron and steel, aluminium and hydrogen are currently covered, with plans to cover all sectors that fall under the ETS by 2030. For many of the sectors covered by CBAM, the regulation notes the relevant "precursors" (material inputs) whose emissions need to be included in the reported.	Yes
German Act on Corporate Due Diligence Obligations in Supply Chains (2023)	Includes environmental due diligence requirements.	No
Japan Financial Services Agency (FSA) corporate disclosure amendments (2023)	Companies listed on the Tokyo Stock Exchange Prime Market, which includes banks and insurers, must make disclosures based on or equivalent to Task Force on Climate-related Financial Disclosures (TCFD) requirements. Since the end of fiscal year 2023, all listed companies have been required to submit securities reports including a description of their views and initiatives on sustainability. Sustainability disclosure standards are currently being developed by the Sustainability Standards Board of Japan (SSBJ) which will likely be aligned with the International Sustainability Standards Board (ISSB) Standards S1 and S2.	No
European Union Corporate Sustainability Due Diligence Directive (2024)	Requires companies to establish procedures to address environment or human rights harms within their supply chains.	No
European Union Ecodesign for Sustainable Products Regulation (ESPR) (2024)	The Ecodesign for Sustainable Products Regulation (ESPR) features a broad set of requirements for manufacturing products that promote and prioritise sustainability through greater durability, reusability, and circularity. The ESPR includes the Digital Product Passport (DPP), a so-called "data carrier" that must be affixed to all products that fall under ESPR. It may take the form of a QR code, RFID tag, or other form of scannable technology. As required by the ESPR, the DPP will contain a wide range of information about a specific product and its sustainability. This includes a breakdown of materials and where they were sourced; the recycled content incorporated into production; and detailed supply chain mapping. The DPP will be required for 30 product categories, with the implementation timeline from 2026 to 2030 (batteries will be the first product covered in 2026/27, followed by textiles and consumer electronics; other priority sectors include: vehicles, plastics, construction and buildings, furniture, and chemicals). The ESPR involves border checks as part of its enforcement strategy, with a focus on ensuring that only compliant, sustainable products enter the European Union market.	Yes
US Securities and Exchange Commission Enhancement and Standardization of Climate-related Disclosures for Investors (proposed)	Under the current proposal, companies would be required to disclose scope 3 emissions if these are material or if they have set targets.	No

Note: This list of measures is not comprehensive, it serves the purpose of providing emerging examples of regulation and the extent to which these might or might not trigger enforcement at the border.

Source: Drawing on initiatives presented in (OECD-BIAC-WEF, 2023<sup>[25]</sup>) and complemented with additional regulations identified.

Mandatory sustainability-related requirements vary in nature, targeting different objectives, and using different reporting requirements. For some, the point of enforcement is at the border. That is, companies will be required to demonstrate compliance prior to their products being released into the import market. For others, compliance takes place behind the border, for example through annual reports on the businesses and their subsidiaries or suppliers' international operations (Table 3).

Where enforcement takes place at the border, the ability of customs and other border agencies to verify compliance and the costs of meeting requirements by businesses will depend on:

- **The reporting standards.** *What* information needs to be collected and the quality of that information; and
- **The mechanisms to exchange information.** *How* this information is exchanged, including the data elements, documents and technologies that are needed to successfully exchange and verify compliance.

The complexity of emerging sustainability-related reporting standards can vary substantially. For instance, forced labour requirements often use origin as an important filter for determining compliance, with companies producing in higher risk locations generally required to provide evidence that forced labour was not used. In the case of requirements linked to carbon footprint, the information needed can relate to emissions along the entire value chain. In addition to reporting their direct emissions (Scope 1) and indirect emissions from purchased energy (Scope 2), companies are increasingly facing expectations to track emissions from upstream and downstream activities in their value chains (Scope 3). The amount and complexity of data that needs to be reported by traders and verified by relevant authorities varies substantially. Firms with more complex global supply chains are likely to find it more difficult to compile the data needed to meet some of these requirements.

How this information is transmitted from the businesses to the authorities also matters. For example, should Scope 1, Scope 2 and Scope 3 emissions be reported separately or together, should they be reported in tonnes of carbon dioxide equivalent (CO<sub>2</sub>eq) or another measure? Will they be filled out in a form, or will there be a dedicated and secure webpage for this? Who will be able to access this information and how will sensitive data be protected from misuse?

One particularly important challenge that emerges from the proliferation of sustainability standards is that different reporting and exchange of information standards will emerge at different border crossings. To avoid growing fragmentation, which could lead to additive costs of compliance along the supply chain but also to reduced ability of customs and border agencies to effectively enforce and monitor implementation, more **technical and regulatory interoperability** is needed.

**Regulatory interoperability** ensures that there is clarity and commonality in the reporting standards.<sup>29</sup> That is, for example, when dealing with issues of environmental sustainability, that agreement is found on how GHG emissions are to be calculated and that this follows common accounting and reporting standards. In turn, **technical interoperability** enables the reduction of transaction costs and operational inefficiencies. For example, ensuring that there are common guidelines on the data attributes to be exchanged (e.g. the data fields and their format, whether numeric or not) and the technologies used for exchanging these across different sustainability-related requirements. Together regulatory and technical interoperability can enable more trusted and efficient exchange of data across the supply chain leading to lower compliance costs.

## 5.2. Mechanisms for reporting, exchanging and verifying information are increasing

Tools for reporting, exchanging and verifying information on sustainability requirements are being developed in parallel by private and public sectors. These differ in their approaches, scope, and implementation. Several private sector initiatives have been focused on developing digital tools for the sharing of such sustainability-related

---

<sup>29</sup> Developments in methodologies and reporting requirements are described in Deconinck, Jansen and Barisone (2023<sub>[27]</sub>) for agriculture and food and in (OECD IFCMA, 2024<sub>[29]</sub>) for other sectors.

information across value chains. These aim to address the issue of technical interoperability, while also accounting for countries and firms' concerns over data sovereignty and confidentiality. Such tools include, for instance, the Partnership for Carbon Transparency (PACT) Pathfinder Network, Catena-X, or the Together for Sustainability (TfS) data exchange platform. The target group for these initiatives varies, with some having cross-sectoral memberships and an industry-agnostic focus, while others cover specific industries. Furthermore, some initiatives prioritise accessibility by lowering entry barriers to the platform, while others seek to foster trust among participants by setting specific requirements for participation (OECD IFCMA, 2024<sup>[29]</sup>).

- The [PACT Pathfinder Network](#)<sup>30</sup> is an open technical specification enabling the interoperable exchange of emissions data among companies across a wide range of sectors and across diverse technology solutions (e.g. emission accounting software).
- [Catena-X](#) seeks to develop an agile, secure data-sharing platform focusing on the automotive supply chain. It was initiated as a consortium of leading automotive companies, and collaborates with manufacturers, suppliers, and dealers, with a special focus on integrating SMEs. Catena-X adopts a decentralised, peer-to-peer approach for data exchange, similar to the PACT Pathfinder Network. Its technical foundation rests on a data connector that must be installed at each participant's site, serving as a gatekeeper for incoming and outgoing data. Participants can specify the parameters of how and when to share data, with whom and under what conditions. Alongside the technical infrastructure, Catena-X has developed a Governance Framework, which outlines the requirements and responsibilities of participants and sets industry-specific standards, such as carbon footprint methodologies and data attributes. To engage with Catena-X, companies must undergo an audit to ensure compliance with its standards.
- The [TfS data exchange platform](#) enables chemical companies to request detailed information from suppliers about the materials they purchase, particularly data related to the product carbon footprint using the related PCF Guideline. This information, when combined with a company's own data regarding its value creation processes, offers a comprehensive view of the carbon footprint. In support of the platform, TfS has also been developing a Data Model for the reporting of product carbon footprint data and metadata.

Mandatory sustainability requirements also increasingly rely on the development of specific information systems and platforms for the reporting and verification of the information submitted by firms. For instance:

- The European Union Deforestation Regulation includes the Information System, which is the IT system that is foreseen to contain the due diligence statements submitted by operators and traders to comply with the requirements of the Regulation. The statements would provide key information for monitoring, namely the HS code of the product, the quantity, the country of production and the geographical coordinates of the farm or plantation where the commodities covered by the regulation were grown. The European Union Information System is foreseen

---

<sup>30</sup> It was developed as the technological counterpart of the PACT Pathfinder Framework (discussed above) by the World Business Council for Sustainable Development (WBCSD) and the SINE foundation - in collaboration with different stakeholders like technology companies and standard-setting bodies.

to interconnect with national customs IT systems across European Union economies.<sup>31</sup>

- The European Union CBAM relies on the CBAM transitional registry for importers to report the information as part of their CBAM obligations. Access to the registry has to be requested through the CBAM National Competent Authority (NCA) of the European Union Member State in which the importer is established. A report can be submitted by a declarant on behalf of a signatory who certifies that the information is correct. The registry is foreseen to enable communication between the European Commission, NCAs, customs authorities of European Union economies, and reporting declarants. While this provides a centralised electronic registry to streamline data collection and communication, the primary responsibilities of registration and CBAM certificate management are handled by national authorities within each Member State.<sup>32</sup>

The development, in parallel so far, of such private and public platforms entails significant challenges for technical interoperability, in terms of the integration of trade-related documentary requirements, border processes, data exchange, and stakeholders' IT systems.

Lessons from sectors such as agriculture and food, which have been confronted with regulatory and technical interoperability challenges in digitalising the exchange of sanitary and phytosanitary (SPS) certificates, can prove useful for a better understanding of the building blocks for technical interoperability. OECD analysis of SPS e-certificates<sup>33</sup> highlights that overall interoperability rests upon the development and adoption of international standards for the exchange of information, clarifying the role of border agencies, and the set-up of information exchange platforms clearly coordinated with national systems for trade (e.g. Single Windows for trade) (Annex E provides further details) (Deuss and Laget, forthcoming 2025<sub>[30]</sub>).

The implementation of sustainability-related regulations also raises new questions (Figure 16) in the context of the regulatory environment for *going paperless* (Figure 2). This includes questions about what new documents may be needed for *conducting transactions electronically* and whether existing regulatory frameworks allow for these to be exchanged across borders. In terms of *digitalising border processes*, the question might be whether new information needs to be incorporated into existing customs declarations or whether entirely new documents are needed. In the context of *cross-border exchanges of information*, questions arise about how governments will protect commercially sensitive information.

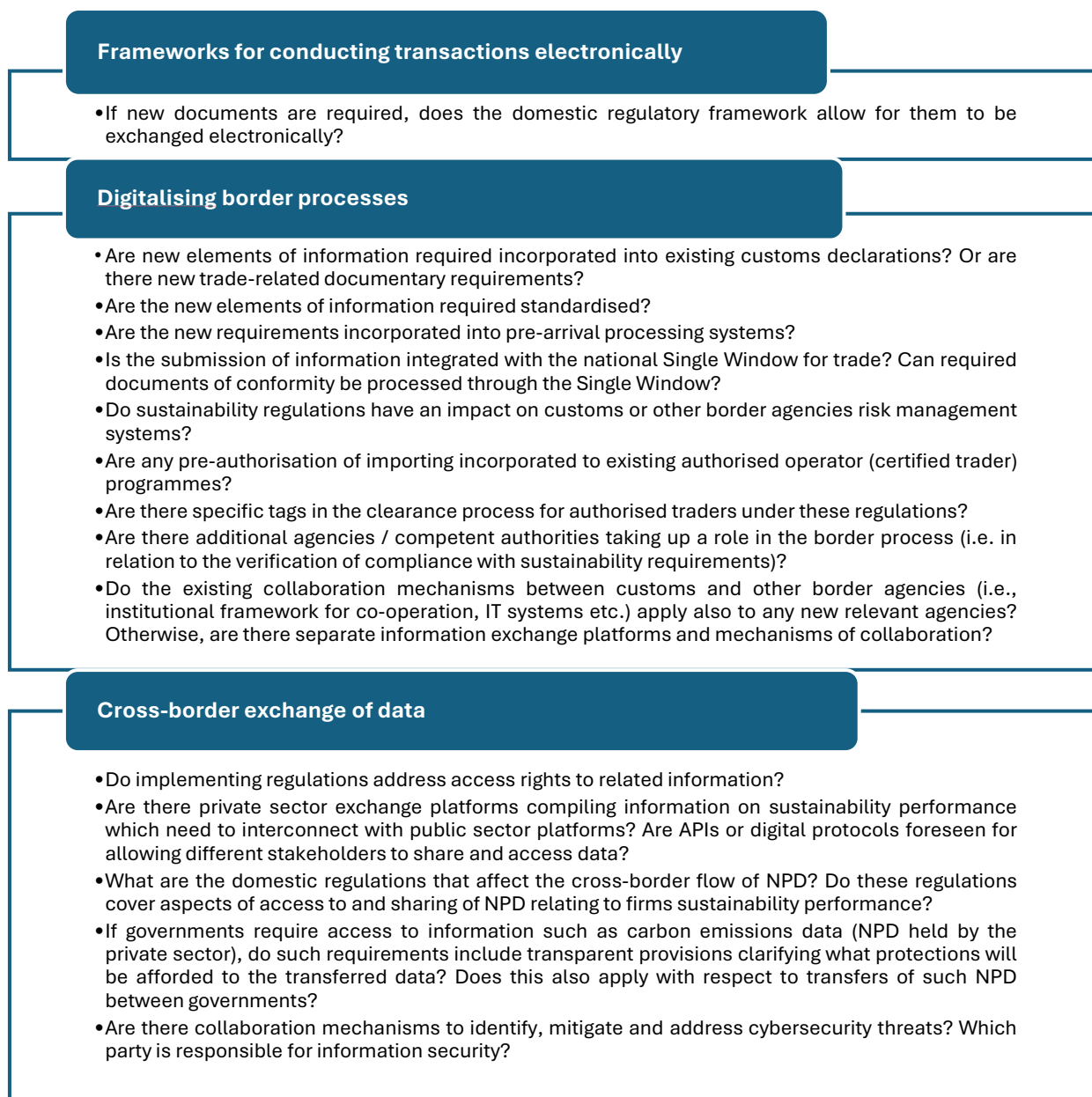
---

<sup>31</sup> European Union Regulation on Deforestation-free Products, January 2025: [https://environment.ec.europa.eu/topics/forests/deforestation/regulation-deforestation-free-products\\_en](https://environment.ec.europa.eu/topics/forests/deforestation/regulation-deforestation-free-products_en)

<sup>32</sup> CBAM implementation guidance, January 2025: [https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism\\_en](https://taxation-customs.ec.europa.eu/carbon-border-adjustment-mechanism_en)

<sup>33</sup> Related work on the role of electronic SPS certificates has been undertaken in the Joint Working Party of Trade and Agriculture (TAD/TC/CA/WP(2023)4/FINAL).

**Figure 16. A checklist of *going paperless* issues raised by new sustainability regulations**



Note: The list is illustrative based on a review of selected regulations in Table 3.

Source: Author's elaboration.

### 5.3. What do we know about how sustainability initiatives can be integrated into going paperless?

The checklist in Figure 16 shows that the *going paperless* policy environment can help create the technical interoperability needed to underpin implementation of sustainability initiatives. In particular for initiatives where compliance is linked to market access, the legislative and operational framework for the sustainability initiative needs to:

- (i) clearly define, in terms of scope, purpose, and procedures, if and where new digital tools, platforms, or documents are needed for the exchange of information,
- (ii) clarify what compliance entails for border processes and how any new compliance procedures will be integrated with the overall trade facilitation ecosystem to minimise risks and disruptions to border clearance.

As the growth in sustainability initiatives linked to market access is a relatively recent and rapidly moving phenomenon, little systematic evaluation is available in terms of practical implementation at- and behind-the-border. With the caveat that guidance on implementation is still work in progress for many of these initiatives, some important insights can be gleaned from an analysis of selected regulations in Table 3.<sup>34</sup>

This analysis reveals that the guidance for implementation of the selected social and environmental sustainability requirements mainly includes aspects relating to the border process and some limited aspects concerning documentary requirements (e.g. documents of conformity, supply chain<sup>35</sup> audits) or platforms for the exchange of information (Figure 17, with more information on the detailed features across these areas is provided in Annex F). Aspects of border agency co-operation appear to be rarely incorporated in the guidance, despite various agencies' links to the clearance process.

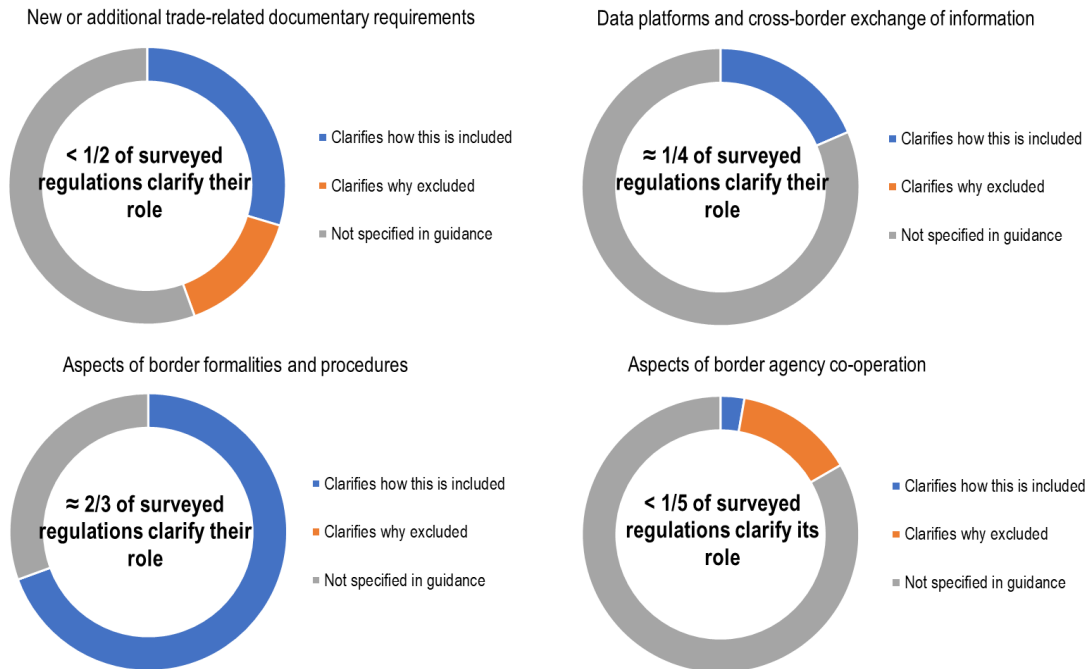
---

<sup>34</sup> This includes the following regulations: [Australia bill banning imports made using forced labour](#) (2021); [United States Customs and Border Protection Forced Labour Trade Law](#) (2022); [Canada BILL S-211 enacting the Fighting Against Forced Labour and Child Labour in Supply Chains Act](#) (2023); [Mexico Forced Labour Law](#) (2023); [European Union ban on products made with forced labour](#) (2024); [United Kingdom Environment Act](#) (2021); [European Union Deforestation-free Products Regulation](#) (2023); [European Union Carbon Border Adjustment Mechanism](#) (2023); [European Union Ecodesign for Sustainable Products Regulation](#) (2024).

<sup>35</sup> Such obligations are sometimes accompanied by descriptions of what is considered part of the supply chain according to the law. But this concept is often left open-ended, potentially covering the firm's entire supply chain, meaning their suppliers, their suppliers' suppliers, and so forth (Jaax and van Lieshout, forthcoming 2025<sub>[26]</sub>).

## Figure 17. The guidance on the relationship to the border process is limited across sustainability regulations

Summary of features, share in selected number of regulations (%)



Note: The chart is based on the following regulations and their available implementation guidance: [Australia bill banning imports made using forced labour](#) (2021); [US Customs and Border Protection Forced Labour Trade Law](#) (2022); [Canada BILL S-211 enacting the Fighting Against Forced Labour and Child Labour in Supply Chains Act](#) (2023); [Mexico Forced Labour Law](#) (2023); [European Union ban on products made with forced labour](#) (2024); [United Kingdom Environment Act](#) (2021); [European Union Deforestation-free Products Regulation](#) (2023); [European Union Carbon Border Adjustment Mechanism](#) (2023); [European Union Ecodesign for Sustainable Products Regulation](#) (2024). Figures in Annex F provide further information on the dimensions covered within each area.

Source: Author's elaboration.

The analysis also shows the complexity of ensuring that any new requirement can benefit from paperless trade. For documentary requirements, implementation guidance generally does not specify whether any new information will need to be integrated into existing customs declarations, nor provide information on specific standards and data formats for any new documentation required (Annex Figure A F.1).

While in many cases the regulations foresee the creation of new platforms for the exchange of information, they do not indicate how this will be integrated with existing national customs and border systems for processing trade-related information (i.e. such as Single Windows or automated customs systems) (Annex Figure A F.3), or whether integration is not required. The mention or introduction across various of the regulations of 'product digital records' or 'traceability systems' emphasises, however, the complex information required from firms to prove compliance. An additional challenge is that the implementation guidance also generally does not address potential linkages with private sector platforms already compiling some (or most) of the relevant information, foregoing potential economies of scale for firms (Annex Figure A F.2).

Similarly, although in many cases (particularly in the case of environmental sustainability) additional agencies with responsibility for managing relevant border processes are key (e.g. designated national competent authorities), the regulations do not explain the specific mechanisms for co-operation with customs and other relevant border agencies in terms of institutional framework, the clearance process, and IT systems (Annex Figure A F.4). The lack of specific mechanisms for domestic border agency co-operation in the implementation of these regulations can also complicate external border agency co-operation and interoperability amongst national Single Windows for trade.

Notwithstanding some important clarifications in implementation guidance and several common features across regulations, the differences highlighted in Annex Figures A F.1-4 underscore the challenge for firms. The lack of regulatory and technical interoperability may be especially burdensome for export-intensive companies operating across multiple jurisdictions, and for smaller firms. This situation is further compounded in developing and low-income countries, which typically have less capacity to address these interoperability challenges compared to developed economies (National Board of Trade Sweden, 2023<sup>[31]</sup>); (OECD IFCMA, 2024<sup>[29]</sup>).

Overall, the analysis highlights the importance of:

- clarifying in implementation guidance the relationship to the border process in terms of documentary requirements, data platforms and cross-border exchange of information, border formalities and procedures, and mechanisms for border agency co-operation.
- enhancing the accessibility and comprehensiveness of the information provided on implementation through online, user-friendly information portals, training and capacity building (for both border officials and trading partners).
- conducting periodic reviews of implementation at the border for more coordination among countries in avoiding regulatory fragmentation and limiting the regulatory burden on firms.

## 6. Key findings and conclusions

This report explores three questions. First, it assessed the specific aspects of the policy environment needed for *going paperless*. Second, it examined the economic benefits of further policy reforms across these areas. Third, it set out the challenges for *going paperless* stemming from new social and environmental sustainability regulations.

Analysis of the policy environment highlights that in supporting the *going paperless* policy environment, the regulatory environment underpinning trade facilitation at the border is increasingly intertwined with the broader regulatory environment for digital trade. Discussions in support of the policy environment are taking place across a wide range of fora.

The report also highlights that the implementation of ambitious reforms across these areas can yield important economic benefits. Automating border processes, when accompanied by streamlining of documents and processes and increased co-operation among border agencies, delivers the greatest trade benefits. A 10% improvement in the TFI score globally for these areas is associated with an increase of up to 18% in global goods exports. In addition, the domestic and international regulatory landscape also matters. Controlling for these reforms, a 0.1-point reduction in the global DSTRI for electronic transaction

frameworks, e-payments and connectivity is associated with an increase in global exports of 37%.

Understanding the role and impacts of these policy areas can also help countries in implementing or managing sustainability-related requirements. The *going paperless* policy environment has an important role to play in supporting technical interoperability when implementing such regulations and can help minimise transaction costs. However, an analysis of selected sustainability regulations reveals that linkages to border processes are often missing from implementation guidance. There is a need for countries that are implementing sustainability-related requirements to clarify for traders and border officials the role of documentary requirements; of data platforms and cross-border exchange of information; of border formalities and procedures; and of border agency co-operation.

## References

- Anderson, J. (1979), “A theoretical foundation for the gravity equation”, *The American Economic Review*, Vol. 69/1, pp. 106-116, <https://www.jstor.org/stable/1802501>. [14]
- Anderson, J. and E. Van Wincoop (2004), “Trade costs”, *Journal of Economic Literature*, Issue 3, Vol. 42, pp. 691-751. [16]
- Arkolakis, C., A. Costinot and A. Rodriguez-Clare (2012), *New trade models, same old gains?*, <https://www.aeaweb.org/articles?id=10.1257/aer.102.1.94>. [17]
- Atkinson, C. (2023), *Unpacking the Digital Transformation of Trade*, <https://www.tradeready.ca/2023/topics/unpacking-the-digital-transformation-of-trade/>. [6]
- Bellucci, C., S. Rubinova and S. Piermartini (2023), *Trade costs, digital connectivity and digital regulation*. [2]
- Borchert, I. et al. (2022), “The International Trade and Production Database for Estimation - Release 2 (ITPD-E-R02)”, *SITC Working Paper 2022-07-A*. [22]
- Burri, M., M. Vasquez Callo-Müller and K. Kugler (2024), *TAPED: Trade Agreement Provisions on Electronic Commerce and Data*, <https://unilu.ch/taped>. [24]
- Carballo, J. et al. (2022), *Trade Policy Meets Digital Technologies: How Digitalization of Trade Procedures Affects Firms’ Exports*, <https://www.freit.org/SETC/2022/selected/graziano.pdf>. [10]
- Deconinck, K., M. Jansen and C. Barisone (2023), “Fast and furious: the rise of environmental impact reporting in food systems”, *European Review of Agricultural Economics*, <https://doi.org/10.1093/erae/jbad018>. [27]
- Deconinck, K., M. Jansen and C. Barisone (2023), “Fast and furious: the rise of environmental impact reporting in food systems”, *European Review of Agricultural Economics*, Vol. 50/4, pp. 1310–1337, <https://doi.org/10.1093/erae/jbad018>. [9]
- Deuss, A. and E. Laget (forthcoming 2025), *Sanitary and Phytosanitary electronic certificates: Current practices and benefits*. [30]
- Duval, Y. and C. Utoktham (2024), *Partial and General Equilibrium Impacts of Trade Digitalization using Structural Gravity Model*, <https://artnet.unescap.org/index.php/publications/working-papers/partial-and-general-equilibrium-impacts-trade-digitalization-using>. [12]
- Eaton, J. and S. Kortum (2002), *Technology, geography, and trade*, <https://www.jstor.org/stable/3082019>. [15]
- Head, K. and T. Mayer (2014), *Gravity Equations: Workhorse, toolkit and cookbook*. [18]

- ICC DSI (2024), *Key Trade Documents and Data Elements*, [7]  
[https://www.dsi.iccwbo.org/files/ugd/8e49a6\\_9f8444133fc64fc9b59fc2eaaca2888e.pdf](https://www.dsi.iccwbo.org/files/ugd/8e49a6_9f8444133fc64fc9b59fc2eaaca2888e.pdf).
- International Chamber of Commerce (2022), *Challenges and opportunities of digitalisation of international trade*, [https://www.icc-france.fr/wp-content/uploads/2022/09/ICC\\_France\\_WhitePaper\\_.pdf](https://www.icc-france.fr/wp-content/uploads/2022/09/ICC_France_WhitePaper_.pdf). [5]
- Jaax, A. and E. van Lieshout (forthcoming 2025), *Mapping efforts to protect worker rights in supply chains*. [26]
- López González, J., S. Sorescu and P. Kaynak (2023), “Of bytes and trade: Quantifying the impact of digitalisation on trade”, *OECD Trade Policy Papers*, No. 273, OECD Publishing, Paris, <https://doi.org/10.1787/11889f2a-en>. [1]
- Mattoo, A., N. Rocha and M. Ruta (2020), *Handbook of Deep Trade Agreements*. [32]
- National Board of Trade Sweden (2023), *Potential Impacts of EU Due Diligence Obligations on Companies’ Suppliers in Developing Countries*. [31]
- OECD (2023), *OECD Trade Facilitation Indicators: Monitoring facilitation reforms up to 2023*, <https://issuu.com/oecd.publishing/docs/oecd-trade-facilitation-update-2023>. [11]
- OECD IFCMA (2024), *Towards more accurate, timely, and granular product-level carbon intensity metrics: challenges and potential solutions*. [29]
- OECD-BIAC-WEF (2023), *Emissions Measurement in Supply Chains: Business Realities and Challenges*, [https://www3.weforum.org/docs/WEF\\_Emissions\\_Measurement\\_in\\_Supply\\_Chains\\_2023.pdf](https://www3.weforum.org/docs/WEF_Emissions_Measurement_in_Supply_Chains_2023.pdf). [25]
- Pauwelyn, J. (2024), *21st Century Customs Fraud: How to Effectively Enforce Sustainability Requirements on Imports*. [28]
- Santos Silva, J. and S. Tenreyro (2006), “The Log of Gravity”, *The Review of Economics and Statistics*, Vol. 88/4, pp. 641–658. [21]
- Sorescu, S. and C. Bollig (2022), “Trade facilitation reforms worldwide: State of play in 2022”, *OECD Trade Policy Papers*, No. 263, OECD Publishing, Paris, <https://doi.org/10.1787/ce7af2ce-en>. [3]
- Tinbergen, J. (1962), *Shaping the World Economy: Suggestions for an International Economic Policy*, <https://onlinelibrary.wiley.com/doi/abs/10.2307/1236502>. [13]
- UNESCAP (2023), *Digital and Sustainable Trade Facilitation: Global Report 2023*, <https://www.untfsurvey.org/report>. [4]
- Wirjo, A. and S. Calizo (2022), *Trade Networks amid Disruption: Promoting Resilience through Digital Trade Facilitation*, [https://www.apec.org/docs/default-source/publications/2022/12/trade-networks-amid-disruption-promoting-resilience-through-digital-trade-facilitation/222\\_psu\\_trade-networks-amid-disruption.pdf?sfvrsn=34a79bec\\_2](https://www.apec.org/docs/default-source/publications/2022/12/trade-networks-amid-disruption-promoting-resilience-through-digital-trade-facilitation/222_psu_trade-networks-amid-disruption.pdf?sfvrsn=34a79bec_2). [8]

- Yotov, Y. (2022), “Gravity at Sixty: The Bijou of Trade”, *Drexel Economics Working Paper Series*, WP 2022-01, [https://econpapers.repec.org/paper/risdrlwp/2022\\_5f001.htm](https://econpapers.repec.org/paper/risdrlwp/2022_5f001.htm). [20]
- Yotov, Y. (2012), *A simple solution to the distance puzzle in international trade*, <https://doi.org/10.1016/j.econlet.2012.08.032>. [23]
- Yotov, Y. et al. (2016), *An Advanced Guide to Trade Policy Analysis: The Structural Gravity Model*, [https://www.wto.org/english/res\\_e/booksp\\_e/advancedwtountad2016\\_e.pdf](https://www.wto.org/english/res_e/booksp_e/advancedwtountad2016_e.pdf). [19]

## Annex A. Estimating impacts of going paperless

The gravity model of trade expresses trade flows as a function of the (economic) size of the trading countries and trade costs. A generic sector-specific structural gravity equation can be expressed as:

$$(X_{ij})^k = \frac{Y_i^k E_j^k}{Y^k} \left( \frac{T_{ij}^k}{\Pi_i^k P_j^k} \right)^{-\theta^k} \quad (1)$$

where trade flows from country  $i$  to country  $j$  in sector  $k$ ,  $X_{ij}^k$ , are a function of the supply of sector  $k$ -goods from country  $i$ ,  $Y_i^k$ , and expenditure for sector  $k$ -goods in country  $j$ ,  $E_j^k$ .  $T_{ij}^k > 1$  are trade costs when sector  $k$ -goods are shipped from exporter-country  $i$  to importer-country  $j$ .  $\theta^k$  is the sector-specific trade elasticity, and  $\Pi_i^k$  and  $P_j^k$  are the price indices representing outward and inward multilateral resistance terms, respectively. The size term is captured by  $\frac{Y_i^k E_j^k}{Y^k}$  and shows the hypothetical level of frictionless trade between two countries, which is proportional to their overall share of global economic activity. The trade cost term,  $\frac{T_{ij}^k}{\Pi_i^k P_j^k}$ , is a scaling factor that takes into account trade frictions.

### Trade flows specifications

The analysis looks at the impact on trade of the different policy elements identified in section 3. This involves estimating trade flows in the following structural gravity model framework, where  $X_{ijt}^k$  are the exports from country  $i$  to country  $j$  in sector  $k$  (including both cross-border trade and domestic trade flows):

$$X_{ijt}^k = \exp(\beta_1 Paperless\_policies_{ijt} + \beta_2 RTA\_depth_{ijt} + \sum_t b_t + \eta_{it}^k + \mu_{jt}^k + v_{ij} + s^k) * \varepsilon_{ijt}^k \quad (2)$$

Paperless policies ( $Paperless\_policies_{ijt}$ ) reflect the elements covered by section 3:

- TFIs – indicators on automation (TFI G); indicators on automation and documents (average of TFI G and TFI F); indicators on automation, documents, procedures and border agency co-operation (average of TFIs G, F, H, I and J). A bilateral index is constructed based on the minimum between the exporter and importer performance.

When employed in the regression alternatively, the TFIs are introduced as natural logarithm (TFIs range between 0 and 2).

- DSTRI – includes the selected areas of infrastructure and connectivity; electronic transaction frameworks; and e-payments (their value ranges between 0 and 1). A bilateral index is constructed based on the maximum between the exporter and importer scores.
- INDIGO-t – includes the bilateral INDIGO to control for trade-related discussions relevant to digital trade (the bilateral INDIGO-t ranges between 0 and 28).

The variables are interacted with a border dummy to account for their impact on cross-border trade (equal to 1 when the trade flow is international, as opposed to domestic).

The specifications control for the presence and depth of an RTA ( $RTA\_depth_{ijt}$ ). This represents the depth of an RTA between countries  $i$  and  $j$  in year  $t$  and can take values from 0 (no trade agreement in force) to 52 (where all possible broad policy areas are included in the trade agreement). Information on the depth of RTAs is obtained from the World Bank Deep Integration Dataset (Mattoo, Rocha and Ruta, 2020<sub>[32]</sub>).

$\sum_t b_t$  are international border-year fixed effects, which take a value of 1 in year  $t$  if the trade flow is international. These terms are meant to control for heterogeneity in unobservable bilateral international trade costs. Including these controls should help better capture changes in the costs of international trade relative to domestic trade.

$\eta_{it}^k$  represent exporter-sector-year fixed effects;  $\mu_{jt}^k$  represent importer-sector-year fixed effects;  $v_{ij}$  represent exporter-year fixed effects; and  $s^k$  are sector fixed effects.

Trade flows specifications are run using PPML with high dimensional fixed effects. PPML (Poisson Pseudo Maximum Likelihood) allows to account for heteroscedasticity and for zero trade flows.

## Trade data

### *USITC ITPD-E database*

The United States International Trade Commission (USITC) International Trade and Production Database for Estimation (ITPD-E) contains data on international and domestic trade for 243 jurisdictions, 170 sectors, and 17 years (Borchert et al., 2022<sub>[22]</sub>).

This allows to cover in the analysis here 19 low-income economies, 46 lower-middle income economies, 41 upper-middle income economies, and 55 high-income and OECD economies (Table A B.1). The sectors available in ITPD-E are matched to 18 sectors in 2-digit ISIC Rev. 4 level classification (Table A A.1).

**Table A A.1. Sector coverage based on the ITPD-E database**

ISIC sector code	ISIC sector name
D01T02	Agriculture, hunting and forestry
D03	Fishing and aquaculture
D05T09	Mining and quarrying, energy production products
D04	Mining and quarrying, non-energy production products
D10T12	Food products, beverages and tobacco
D13T15	Textiles, wearing apparel, leather and related products
D16	Wood and products of wood and cork
D17T18	Paper products and printing
D19	Coke and refined petroleum products
D20	Chemical and chemical products
D21	Pharmaceuticals
D22	Rubber and plastics products
D23	Other non-metallic mineral products
D24	Basic metals
D25	Fabricated metal products
D26	Computer, electronic and optical products
D27	Electrical equipment
D28	Machinery and equipment n.e.c.
D29	Motor vehicles, trailers, and semi-trailers
D30	Other transport equipment
D31T33	Manufacturing nec; repair and installation of machinery and equipment

## Annex B. Trade impacts of going paperless

**Table A B.1. Impact of policy indicators on trade using ITPD-E database (2012-19)**

	(1) All sectors	(2) All sectors	(3) All sectors	(4) All sectors	(5) Agri-food	(6) Manufacturing
lnTFL_automation_ij	1.118*** (0.009)					
lnTFL_auto&docs_ij		1.416*** (0.034)				
lnTFL_auto&docs&proc_ij			2.496*** (0.063)	1.863*** (0.009)	1.266*** (0.169)	2.349*** (0.060)
DSTRI_Etrans_pay_connect_ij				-3.152* (2.294)	-2.778 (2.496)	-4.720* (2.686)
lnINDIGO_t_ij				0.735*** (0.016)	0.316* (0.230)	0.708*** (0.074)
Depth_RTA	0.015** (0.002)	0.017*** (0.002)	0.018*** (0.002)	0.058*** (0.006)	0.075** (0.018)	0.059*** (0.006)
Constant	3.641*** (0.217)	3.818*** (0.219)	4.002*** (0.222)	1.506*** (0.117)	-.0154 (0.222)	1.746*** (0.093)
N	3 259 370	3 259 370	3 259 370	1 255 055	77 008	1 131 155

Note: Estimations using ppmlhdfc, controlling for the presence and depth of an RTA. Reporter-partner, reporter-sector-year and partner-sector-year fixed effects are included but not reported for brevity. Robust standard errors are reported in parentheses. \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01.

Source: Own calculations using ITPD-E database.

## Annex C. G20 High-Level Principles on the Digitalization of Trade Documents

Together with the Indian Institute for Foreign Trade (IIFT) and UN ESCAP, the OECD was a knowledge partner to the 2023 G20 India Presidency Trade & Investment Working Group – Logistics for Trade pillar. Support was provided during the drafting and discussions on the G20 High-Level Principles on the Digitalization of Trade Documents, which were adopted at the G20 Trade and Investment Ministerial Meeting in August 2023.

The ten HLPs cover aspects of neutrality, security, trust, interoperability, data privacy, reliability, voluntary sharing of data, collaboration, scalability, and traceability.

### **PRINCIPLE 1: NEUTRALITY**

Digitalization initiatives for trade documents should remain unbiased towards any specific technology, software or system. The initiatives should ensure the immutability and interoperability of data for seamless communication and exchange across diverse systems.

### **PRINCIPLE 2: SECURITY**

To ensure the security of data related to electronic trade document(s), the utilized technologies, including their related digital infrastructure should adopt robust encryption and other security protocols to protect data and the infrastructure concerned against physical damage and information security threats or data theft.

### **PRINCIPLE 3: TRUST**

Technologies/frameworks based on transparent domestic rules and procedures should enable confidence, accountability and authentication for the generation and exchange/transfer of the electronic trade documents.

### **PRINCIPLE 4: INTEROPERABILITY**

The utilized technologies, including their related digital infrastructure should aim to ensure interoperability and seamless exchange of electronic trade document(s) and related data between or among the transacting parties and other stakeholders. The desired interoperability should enable the use of a variety of existing technological systems, standards, document formats and frameworks.

### **PRINCIPLE 5: DATA PRIVACY**

The utilized technologies should implement privacy enhancing technological features/solutions, and share the minimum data necessary for the generation/exchange of electronic trade document(s) and execution of business transactions between the transacting parties. Also, utilized technologies should comply with applicable data privacy rules/norms.

### **PRINCIPLE 6: RELIABILITY**

The utilized technologies, including their related digital infrastructure should ensure the authenticity, immutability and validity of electronic trade documents.

### **PRINCIPLE 7: VOLUNTARY SHARING OF DATA**

Sharing of electronic trade documents and related data should be voluntary with the informed consent of economic operators supplying data and only limited to the minimum data exchange necessary for the generation and exchange of documents, and execution of business transaction between the transacting parties in compliance with applicable domestic rules and regulations.

### **PRINCIPLE 8: COLLABORATION**

The utilized technologies should provide adequate flexibility to facilitate reliance on the same electronic trade document by governments and competent authorities concerned, financial institutions, transacting parties, technology providers and other stakeholders.

**PRINCIPLE 9: TRACEABILITY**

The utilized technologies should provide a comprehensive audit trail of the transaction(s), in accordance with domestic regulations of electronic trade documents.

**PRINCIPLE 10: SCALABILITY**

To accommodate growth, shifting trade conditions and new technological developments, utilized technologies for the exchange of electronic trade documents must be scalable, and should be able to handle extensive data volumes and transaction numbers.

## Annex D. Selected examples of country initiatives

### Developing an Ecosystem of Trust at the United Kingdom border

Initially set out in the 2025 United Kingdom Border Strategy, the Ecosystem of Trust<sup>36</sup> (EoT) proposed a collaborative model for managing the border, involving government, border users and technology firms. The ambition was to use technological and enhanced data solutions to enhance trust within the supply chain, and by government, with the aim of minimising trade frictions. The project tested whether the use of supply chain data, alongside technologies such as smart seals and smart containers, could be integrated into United Kingdom border processes. These solutions were tested via pilots and involved both industry and government participants.

The United Kingdom government partnered with six “consortia” to test a variety of proposals which involved sharing supply chain information between trade and government using a different supply chain data platform, and a wider set of technology across a variety of transport modes, commodities and routes, with the intention of understanding the feasibility of solutions across these variables. The pilots highlighted that up to 80% of the minimum risk requirements for Customs purposes and 60% of trade statistics requirements could be provided by supply chain data. This could improve confidence of government border agencies teams in making decisions, and potentially reduce the time taken border staff to make these decisions by nearly 20%.

The EoT August 2023 Evaluation Report delivered three key recommendations:

- **Collaboration** between government and industry is essential for driving innovation at the border.
- **Interoperability** proved to be the greatest challenge identified by the pilots and the biggest barrier to scaling an EoT model. Integrating industry data as it is held and managed at present into government systems at scale proved to be challenging.
- **Maximising value to trade** is central to incentivising the adoption of technologies and the sharing of data which can provide further assurance to government – whether that is platforms for managing digital supply chain data, or augmenting technologies.

### Simplifying Australia’s trade system

Australia’s Simplified Trade System<sup>37</sup> Implementation Taskforce over the past 3 years showed benefits to business. This included delivery of regular changes, co-designed with business, to incrementally simplify the process for imports and exports.

#### *Reforms implemented*

- A Customs Regulatory Sandbox established under the Customs Act 1901 to facilitate time-limited, controlled trials. It uses an innovative regulatory framework to drive evidence-based reform to Australian customs legislation.

---

<sup>36</sup> United Kingdom Cabinet Office Ecosystem of Trust Evaluation Report, August 2023.

<sup>37</sup> Australian Government, Simplified trade reforms, June 2024.

- The Go Global Toolkit is a single source of online information on how to export priority sector goods. It includes regulatory and border compliance requirements.
- A Biosecurity Portal gives import clients the ability to make and manage inspection booking requests. They can also view direction information and lodge inspection outcomes 24/7 through an online system.
- An Integrated Cargo System (ICS) real-time notifications function for industry ICS system degradation and outages. This is through client self-registration and providing SMS and/or email customer notification functionality.

### *Reforms underway*

- The Digital Trade Accelerator Program (DTAP) to target cargo for border and biosecurity protection through improved customs and risk assessments; and to facilitate how government connects with, and shares trade-related data with business, initially for cargo clearance status.
- A cross-border trade data sharing framework developed with agencies and business to standardise and share cross-border trade data between agencies by default. This will simplify future cross-border trade processes.
- Updating current data interchanges between government and business within the Integrated Cargo System (ICS), improving ICS user interfaces, and piloting myGovID access.
- Legislative amendments to the Customs Act 1901 to strengthen the customs licensing regime and digitise customs processes for the return of seized goods.
- Agricultural traceability and credentials 'ecosystem' work to harmonise traceability standards and data.
- Digital Verification Platform (DVP) to create and verify digital trade documents.
- The Simplified Targeting and Enhanced Processing System (STEPS) to make cargo clearance faster, simpler and support biosecurity management, including digitising manual processes and documents.
- Led by the Attorney-General's Department, exploring options to align Commonwealth legislation with UNCITRAL MLETR to support transitioning to paperless trade.
- Led by ABF and building on the Department of Agriculture, Fisheries and Forestry air cargo supply chain trials, streamlining the Cargo Intervention Model (SCIM) to reduce inspection times and supply chain delays for traders by up to 90% of current levels.

## **Annex E. Going paperless in agricultural and food trade: Insights from the implementation of SPS e-certificates**

SPS certificates are part of the non-customs regulatory documents exchanged in an international agro-food trade transaction. As for their physical equivalents, electronic official certificates involving SPS and related assurances are issued by the relevant competent authority of the exporting country to attest that agricultural consignments are free of pests and diseases and therefore safe to import.

This Annex summarises findings from OECD work on the use of electronic SPS certificates (Deuss and Laget, forthcoming 2025<sup>[30]</sup>), focusing on the role of regulatory and technical interoperability.

As regards *regulatory interoperability*, the three international SPS standard-setting organisations, the FAO/WHO Codex Alimentarius Commission (Codex) for food products, the FAO International Plant Protection Convention (IPPC) for plants and plants products, and the World Organization for Animal Health (WOAH) for animals and animal products are the ones that provide guidelines to standardise the format and data contents of physical SPS certificates. In practice, a paper certificate is issued to the exporter by its competent authority based on a prescribed format, who then sends it to the importer for presentation to the competent authority of the importing country. The document certifies that the animals, plants or derived products declared in the consignment have been found free from pests and diseases after inspection and comply with the SPS measures of the importing countries.

As regards *technical interoperability*, the exchange of SPS certificates electronically relies on the following:

### **1. Developing and adopting international standards for the exchange of information**

UN/CEFACT has developed the e-CERT standard, which provides a structured format for electronic SPS certificates. This solution is reflecting established business processes that operate in accordance with international SPS standards and bilateral agreements made by government regulators.

- The e-CERT standard is accessible free of charge on the UNECE-UN/CEFACT website and includes three elements. The first element is a Business Requirement Specification (BRS) or Business Process Model, which explains the business processes that are supported by the e-CERT standard. It is a visual representation (using flowcharts) that illustrates how various tasks are carried out by government inspection and quarantine authorities involved in cross-border clearance activities to achieve the electronic exchange of export certificate data. The BRS features some key elements such as: tasks or steps that make up the process and what need to be done to achieve the electronic exchange of export certificate data, sequences that represent the order in which tasks are performed and showing the flow of the process from start to finish, responsibilities that identify who is accountable for each task, inputs and outputs that identify as data required to initiate and then complete a given task, decision points that indicate where decisions need to be made and the different paths that may be followed based on specific conditions.
- The second element of e-CERT is a Data Requirement Specification (RSM), which transforms the government-to-government electronic certification business requirements elaborated in the BRS document into a technical requirement

specification for the exchange of SPS export certification data. It is a data model of the electronic message and explains the data fields used in the message. There are five components in the electronic certificate that are required to verify compliance with agreed SPS requirements. The Certificate Header comprises base information relating to the whole consignment and is primarily used for identification, traceability and authentication. The Certificate Transport identifies the main carriage for this consignment, including routing details. The Certificate Product identifies individual agricultural commodity items included in this consignment and may be used by the border control authority to determine the level of inspection required at the point of entry. The Certificate Approval provides authentication of the certificate and details of the certifying officer. The Withdrawal/ Return/ Acknowledgement Document provides the revised status of the certificate, including date and reason for revision.

- Finally, the e-CERT standard provides a third element that is a set of XML Schemas, which specify the structure of the messages for electronic exchange of the certificates. XML is the acronym for eXtensible Markup Language. It is an internationally recognized computer language. Its format is machine readable but can be easily converted to a more user-friendly format such as a PDF file. It is standardised to allow communication through the Internet between different computer systems. It is one of the most widely used computer languages for sharing structured information. To facilitate the exchange of electronic certificates between various competent authorities, a harmonised schema, codes and lists are needed to ensure that the receiving competent authority can read the message of the sending competent authority. E-CERT encourages the use of standardised terms, codes and text for the data elements associated with the XML message.

## **2. Clarifying the role of relevant border authorities**

Under electronic certification, exporters and importers no longer transmit and submit the certificates. The SPS e-certificate circulates exclusively between the national competent authorities, either through a bilateral relationship or through a multilateral option provided by a Hub. This means that confirming the issuance of electronic certificates does not involve the transmission (i.e. mailing) of a physical SPS certificate but only the notification that the certificate has been issued and that the consignment is under way. When SPS e-certificates are issued by the competent authority of the exporting or re-exporting country, they are directly available to the competent authority of the importing country.

## **3. Set-up of information exchange platforms and coordination with national systems for trade**

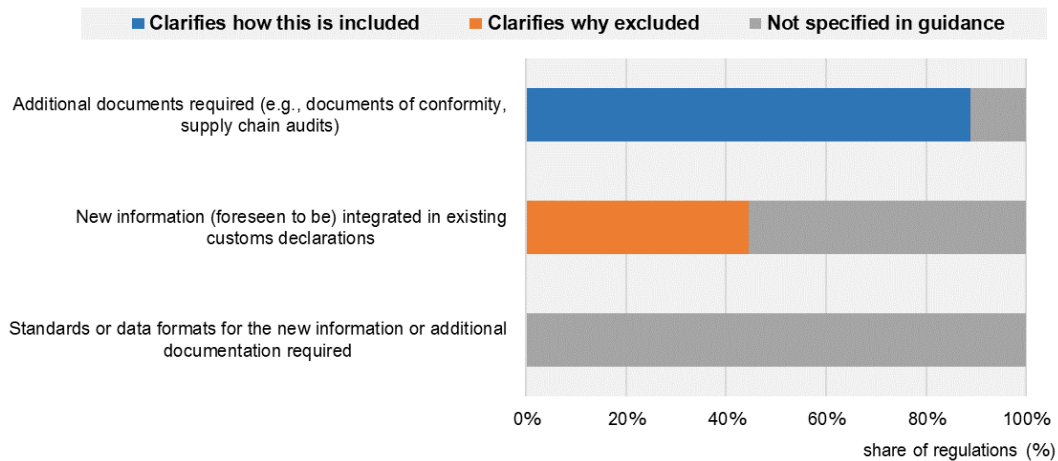
SPS certificates can currently be exchanged in two ways, using a bilateral government-to-government model or a multilateral single hub model.

- The bilateral government-to-government (G2G) model was the first approach used to exchange SPS e-certificates. Under this model SPS e-certificates are directly exchanged between competent authorities via their national Single Windows for trade or more frequently via their electronic SPS certificate management systems.
- The Single Hub model (G2HUB2G) is characterised by a single point exchange. The IPPC offers a solution to exchange phytosanitary certificates electronically under the ePhyto G2HUB2G model, currently used by 133 countries. In a Single Hub model, only one access agreement is required to send or receive e-certificates to and from all countries connected to the Hub. This is exemplified by the approach adopted by the United States regarding the use of the IPPC ePhyto Solution, which

enables the exchange of e-phytos with over 100 countries. European Member countries are connected to the IPPC's Hub through the European Commission's Trade Control and Expert System (TRACES-NT), which serves as a platform for managing SPS certification. The eIDAS regulation No 910/2014 on electronic identification and trust services for electronic transactions, passed in 2014, requires electronic signatures on SPS e-certificates. The scope and necessary conditions of legally binding electronic signatures (such as the identification of third-party certified e-signature providers) imply that European Member countries only receive e-certificates with a limited number of third countries and highlights the interlinkages between the digital tools for facilitating trade at the border and the overall framework for electronic transactions.

## Annex F. Features of sustainability regulations in terms of their links to the border process

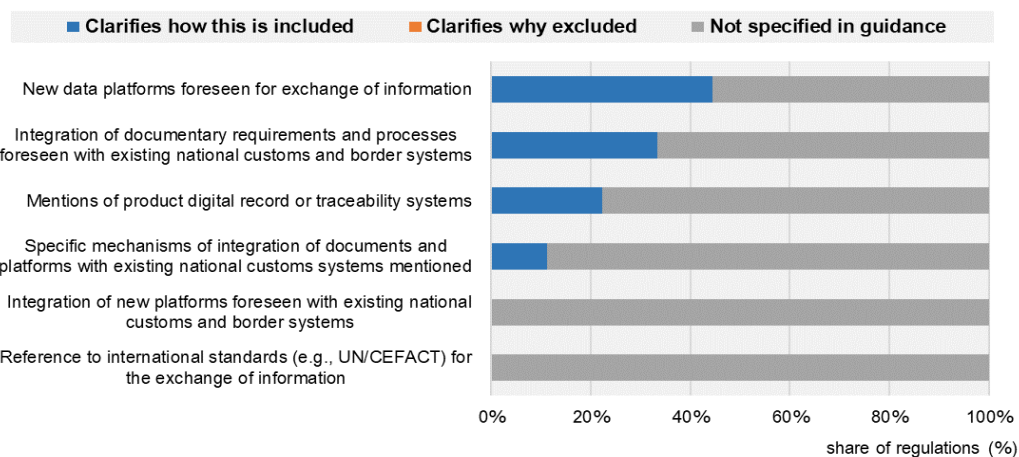
Figure A F.1. Documentary requirements



Note: The chart is based on the following regulations and their available implementation guidance: [Australia bill banning imports made using forced labour](#) (2021); [US Customs and Border Protection Forced Labour Trade Law](#) (2022); [Canada BILL S-211 enacting the Fighting Against Forced Labour and Child Labour in Supply Chains Act](#) (2023); [Mexico Forced Labour Law](#) (2023); [European Union ban on products made with forced labour](#) (2024); [United Kingdom Environment Act](#) (2021); [European Union Deforestation-free Products Regulation](#) (2023); [European Union Carbon Border Adjustment Mechanism](#) (2023); [European Union Ecodesign for Sustainable Products Regulation](#) (2024).

Source: Author's elaboration.

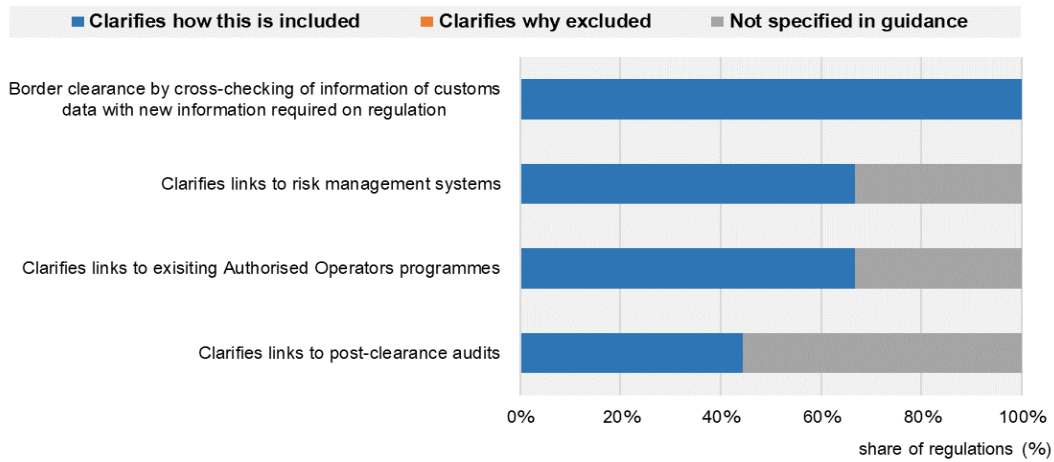
Figure A F.2. Digital tools for the exchange of information



Note: The chart is based on the following regulations and their available implementation guidance: [Australia bill banning imports made using forced labour](#) (2021); [US Customs and Border Protection Forced Labour Trade Law](#) (2022); [Canada BILL S-211 enacting the Fighting Against Forced Labour and Child Labour in Supply Chains Act](#) (2023); [Mexico Forced Labour Law](#) (2023); [European Union ban on products made with forced labour](#) (2024); [United Kingdom Environment Act](#) (2021); [European Union Deforestation-free Products Regulation](#) (2023); [European Union Carbon Border Adjustment Mechanism](#) (2023); [European Union Ecodesign for Sustainable Products Regulation](#) (2024).

Source: Author's elaboration.

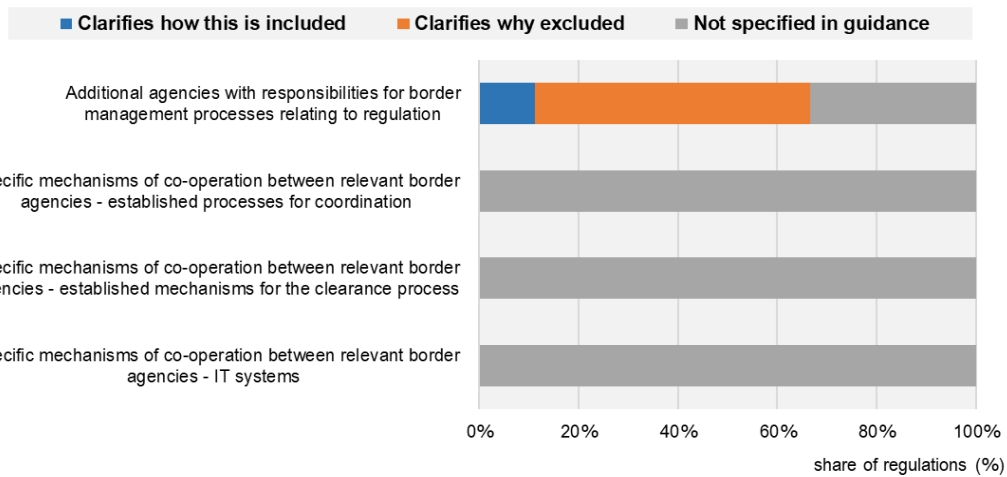
Figure A F.3. Border processes



Note: The chart is based on the following regulations and their available implementation guidance: [Australia bill banning imports made using forced labour](#) (2021); [US Customs and Border Protection Forced Labour Trade Law](#) (2022); [Canada BILL S-211 enacting the Fighting Against Forced Labour and Child Labour in Supply Chains Act](#) (2023); [Mexico Forced Labour Law](#) (2023); [European Union ban on products made with forced labour](#) (2024); [United Kingdom Environment Act](#) (2021); [European Union Deforestation-free Products Regulation](#) (2023); [European Union Carbon Border Adjustment Mechanism](#) (2023); [European Union Ecodesign for Sustainable Products Regulation](#) (2024).

Source: Author’s elaboration.

Figure A F.4. Mechanisms for border agency co-operation



Note: The chart is based on the following regulations and their available implementation guidance: [Australia bill banning imports made using forced labour](#) (2021); [US Customs and Border Protection Forced Labour Trade Law](#) (2022); [Canada BILL S-211 enacting the Fighting Against Forced Labour and Child Labour in Supply Chains Act](#) (2023); [Mexico Forced Labour Law](#) (2023); [European Union ban on products made with forced labour](#) (2024); [United Kingdom Environment Act](#) (2021); [European Union Deforestation-free Products Regulation](#) (2023); [European Union Carbon Border Adjustment Mechanism](#) (2023); [European Union Ecodesign for Sustainable Products Regulation](#) (2024).

Source: Author’s elaboration.