PEN-CP
Pan-European Network of Customs Practitioners

Enhancing Customs Risk Management with External Data

First edition | February 2021

Annual study report by the Pan-European Network of Customs Practitioners (PEN-CP)

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Credits

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1 Overview of data sources used for customs risk management

Maintaining security and preventing fraud in cross-border trade and supply chains are key priorities for the EU customs, under the heightened risk of transnational crime and terrorism. At the same time, smooth and safe trade flows are of critical importance to the economic growth and competitiveness of the EU. With growing trade volumes, tight resource constraints, and increasing demands for smooth cross-border traffic, the EU customs administrations are looking for new ways to maintain regulatory control without disrupting trade.

Risk-based and data-driven approaches to customs operations have formed the foundation of customs control activities in Europe since many years. Risk-based controls allow customs to focus on high-risk traffic, facilitate low-risk traffic, and this way oversee cross-border trade without disrupting the flow of goods. Data, the number one commodity of digital customs, is the key enabler of risk-based controls: timely and accurate information on traders, goods, and modes of transport allows customs to target high-risk goods and to determine the most appropriate time, place and technique for controls.

Some information, like declaration data, is readily available for customs, based on laws and regulations. But access to some other sources of information require extra efforts. This opening section outlines the main sources of data and information that customs typically use for risk assessment.

1.1 Regulatory data from trade and logistics

Declaration data is mandatory and legally binding information customs get from traders under customs rules. Examples of declaration datasets include Single Administrative Documentations (SAD), Entry Summary Declarations (ENS), arrival notices, and some accompanying documents like Bill of Lading and Certificate-of-Origin. Regulations determine when traders have to lodge their declarations and what data elements each declaration should report.

1.2 Voluntary data from trade and logistics

Customs also receive useful data from traders who are willing to share additional information with authorities beyond regulatory requirements. This voluntary sharing of information is often incentivized by trade facilitation benefits: customs may grant a cooperative trader a preferential access to simplified formalities or expedited passage through customs controls. Documents that traders commonly share with customs voluntarily include invoices and packing lists. Online platforms and digital documents are making voluntary sharing of information faster and automated.

1.3 Customs in-house processes

Customs operations generate useful information for risk management purposes. Outcomes of physical inspections, document checks, X-ray scans, and other controls are critical feedback that customs need to improve the targeting function systematically. Data from various devices and sensors — X-rays, material trace detectors, and e-seals for example — can prove useful in improving effectiveness of

customs controls. Historic data on past trader behavior and trade flows, that can be often found in customs databases, provide insights what is a typical trade pattern and what is not.

1.4 National authorities

Customs can also obtain useful information on cross-border trade from other government agencies. In most countries, a number of regulatory bodies grant permits, licenses, and certificates for cross-border traders. With access to licensing databases, customs could verify whether, and under which conditions, a trader is authorized to import or export certain goods. Law enforcement agencies in general are a key source of tactical information for customs. For example, the police or border guards may share useful information with customs on cross-border criminal activities or past offences of a new trader.

1.5 EU customs community

Customs administrations of the 27 EU Member States have a common responsibility of protecting the EU customs area from external threats. For this purpose, the EU has created several mechanisms and databases that allow EU customs to exchange information. There are databases, for example, on Authorized Economic Operators (EU AEOs) and companies with EORI numbers (Economic Operators Registration and Identification). EU customs exchange risk-relevant information — like risk indicators and priority control areas — with Risk Information Forms (RIF) and, in the near future, through the Import Control System 2 (ICS2).

1.6 Other EU authorities

Other EU agencies can feed useful information for customs risk management processes as well. Frontex, an EU agency tasked to coordinate the border and coast guards in the EU, has first-hand information on passenger flows across the Schengen border. Europol coordinates police matters in the EU and can provide intelligence on cross-border criminal activities for customs. The EU's anti-fraud agency OLAF is a source of information on fraud-related information. ConTraffic platform of Joint Research Centre (JRC) contains information on container movements (Container Status Messages). Anti-counterfeiting system COPIS and the Anti-Fraud Information System (AFIS) are other promising examples of EU-managed databases that can add value to customs risk management.

1.7 Global customs community

Other customs administrations worldwide form another source of information for EU customs. Perhaps the most important global data exchange platform is the Customs Enforcement Network (CEN) of the World Customs Organisation (WCO), which allows customs to share risk-relevant information with one another. The WCO's Regional Intelligence Liaison Offices (RILOs) are instruments for more detailed bilateral and multilateral customs-to-customs information exchange.

1.8 Other global government entities

There are other multi-governmental bodies relevant for customs administrations, besides the World Customs Organisation. INTERPOL, for example, generates intelligence on global criminal networks that can be useful for customs risk management purposes. Similarly, UN organizations like the United Nations Office on Drugs and Crime (UNODC) monitor illegal trade and produce insightful analyses on criminal trends and dynamics.

1.9 External data

External data refers to any information that lies outside customs systems and that is not readily available for customs. External data sources exclude all types of customs information explained above. External data and information come from a large number of sources, for example third party data sharing platforms, data analytics and service providers, and open internet.

1.10 Summary

The opening chapter provides a look on data sources that customs typically use for customs risk management purposes. Besides these eight established categories of data sources, customs can also use external data to enrich their pre-existing datasets, in order to improve targeting and selective controls in the future. This document analyses next the key characteristics of external data sources and discusses how customs administration can tap the full potential of external data.

2 How can external data add value to customs risk management?

Access to external data provides customs valuable, complementary information on cross-border traffic for risk assessment purposes. External data increases the value of pre-existing datasets like customs declarations and tactical intelligence, allowing customs officers to identify high-risk shipments more effectively and efficiently, which can translate into higher hit rates and lower rates of false positives. External data can contribute to smarter customs controls through better-informed decision-making. Based on preliminary analysis, we have identified seven main ways how external data can add value to customs risk management and overall customs performance.

2.1 Access to additional information beyond declaration data

External data can give customs access to commercial and administrative information beyond declaration data that might otherwise not be available to customs. Such information includes, for example, transportation data, payment data and verified company information. Additional pieces of external information help customs to construct a more complete profile of a shipment, mode of transport, tradelane or economic operator.

For instance, data from international company information providers like Orbis and Dun & Bradstreet offer detailed information about parties involved in cross-border freight movements. This information helps customs to identify and risk assess economic operators, especially foreign traders and unknown importers who have no track record of compliance.

Shipping instructions are another interesting source of additional external information for customs. Shipping instructions, documents that consignors or their agents share with carriers, contain detailed information on the type and packaging of cargo, which can be useful for customs to assess the true nature of a shipment.

2.2 Earlier availability of information

The sooner information becomes available, the sooner customs can assess risk. Timely information on incoming traffic enables customs to risk assess goods in advance, identify possible threats early, and organize well-timed controls. Timing of risk assessment and related controls is critical because some threats are more urgent than others. For example, explosive threats should be detected and neutralized as soon as possible, definitely prior to loading on a mode of transport. On the other hand, as fiscal contraband is not going cause damage during transport, customs can risk assess goods for fiscal purposes whenever it is most convenient to do, and this is often only after the goods have arrived.

External data sources contain datasets that may allow customs to identify potential threats in advance. For instance, there are industry platforms like CargoHUB and INTTRA that shippers and their agents use to plan and book transports and to instruct carriers how their goods should be shipped. This container booking and shipping instruction information could provide customs useful early information for risk assessment purposes.

2.3 More reliable data from the source

External data can help customs to overcome one reason of inaccurate declaration data: the fact that declaration data may not come directly from the source, namely from the sellers, shippers, logistics operators, and other entities at the upstream of the supply chain, closer to the source of the goods. A part of the problem is that freight forwarders and other agents are often the ones completing customs declarations on behalf of their clients. Also manifests, Bills of Lading, and other transport documents provided by these agents may be inaccurate because the information does not come directly from their clients who ship the goods. As a consequence, the reliability of information is determined by the risk associated with the agents who handle and transmit the data.

External data sources can help customs to identify the true consignee and consignor of a shipment and to access information from the upstream of the international supply chain. Trusted, external data from the source can be in forms of purchase orders, packing lists, invoices, or other documents that detail the nature of goods and the terms of shipping them. Customs could also reuse the information, that upstream operators use to manage their own risks, for the purposes of customs controls and compliance monitoring. The idea of this “piggy-backing” principle is that if information is reliable enough for companies to do risk assessment, it also can help customs to assess risks.

2.4 Enhanced cross-validation

Cross-validation is the practice of verifying information by using multiple sources of data. Customs use cross-validation to cross-check fields and values of customs declarations against information found in Bills of Lading, invoices, or other documents that customs may have access to. If the declared information appears consistently in all transport and commercial documents, customs can be rather confident that the declared information holds true. On the other hand, conflicting, suspicious, vague, or missing information signals high risk and may raise questions: Why is the value of goods lower in the customs declaration than it is in the commercial invoice? Why the commodity code is not consistent in all documents?

With information from external sources, customs can better verify specific details in declaration data. Cross-validation across multiple datasets can provide corroborating evidence that help targeting officers to make control and de-risking decisions with higher confidence.

2.5 Access to the latest information

Global trade and logistics are in a state of constant change: new traders emerge, tradelanes change, and business models evolve. The same applies to cross-border smuggling networks that must constantly adapt their structures and tactics to outwit law enforcement. To have a chance against dynamic cross-border crime, it is critical for customs to stay abreast of the changing trading environment

External data sources can help customs to maintain their records up-to-date, for example on traders and logistics companies, trade lanes, and product prices. For example, company information providers like Orbis and Dun & Bradstreet offer information on company ownerships, lines of business, and

trading activity. Similarly, providers of import and export analytics services allow customs to monitor global trade flows and trading activities of individual companies in close to real-time, this way allowing customs to react to any suspicious changes in trader behavior. Information from trade platforms and movement tracking services allow customs to access the most recent changes in shipment routing, cargo ownerships, or other risk-critical factors.

2.6 Historic data for enhanced economic operator profiles

Analysis of historic data on trade flows and trader behavior can uncover meaningful insights on expected, normal trading patterns. Having boundaries for normal trading activities enables customs to detect and react to unusual, suspicious trading activities.

External data can also be a rich source of information about the past behavior of economic operators, including information on regular clients, typical logistics partners, routine shipping routes, and usual cargo types. Customs can use this historical information to build more accurate models for predicting future activities and to detect unusual operator behavior. Historic records of vessel tracking data, shipping instructions, or public import and export statistics can reveal new insights that have previously escaped customs risk assessment analyses.

2.7 Summary

External data provides customs a whole new perspective on cross-border traffic. External data enriches pre-existing declaration data, providing additional data elements for customs to verify and base risk assessment on. In some cases, the value of external data lies in its early availability, which allows customs to carry out risk assessment earlier than with the traditional datasets. In some cases, external data is about commercial information that sellers, buyers, and intermediaries exchange to organize trading and logistics; this first-hand, binding commercial information tends to be relatively accurate and reliable. Access to additional external data also enables more effective cross-validation across datasets and updating of customs information with the latest data. Historical data from external sources can also help customs to improve the accuracy of trader profiling.

3 External data sources explored

External data is defined as any information outside customs systems that is not readily available for customs. To connect to external data sources, customs need to negotiate with data owners, organize data retrieval, and pay for data access. This figure below summarizes the seven groups of external data sources.

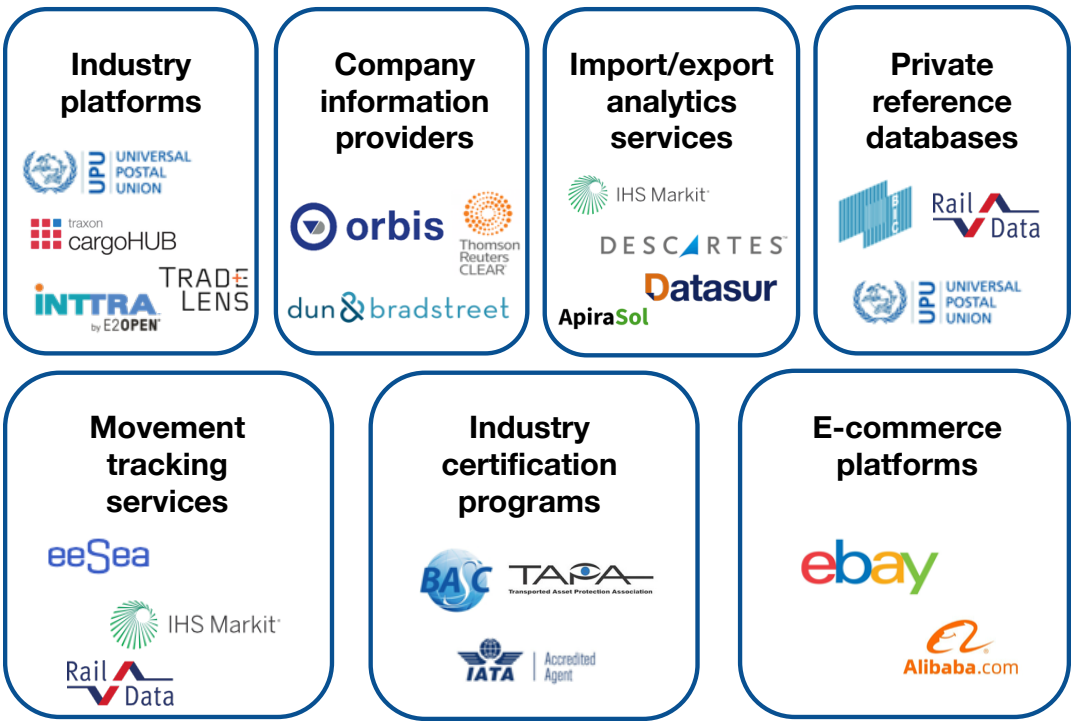

Figure 1 Categorization and examples of external data sources

3.1 Industry platforms

Industry platforms are information systems that capture digital logistics and commercial information across end-to-end international supply chains. Most of the industry platforms are commercial products that offer services and functionalities for specific transport modalities, tradelanes, or industries. In that sense, many platforms are limited to a specific mode of transport, geography, or a set of stakeholders and therefore provide only a partial picture of what is happening in the supply chain. Notable industry platforms include CargoHub for air cargo, INTTRA and TradeLens for sea containers, and Post*Net for international postal deliveries.

Table 1 Industry platforms (Source: company websites | CBRA analysis)

Data source	Description	Coverage

Traxon cargoHUB | CHAMP	Database of electronic air cargo documents, especially bookings and Air Waybills, manifests, and tracking events.	Over 30% of global air cargo by value. Over 100 airlines, 1000 other supply chain members
INTTRA | E2OPEN	Data on global sea container logistics: shipping instructions, container bookings, and container tracking events.	60+ ocean carriers and NVOCCs and 35,000+ shippers in 175 countries. 1 out of every 4 containers worldwide.
TradeLens | IBM and Maersk	An open, blockchain-powered industry-wide platform where parties of the supply chain can share digital documents, including commercial invoice, packing list, Bill of Lading, sea waybill, export documentation, advance declaration, pre-paid invoice, certificate of origin, shipping instructions, dangerous goods declaration, and import documentation.	Over 90 ports and terminals, 18 ocean carriers, 16 customs authorities.
Post*Net | Universal Postal Union	Electronic data on international postal items: location and status information, postal item information (names and addresses of senders and receivers, content description, and related quantity, weight and value) and consignment information (origin, destination, class, weight, and quantities of mail consignments).	Global

Industry platforms contain a large variety and volume of commercial and logistics information that can be useful for customs to risk assess cross-border movements at shipment, transaction, and tradelane levels. Here are some examples how the information on industry platforms can contribute to customs risk management processes:

- **Cross-validation of data across the supply chain.** Industry platforms provide tools for organizing sales and shipping internationally. Information on the industry platforms may allow customs to check whether traders report information consistently across commercial, transport, regulatory, and other documents. For example, do the shippers and other parties at the upstream of the supply chain report the same information than the importers and other downstream parties report? Or does declaration data correspond the information found in invoices, Bills of Lading and packing lists.
- **Document fraud.** Some industry platforms provide advanced services for the verification of documents and information. For example, blockchain-based systems help to increase accountability among parties that feed data into industry platforms.

3.2 Company information providers

Company information providers offer the latest firmographic and commercial data on companies worldwide. These service providers compile information from public and private sources, enrich this information with complementary sources, and build clean databases of up-to-date, accurate, and comparable information on companies: addresses, legal statuses, financials, sizes, subsidiaries, owners, corporate linkages, and much more.

The table below introduces three providers of global company information. Orbis by Bureau van Dijk and Dun & Bradstreet appear as similar services, given their global scope and similar datasets. The Clear service of Thomson Reuters focuses on individuals and positions itself as a tool for supporting fraud investigations.

Table 2 Company information providers (Source: company websites | CBRA analysis)

Data source	Description	Coverage
Orbis | Bureau van Dijk	Verified information on business entities worldwide: contact details, sectors of activity, size, legal status, financials, corporate linkages, and various risk scores.	More than 360 million companies worldwide
Dun & Bradstreet	Verified information on business entities worldwide: contact details, sectors of activity, size, legal status, financials, corporate linkages, and various risk scores.	More than 315 million company records
CLEAR | Thomson Reuters	Information about individuals, businesses, assets, affiliations, and other entities from public and proprietary records: phone numbers, addresses, vehicle data, and online information.	N/A

Reliable company information supports customs risk management in many ways. Here are some practical examples how customs can benefit from the use of the services offered by company information providers:

- **Up-to-date trader information.** Customs cannot monitor all changes that traders around the world undergo, because there are so many changes every day. Company information services allow customs to refresh their data on traders. Updates allow customs to react when traders undergo events that affect their risk profiles, for example a change of ownership or country of operation.
- **Risk profiling of first-time traders.** Many times, customs have little to no information on foreign first-time importers. Company information providers may have observed the importer's activities domestically or in other counties for years and built a risk profile for the firm.
- **Risk profiling of transactions.** Company information helps customs verify importers and exporters by confirming the legitimacy of a business – and by analyzing the risk associated with all trading partners and whether traded commodities match business type (for example why

does a marketing agency trade in laboratory equipment). This information reveals relationships between businesses and individuals, uncovering beneficial ownership that is often hidden behind series shell companies.

- **Investigative aid.** Information on companies and associated individuals and assets help customs to investigate fraud.

3.3 Import and export analytics services

There are 29 countries in the world that are known to publish detailed data on exports and imports, to the level you would normally find in actual customs declarations. This import-export information help public and private parties worldwide to understand essential aspects of trade flows in and out of these countries (see the countries below).

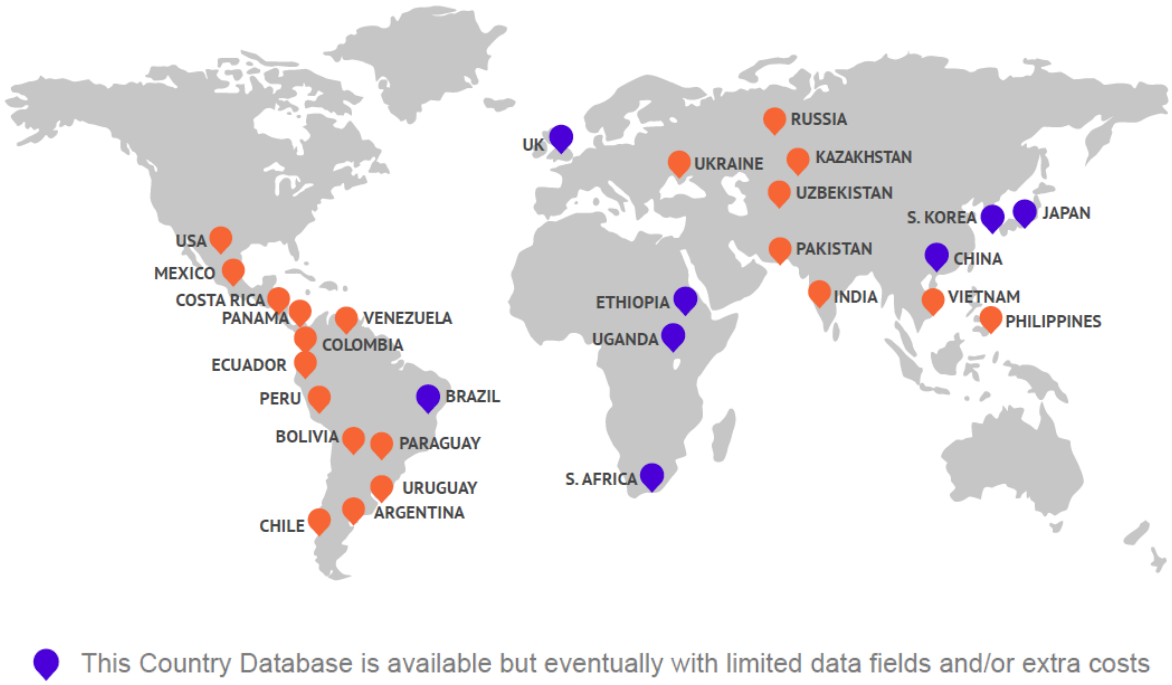

Figure 2 Countries that are known to publish detailed import-export data (Source Apirasol 2020)

It would be time-consuming for customs administrations to compile export-import datasets from public sources because the data is located at different systems and available in different formats and languages. Companies like IHS Markit, and Descartes, Apirasol collect and clean these publicly available datasets and offer data integration and analytics services for their clients.

Table 3 Import and export analytics services (Source: company websites | CBRA analysis)

Data source	Description	Coverage
PIERS | IHS Markit	Transactional trade data with standardized company details, including imports and exports	Global coverage, focus on the US

	by company. Also Bill of Lading data on US waterborne import and exports.	
Datamyne | Descartes	Large records of import and export trade data and business intelligence.	56 countries from 5 continents and 76% of the world's import trade by value
Datasur	A Chilean provider of foreign commerce information	Global coverage with 60 countries
Eximpulse	An Indian company specializing in export-import data services and related analytics.	Global coverage
Apirasol	Analytics services that combine online intelligence with shipments analytics, uncovering the entire counterfeit supply chain, from producers to importers, distributors and retailers.	Global coverage

The level of detail varies between the 29 countries that provide import-export information, but the datasets typically contains shipment-level information on HS-codes, production descriptions, importers, exporters, and transaction prices. Some countries publish detailed Bill of Lading information, as well. A major shortcoming of import-export data is that it is not made public immediately: the delay of publishing data varies from 2 weeks to 9 months. Anyhow, even if this delay makes real-time import-export analysis unfeasible, customs in the EU and elsewhere can leverage this information for risk management purposes:

- **Cross-checking of import and export data.** The import-export data allows customs compare whether information of the export declaration corresponds information of the import declaration. The comparison can be conducted at aggregate or transaction levels, but only after the import-export is made public after a delay of two weeks to nine months.
- **Deeper understanding of trader behavior.** Customs can study what kind of activities of a trader has conducted in other countries and this way understand better the trader's business and associated risks of non-compliance.

3.4 Cross-validation databases

Cross-validation databases are registers and directories with verified, up to date information on goods, cargo units, vehicles of transport, traders, and other parties that play a role in international trade and logistics. Customs administrations can use these databases to cross-check information they receive from other sources, especially as part of customs declarations. The table below presents a non-exhaustive list of data sources that customs could use for cross-validation purposes.

Table 4 Cross-validation databases (Source: company websites | CBRA analysis)

Data source	Description	Coverage
BoxTech | BIC	Container technical details, including: container number, size-type code, tare weight, maximum gross mass, maximum payload, maximum stacking weight, and manufacturer ID number.	11 millions containers, more than 40% of the global fleet
BIC Code | BIC	Identification codes of container owners and principal operators, with full address and contact details. The database contains data on containers, including dimensions, type, year of putting into operation, date of control, and maintenance history.	Used by over 2400 container owners/operators worldwide
LoCodes | BIC	International identification codes and addresses for container facilities.	11,000 facilities in 160 countries
SeaWeb | IHS Markit	Information on ships, ship owners, shipbuilders, ship movements, ports, fixtures and casualty information.	220,000 ships, 290,000 owners, 300,000 companies, 16,000 ports worldwide.
Seasearcher | Maritime intelligence	Data on vessel characteristics, vessel movements, ports, casualties, companies and ownerships.	300,000 vessels, 7,800 ports in 208 countries
RailData | CoReDa	A freight wagon database for identification of the current keeper and commercial responsible of freight wagons.	18 European railway undertakings
POST*CODE | Universal Postal Union	Postcodes and addressing data at town, locality, street, and delivery-point levels.	192 countries around the world

Access to reliable, up-to-date reference databases can contribute to customs risk management in many ways. Here are some examples:

- **Enhanced cross-checking.** Reference databases can help customs find inconsistencies across data elements and across different datasets, for example: the container type is not optimal for the declared goods, the weight of goods is unusually high given the container size, or the container ID is invalid.
- **Association of modes of transport with high-risk operators.** Current or past owners of ships, railway wagons, or containers may raise red flags and signal high-risk for customs.

- **Finding of non-existent, wrong or suspicious credentials.** Reference databases contain help customs verify addresses, identities, and entities behind cross-border transactions. Some databases enable cross-checking against sanctions lists.

3.5 Movement tracking services

Movement tracking services offer information and analytics based on tracking data on ships, trains, trucks, and other vehicles of transport as well as cargo units. These services often rely on data from satellites, ground stations as well as on-board transponders and trackers. The table below presents some of the providers of tracking services across different modes of transport.

Table 5 Movement tracking services (Source: company websites | CBRA analysis)

Data source	Description	Coverage
AIS Live | IHS Markit	Ship movement tracking with combined terrestrial and satellite AIS data.	130,000+ ships and vessels and 16,000+ ports and terminals worldwide
ISR | RailData	Railway wagon movement and status information for track and trace purposes.	About 14 millions of wagon events every month in 19 European countries.
eeSea	Data on liner networks, port-to-port transit times, vessel schedules, vessel forecasts, vessel on-time reliability, ports and terminals.	Global
Royal Dirkzwager	Real-time and historical information on vessel positions, vessel details, vessel movements and AIS information.	200,000 ship movements each year around the world.
Orbcomm	A broad range of asset monitoring services for ships, trucks, railway wagons, containers, trailers, and more.	Global

How can customs benefit from tracking services? The full range of benefits can be discovered only after customs have pilot some of the tracking services. But for the sake of discussion, here are some areas where monitoring services can prove useful for customs risk management:

- **Tracking and trace of irregular behavior**. The movement tracking services could be used to backtrack whereabouts of vessels and cargo units through a global supply chain. Red flags would include uneconomic routing (especially through troubled areas or trafficking hotspots) or unexplainable or prolonged stops along the way. Unnecessary meetings with other vessels or turning-off tracking devices (such as AIS transponders) would also signal heightened risk.

3.6 Industry certification programs

Industry certification programs offer risk data on certified companies and supply chain partners of these companies. It would be particularly useful for EU customs to obtain information about foreign companies that export goods to the EU. For the purposes of this study, the table below present two popular security-centric industry certification programs, one managed by the Business Alliance for Secure Commerce (BASC) and the other by Transported Asset Protection Association (TAPA).

Table 6 Industry certification programs (Source: company websites | CBRA analysis)

Data source	Description	Coverage
BASC certificate	The BASC certification provides visibility across the upstream supply chain of the certified companies. To become a certified company, a business must request their suppliers to become "verified" by filling out the C-TPAT auto-evaluation form.	About 3500 certified companies in 15 countries. 16,000 validated BASC business partners.
Tracking Security Requirement | TAPA	A three-level certification that represent minimum standards for transporting theft-prone products by road.	126 certified companies in EMEA (by end Q4/17)

The information these industry certification programs hold seems valuable for customs risk assessment purposes. Customs in the EU and elsewhere could leverage these databases, for instance, in the following ways:

- **Information on unknown first-time importers.** EU customs have little to no information on foreign first-time importers. Industry data might help EU customs verify importers and exporters by confirming the legitimacy of a business – and by analysing the risk associated with all trading partners.
- **Up-to-date company profiles.** Customs cannot easily monitor all changes that traders undergo. Industry data on companies could provide customs the most recent information about certified companies, for example the line of business, owners, and executive managers.
- **Enhanced cross-checking.** Industry databases can help customs to find inconsistencies across data elements and across different datasets, for example: the type of goods a company imports to the EU does not correspond the company's field of business in the industry database.
- **Association of imports with low-risk operators.** A private-sector security certificate signals an exporter's commitment to secure and safe commerce. The certification may therefore result a lower risk score and lower likelihood of ending in a customs control at arrival.

3.7 E-commerce platforms

E-commerce marketplaces have become highly popular among consumers and companies who prefer to purchase products online. From the customs perspective, foreign e-commerce platforms hold loads of useful information that could benefit customs risk assessment. Data elements of interest would include supplier's name and address, buyer's name and address, place of delivery, description of goods, value of goods, weight of goods, number of pieces, and any track and trace information (WCO 2019). Also, any complementary information about online merchants and suppliers could be valuable for customs.

Table 7 E-commerce marketplaces (Source: company websites | CBRA analysis)

Data source	Description	Coverage
Alibaba	The world largest e-commerce company that offers consumer-to-consumer, business-to-consumer, and business-to-business online sales services.	Operations in 200 countries
eBay	An international online marketplace that facilitates consumer-to-consumer and business-to-consumer sales.	Available in 180 countries

Customs could form partnerships with major online merchants and marketplaces to get access to their information on suppliers, orders, payments, and shipping processes. Closer cooperation and improved access to information would allow customs carry out better risk assessment on e-commerce goods:

- **More accurate information for valuation purposes.** Getting data directly from e-commerce operators about sales prices, weights, and shipping costs would allow customs to better assess taxes and duties of imported e-commerce goods. Customs could also benefit from up-to-date price on typical goods sold on e-commerce platforms; this information would help customs officers to determine if the declared value of the imported goods is correct and whether some goods might be undervalued.
- **Information on unknown first-time importers.** Data from multinational e-commerce companies might help EU customs verify importers and exporters by confirming the legitimacy of a business or by checking whether a certain transaction reflects the normal trading pattern of the online seller and buyer.

3.8 Summary

The seven main categories of external data look at cross-border traffic from different angles, providing unique information on international traders, transactions, and movements of goods. Industry platforms typically contain commercial data that traders and middlemen exchange to organize trade and logistics. Company information providers offer access to up-to-date data on companies worldwide.

Import and export analytics services increase visibility on global trade flows, some cases down to a trader and transaction level. Private reference databases provide a verified information on shipping containers, vehicles of transport, and other objects that move through global supply chains, including data on technical specifications, owners, as well as repair history. Movement tracking services provide information on the past and current locations of these objects. Industry certification programs offer a complementary source of information customs can use to assess risk levels of foreign traders and logistics service providers. Lastly, information from e-commerce platforms can provides customs a unique view on online trading and related cross-border delivery of goods.

4 Customs pilots on external data use

This section showcases two pilots that demonstrate how customs could use external data to improve targeting and control activities. The Belgian example is about how to enrich pre-arrival Entry Summary Declaration (ENS) data with additional information from external data sources. The Dutch example shows how customs can obtain information from online e-commerce marketplaces for the benefit of fiscal risk assessment.

The two pilots are part of the EU-funded PROFILE project that seeks to upgrade customs data analytics capabilities and to improve the use of risk-relevant data sources for customs risk management. The way how the pilots are described in this study provide only a partial and simplified view on the work that is being carried out in PROFILE.

4.1 Enrichment of Entry Summary Declarations with external data

Today, EU customs receive Entry Summary Declarations (ENS) on inbound containers 24 hours before the containers are loaded on a ship in a foreign port. In principle, this pre-loading information allows customs to carry out pre-arrival risk assessment for security and safety purposes and therefore identify high-risk containers before they arrive in the EU. However, making the full use of the ENS data has been challenging for EU customs because this data is often either incomplete or inaccurate.

One aspect of the Belgian pilot in PROFILE is to evaluate the value of select external data sources for customs risk assessment. In the long run, not necessarily during the PROFILE project, this work is expected to improve operational ENS-based pre-arrival risk assessment of maritime shipments with external datasets. The pilot seeks to enrich and validate ENS data with multiple interlinked datasets. These datasets are expected to provide additional and more accurate information on EU-bound container traffic in the maritime domain.

As the starting point, Belgian customs already uses the ENS data and many other datasets to risk assess inbound maritime containers and shipments. These baseline datasets include mainly regulatory data from traders and logistics parties, which customs receive in the form of various declarations:

- **Entry Summary Declarations (ENS).** Ocean carrier must send the ENS information to the customs at least 24 hours prior to loading a container aboard a EU-bound ship. The ENS must be lodged at the customs office of first entry, namely the customs in the EU country where the first intended port of call is intended to take place for the ship. The ENS dataset includes around 30 data elements about goods, economic operators, and routing (see Annex A for details).
- **Customs Cargo messages (Cuscar)** are combinations of customs manifests and temporary storage declarations in Belgium. Cuscar has the customs manifest, a document that lists and gives details of goods on an arriving ship, as the key component. The customs manifest, in turn, is generated with Bill of Lading information.

At arrival in the EU Customs Union, traders must clear goods for free circulation or place them under transit, temporary storage or other customs procedure. In any case, upon arrival, traders must declare their goods to customs using the appropriate forms:

- **Import declaration**, or the Single Administrative Document (SAD), is the document importers submit to customs to clear goods for free circulation in the EU Customs Union. Import declaration provides information at the level of imported goods; it does not typically refer to a container or previous declarations like ENS or Cuscar.
- **Value Declaration (DV1)** must be presented to customs when the value of imported goods exceeds 20,000 EUR. The DV1 document provides additional information beyond the import declaration, including more details for example about the parties involved in the import transaction.
- **Transit declarations** are lodged for imported goods that will be transported from Belgium to another EU country, where they are cleared eventually. Depending on the transit procedure, transit declarations are submitted using either the T1 or T2 form.

Belgian customs collect operational data systematically to manage targeting and control activities. For instance, control feedback is a critical operational dataset that allows Belgian customs to improve risk management performance over time.

- **Control feedback** is data about outcomes of physical inspections, document checks, X-ray scans, and other controls on all types of goods. The control feedback dataset contains the actual inspection results of those shipments that have been controlled. The control feedback refers to incoming shipments and containers.

The vision of the Belgian pilot is to integrate external data sources into the risk assessment process. One set of external data is obtained from one of the global container booking platforms that we call "BigDataMari" for the purposes of this study. This container booking platform provides services for shippers, their agents, and carriers to organize international shipping. The Belgian pilot uses the following datasets from the BigDataMari:

- **Bookings.** Information given by the exporter, shipper, or forwarder as part of the container booking process. The dataset contains information on shippers, consignees, forwarders, carries, notify parties, cargo, containers, and routings.
- **Shipping Instructions.** Information given by the exporter, shipper or forwarder to the carrier detailing how goods are to be shipped and delivered. The dataset includes data on shippers, consignees, forwarders, carries, notify parties, cargo, containers, and routings. The dataset contains a free-text description of the cargo packed in a container. The shipping instructions are normally used as the basis for generating Bills of Lading.
- **Track and trace.** Container tracking events sent by the carrier to the freight forwarder and shipper.

Another source of external data one of the large online logistics platforms that stores information about containers, routings, cargo, parties of the supply chain. The Belgian pilot makes use of the Bill of Ladings and tracking events available on the ecosystem:

- **Bill of Lading** is a document, created by the carrier or its agent for the shipper, that details the goods, the ship, and the port of destination. Bill of Lading represents the contract of carriage and carries the title of goods, meaning that the bearer of the Bill of Lading owns the goods (EC 2020a).

- **Tracking events.** Information on whereabouts and statuses of shipping containers.

The Belgian pilot also makes use of the Container Status Messages that are available on the ConTraffic platform of the Joint Research Centre of the European Commission.

- **Container Status Messages (CSM).** Tracking events on global shipping container traffic (locations, dates and times, statuses) provided by shipping lines. Underlying analytics of the CSM may enable to detect anomalies in container routines by comparing tracking events against vessel movement information of the Automatic Identification System (AIS).

Belgian customs administration explores how all these internal and external datasets could be linked, integrated, and used to validate and enrich ENS data for more accurate pre-arrival targeting of EU-bound maritime containers. The figure below illustrates the timings when different datasets become available for Belgian customs during the importation process.

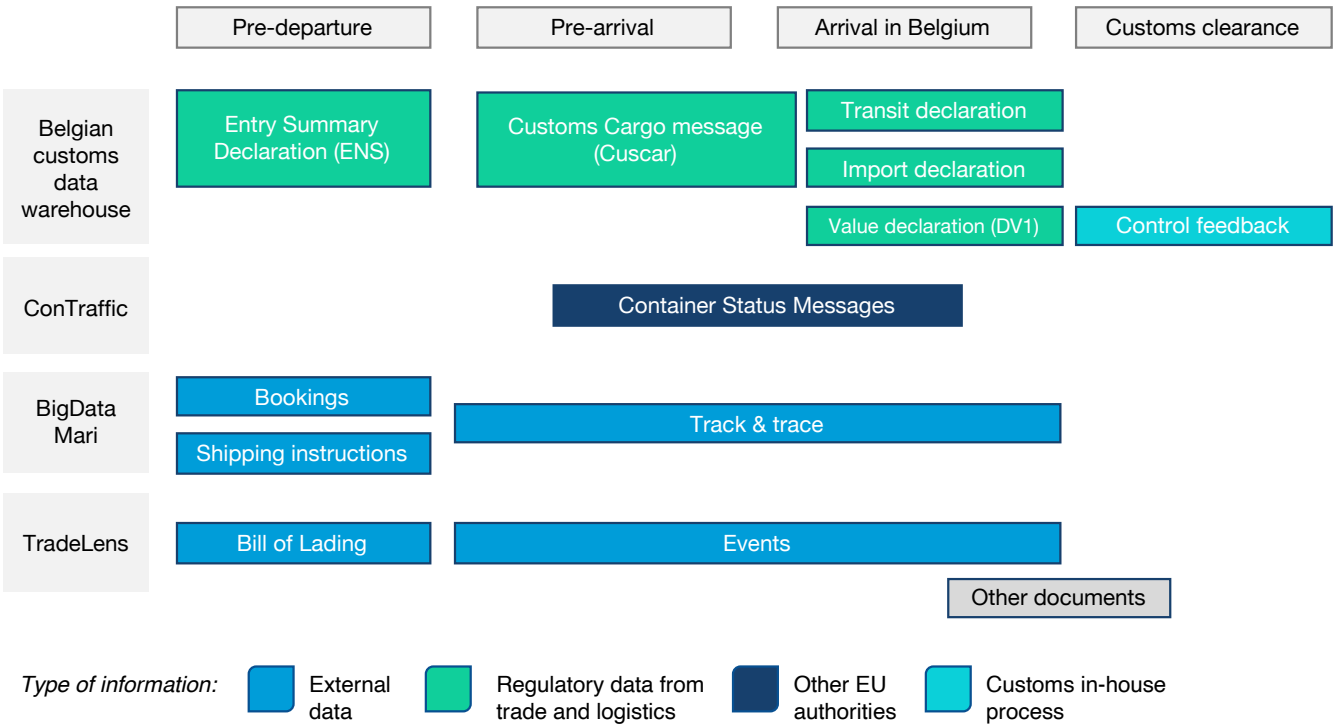

Figure 3 Timings of risk-relevant datasets during the import process in Belgium

At the moment, because the Belgian pilot is still in progress, there is no conclusive evidence about the benefits of external data on the pre-arrival targeting process. However, Belgian customs considers that certain benefits are realistic, even expected, thanks to the early access to reliable and accurate external information:

- **Enhanced cross-validation across datasets.** BigDataMari and data from the online logistics platform provide early information on EU-bound containers long before the containers are loaded on a ship in a foreign port. Booking information, shipping instructions, and Bill of Lading data provide insights on what cargo is going to be shipped, how, when, and by whom. Having access to this information allows customs to see if there are any inconsistencies between

different data sources. For example, why is not goods description the same in Entry Summary Declaration and shipping instructions?

- **Accuracy and reliability of information.** Shippers, forwarders, and carries pay attention to the quality of information they use to organize logistics for practical reasons: wrong booking data can lead to delays; inaccurate shipping instructions may result in damaged goods. For this reason, information commercial parties exchange between themselves is often of better quality than data customs receive as part of Entry Summary Declarations. Moreover, as Bill of Lading data is commercially binding, wrong or incomplete information can lead to contractual sanctions.
- **True consignors and consignees.** Sometimes Entry Summary Declarations name freight forwarding agents only and do not mention the true consignees and consignors behind a shipment. Linking ENS data with booking and bill of lading information can help customs to identify the true parties behind a cross-border transaction.

4.2 Using data from e-commerce websites for fiscal risk assessment

Web stores and online marketplaces are rich sources of information on millions of products that companies and consumers sell and buy online. This information can prove useful for custom to risk assess imported e-commerce goods. Even so, this potential remains largely unexplored because, to our best understanding, there are no direct data exchange going on between e-commerce platforms and customs today.

The Dutch pilot in PROFILE explores ways to obtain product information directly from e-commerce sites for the benefit of fiscal risk assessment. The vision is to collect product price information from e-commerce sites and use this information to estimate average prices of typical e-commerce products. These average prices could be then matched against declared values of e-commerce goods to find imports of suspiciously low value. At the end, the average prices would help the customs targeting system to estimate the fair value of a product and determine whether the declared value of an imported product is close to its fair value. A major deviation from the product's typical price range would be considered as an indicator of potential under-valuation and fiscal fraud.

The Dutch pilot involves three main components: the VENUE e-commerce declaration system, the web data retrievers designed to collect valuation-relevant website form e-commerce websites, and the user interface for targeting officers.

4.2.1 VENUE e-commerce declaration system

To start with, it is critical to understand how e-commerce imports are declared in the Netherlands. VENUE is the declaration system that authorised shippers or their agents can use to clear imported e-commerce goods. When declaring at VENUE, the authorised declarants are allowed to submit a reduced dataset part of the import declaration. For example, the commodity code (HS or TARIC) is not part of this dataset.

4.2.2 Retrieval of price information from e-commerce sites

As its main feature, the pilot develops and tests a web crawler that retrieves valuation-relevant information — mainly price data — from one the biggest international online marketplaces. The price data is eventually used to estimate average sales prices for common e-commerce goods. What is remarkable about the crawling technique is that it does not necessarily require any formal partnerships with e-commerce platforms, as long as the e-commerce sites provide suitable application programming interfaces (APIs) and do not forbid web crawling in their terms and conditions.

Natural language processing and text mining are the two key enabling technologies used for the analysis of unstructured textual information. E-commerce sites use free-form text to describe the products they have on sale. Also, e-commerce importers, who declare goods at the VENUE declaration system, provide usually only free-text goods descriptions as part of the simplified import declaration (note that commodity codes are not mandatory). The techniques of natural language processing and text mining are necessary for the accurate identification of goods based on the free-text descriptions. Only after the identity of the goods has been established it is possible to compare the declared value of e-commerce goods against the usual prices of the same goods sold online.

4.2.3 Targeting interface

Dutch customs will gradually phase out the VENUE declaration and replace it with a new, more advanced declaration system and targeting interface. The new system is designed to collect all available information on incoming e-commerce goods, risk assess declarations based on risk rules, and flag high-risk shipments for inspections.

Ideally, as part of the risk assessment, the system would also compare declared values against average online retail prices, to boost the system's ability to detect cases of under-valuation and fiscal fraud. The system would take in account available product details: goods description, quantity of products weight, and other possible information. Then targeting system would calculate the expected deviation of the declared value from the product's typical price. As a risk rule, the system would raise an alarm whenever the gap between the declared value and retail price is suspiciously large. This way, the targeting system determines whether a particular declaration and the associated e-commerce goods should be inspected in more detail.

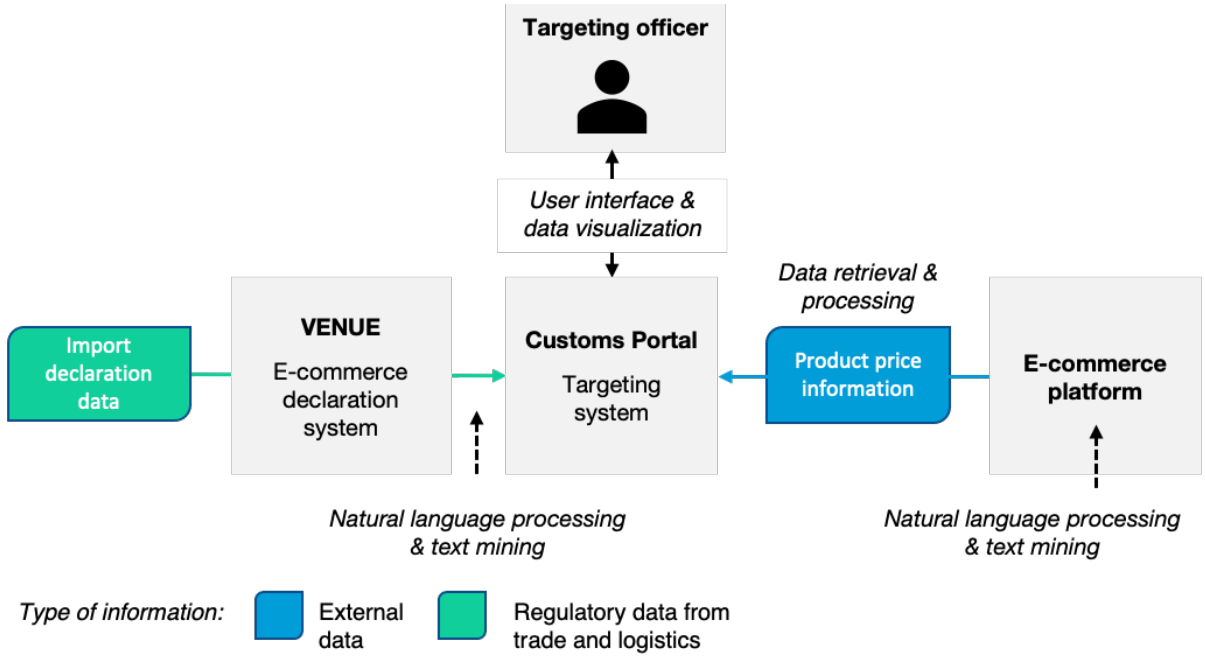

Figure 4 Overview of the Dutch pilot in PROFILE (a simplified presentation)

4.3 Summary

This chapter offers a sneak peek at two pilots that seek to use external data to improve targeting and selective customs controls. The Belgian pilot incorporates data from two commercial logistics platforms to enrich pre-arrival risk assessment. Datasets from the platforms include container booking records, shipping instructions, bills of lading data, and container tracking events. The pilot is expected to enhance customs' ability to cross-validate data across multiple datasets, improve accuracy and reliability of available information, and help customs to identify true consignors and consignees behind transactions. The second pilot with Dutch customs describes a process for obtaining information from online e-commerce marketplaces for the benefit of fiscal risk assessment. The pilot makes use of modern natural language processing and text mining technologies.

5 How to unlock the power of external data?

External data sources can contribute substantially to customs risk management processes. However, accessing to external data can be difficult for various legal, technical, and organizational reasons. Customs, like many other public and private organizations, must overcome common challenges of the digital information that revolve around privacy, confidentiality, and connectivity.

5.1 Improve quality of external data

Data quality is critical for risk assessment and a lasting challenge for customs experts. Many customs experts lament the low quality of declaration data: vague goods descriptions, incorrect HS codes, and missing sender information. The same criticism can be pointed towards external datasets that may contain inaccurate, incomplete, or poorly structured information in wrong formats. Overall, low quality data undermines risk assessment process, making it hard for customs to facilitate low-risk traffic and focus controls on the shipments of highest risks. Low data also burdens data analytics experts who need to spend considerable time to clean and prepare data.

Table 8 What does data quality mean for customs? (Source: CBRA analysis, update in BCA 2020)

Dimension of data quality	**How it is measured**
Accuracy	Is data correct and how well does it represent reality?
Completeness	Does a dataset include all critical data elements?
Granularity	Does data provide detailed enough information?
Timeliness	Is data available when it is needed?
Standardization	Is data in a standardized format?
Comparability	Can data be used with other information to support decision-making?
Variety	How many distinct sources are available?

Ensuring adequate quality of external data is a critical task for customs. But how can customs improve the quality of external data? Here are some ideas:

Co-development of data sources. Customs will find that many data suppliers are keen to improve the quality of their data assets together with customs. In a typical setting, customs would experiment with an external dataset and then give feedback to the supplier how the datasets could be improved from the customs risk management perspective.

Align with recognized standards. Internationally recognized standards offer a common basis for data management in the customs domain. The more customs follow standards like the WCO Data Model and EU Customs Data Model, the easier it is for external data suppliers to provide services that meet the needs of many customs administrations. Common rules for data formats also tackles the comparability problem of external data.

Monitor data quality. Customs can prevent deterioration of external data feeds through systematic quality control. What customs can do is to cross-validate data that can be found in multiple sources and to use physical checks to spot inconsistencies between goods and associated data. Data suppliers could be rated by the quality of data they provide.

Increase accountability. Companies and individuals are more inclined to provide quality data if they are held responsible for it. To increase accountability of data sources, customs can carry out compliance check and impose contractual penalties on those who supply poor data. A key for accountability is the understanding how different data elements are generated and where they come from.

5.2 Establish links between datasets

External datasets are as diverse as any information that comes from a multitude of organizations and that is collected for a variety of purposes. This diversity makes integration of external data sources a challenging technical task. This is a critical challenge to tackle because without data integration, customs cannot unlock the full potential of external data: integrated datasets enable more expanded and sophisticated data analysis, allowing analysts to run queries, analytics, and modeling across multiple linked datasets.

A necessary step of data integration is linking, the process of finding and connecting records across different datasets that refer to the same shipment, trader, mode of transport, or other entity. The linking results in a new, richer dataset that brings together from multiple sources and creates a single view on the data.

Sometimes two datasets include the same unique identifier that allow data analysts to establish an unmistakable link between corresponding records between the datasets. Such unique identifiers can be tracking numbers, container seal numbers, transaction IDs, voyage numbers, or DUNS numbers for businesses. The table below lists some other common unique identifiers that customs can use to link different datasets, documents, as well as shipments, modes of transport, and other physical objects.

Table 9 Potential unique identifiers for linking datasets

Unique identifier	What it is	Where it commonly appears
Master Reference Number (MRN)	MRN is used by EU customs to identify and process shipments that are transiting through or about to enter or exit the EU customs territory. MRN is issued by the customs office that validates and accepts customs declarations, entry summary declarations (ENS), exit summary declarations (EXS), and some other declarations.	Transit declarations, export declarations and certain notifications of arrival and exit (EC 2020b)
Container number	Container number is a standard alpha-numeric code that is used to identify intermodal shipping containers internationally. Managed by the International Container Bureau (BIC).	Shipping instructions, packing lists, Bill of Ladings

EORI number	Economic Operators Registration and Identification (EORI) refers to the EU-wide system for the registration and identification of economic operators.	Customs declarations, transit declarations, export declarations
IMO number	A unique identifier for ships, ship owners and management companies. Managed by the International Maritime Organisation (IMO).	Shipping instructions, Entry Summary Declarations, Bill of Lading

Sometimes, there are no unique identifiers in two datasets that would allow clear-cut linking of records. In such cases, linking becomes more complicated, but not impossible. What data analysts can do is to look similarities between records in the two different datasets. For instance, if two records occur on the same date, name the same shipper and consignee, and report the same value of goods, it is likely that the two records refer to the same shipment. Such linking keys, composed of multiple pieces of information, act as a proxy for the unique identifiers.

Linking records across multiple datasets underpins effective use of external data for customs risk assessment purposes. Here is what customs should consider to achieve reliable and productive linking of datasets.

Ensure overlap between datasets. Any dataset is limited in a sense how much information it provides on cross-border traffic. One dataset may provide information on imports of ocean-bound containers over a two-year period. Another dataset may cover data on movements of container ships in the North Sea. A third dataset may offer information on international flows of letters and parcels. In any case, the information contents of a dataset is determined by the time period, traffic type, mode of transport, and geography it covers. Understandably, records in two datasets can be linked only if the both datasets cover the same subset of cross-border traffic over the same time period. In other words, matching records can be found only in datasets that overlap at least to some extent. Consider two datasets: 1) shipping instructions for containers destined to Southern Europe between February and March and 2) bookings for containers destined to Southern and Central Europe between January and February. We can realistically find matching records for containers destined to Southern Europe in February, which is the area where these two datasets overlap (see the figure below).

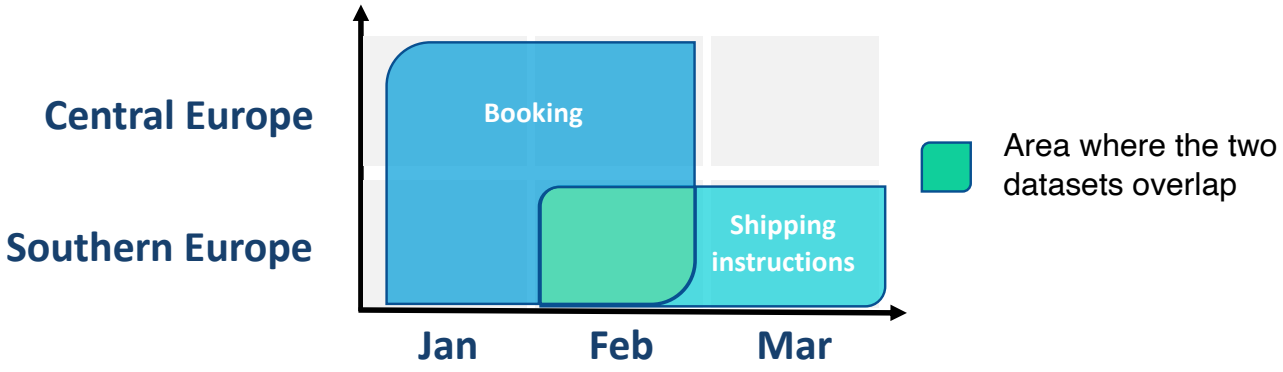

Figure 5 Illustration of overlapping datasets

Here are some techniques customs can adopt to facilitate linking of different datasets:

Create guidelines for interpreting unconventional identifiers. Suppliers of external data may tag their data with standard unique identifiers to facilitate record-to-record matching of information across datasets. Unfortunately, it is common for many data suppliers to use unconventional identifiers or to omit the identifiers altogether. To facilitate the linking process, the EU customs community could produce common guidelines for dealing with unconventional identifiers. Such guidelines could instruct how to turn unconventional identifiers into standard ones. The EU customs could create, for example, a cross-reference list for identifying businesses through cross-checking of EORI numbers, DUN numbers, and free text company names.

Understand how datasets are created. Before a dataset can be linked with other datasets, data analysts must select which data elements can be used in the linking process. This pre-linking exercise often requires deep understanding of the source dataset. Metadata is contextual information about a dataset: it provides insights into how and when a dataset was created and for what purposes. Access to metadata — any data dictionaries or other instruction documents — help data analysts to understand the source dataset.

5.3 Organize access to external data

Accessing external data can be rather complicated for technical, organizational, political and other reasons. Here are the a few recommendations how customs administrations can overcome the barriers of data access:

Compensate data owners. Data is often touted as the main currency in the information age. Most data owners recognize the value of their information and want to get compensated for sharing their data with customs. This compensation can take different forms. Some data owners charge a fee, others are satisfied with trade facilitation prospects that may come with closer cooperation with customs. Some data owners may give their data for free for research purposes, to be able to benefit from the project's findings, eventually. But no matter what incentives are at play, data owners want to get something back for sharing their precious data with customs.

Negotiate favorable terms and conditions. Contracts for external data access include many important clauses to pay attention to. Customs normally want to get unrestricted access to raw data that allow customs data analysts to run analytics on their own terms. This may be against the preference of some data owners who give their clients access to pre-curated datasets only and even force their clients to use their proprietary tools for process and analyze the data. Sometimes, data suppliers provide data access at a relatively low price at first and increase fees considerably later. For customs, it makes no sense to invest in data analytics capabilities with a certain dataset if data cannot be accessed at a reasonable cost in the future.

Data integrity concerns. Customs must demonstrate their capability to protect data to reassure concerned data owners about security, privacy and confidentiality of their data. It is not generally a problem for EU customs to receive personal data as part of external datasets because customs handle personal data elements — such as addresses, names, and phone numbers of individuals — in any

case. But privacy issues may arise if customs share this information with private data analytics companies that work with customs.

5.4 Summary

Customs worldwide have realized the potential of external data for customs risk management. Despite the vast potential, it takes time and effort to integrate external data into the targeting processes, in a meaningful way. First, because external data comes in many shapes and forms, customs administration need to often spend considerable resources to clean and refine external data into useful insights and actionable intelligence. Another issue is that it is often hard to link external datasets reliably with other records of information. A third challenge is associated with possible difficulties customs administrations face when they try to organize access to external data sources: accessing external data often involves lengthy negotiations with data owners, including bargaining over prices and contractual terms.

6 Summary and way forward

This PEN-CP annual study on external data sources explored data landscapes of the today's customs world. The study put a spotlight on promising external data sources and showed how unlocking these sources of information can benefit customs risk assessment.

We defined external data as any information that lies outside customs systems and that is not readily available for customs. External data comes in many forms: it can be open-source or proprietary information, structured or unstructured data, and available for a fee or for free. We identified seven categories of external data that can offer unique information on international traders, transactions, and movements of goods, for the ultimate benefit of customs risk management:

1. **Industry platforms** are information systems that capture digital logistics and commercial information across end-to-end international supply chains. Notable platforms include CargoHub for air cargo, TradeLens and INTTRA for sea containers, and Post*Net for postal deliveries.

2. **Company information providers** offer the latest firmographic and commercial data on companies worldwide. Notable service providers include Dun & Bradstreet and Orbis by Bureau van Dijk.

3. **Import/export analytics services,** such as IHS Markit and Descartes, provide detailed and consolidated information and analytics on imported and exported goods.

4. **Cross-validation databases** are registers and directories with verified, up to date information on goods, traders, and modes of transport, which customs can use to cross-check information they receive from other sources. For instance, the Post*Code product of the Universal Postal Union (UPU) contain address information from around the world, and the database of Bureau of International Containers (BIC) offer details about owners and operators of shipping containers.

5. **Movement tracking services** offer information and analytics based on tracking data on ships, trains, trucks, and other vehicles of transport. IHS Markit and eeSea are examples of such services. The services often rely on data from satellites, ground stations as well as on-board transponders and trackers.

6. **Industry certification programs** offer risk data on companies and their supply chains. Examples include the Accredited Agent program of the International Air Transport Association (IATA), security program of the Business Alliance for Secure Commerce (BASC), and security standardization programme of the Transported Asset Protection Association (TAPA).

7. **E-commerce platforms** like eBay and Alibaba collect lots of information on online suppliers, orders, payments, and shipping processes

What about the benefits of external data for customs? After all, accessing external data costs considerable time and money. So why should customs entertain the idea of connecting to external data sources? We have identified six ways how external data can add value to customs risk management and overall customs performance:

- **Access to additional information beyond declaration data.** External data sources provide access to commercial and administrative documents that would otherwise not be available to customs, such as payment data, transportation data, and verified company information.

- **Access to the latest information.** External data providers can help customs to maintain their records about traders, trade lanes, other important factors up to date.

- **More reliable data from the source.** Much of the data customs receive from trade is inaccurate because the information does not come from the original source, that is shippers who pack and send goods. External data sources can help customs access information like invoices and purchase orders from the upstream of the international supply chain.

- **Enhanced cross-validation.** With information from external sources, customs can better verify declaration data. Cross-checking across multiple datasets helps customs to identify shipments of high risk.

- **Earlier availability of information.** The sooner information becomes available, the sooner customs can assess risk. External data sources contain datasets like container bookings and shipping instructions that allow customs identify potential threats in advance.

- **Bigger data pool for data mining and analytics.** Modern analytics require large and detailed datasets to function effectively. External data can contribute to the compilation of larger datasets of higher quality.

This study also provided the first look at two pilots that are exploring how customs can benefit from external data. The Belgian pilot seeks to improve pre-arrival risk assessment by enriching Entry Summary Declarations with commercial information, such as booking records, shipping instructions, bills of lading data, and container tracking events. The Dutch pilot develops ways to obtain valuation-relevant information from online e-commerce marketplaces.

All in all, data-driven customs risk management is the key to smarter targeting and controls, and external data holds a great potential for expanding customs risk management capabilities. To unlock the full potential of external data, customs should forge relationships with data providers and data analytics providers. Customs should also constantly identify promising external data sources, negotiate access to them, and organize and link these data sources to existing datasets customs have at hand.

The second edition of this study will be published by the end of 2021. The document will feature more examples of external data use by customs. The study will also expand the list of external data sources and shed more light into the potential benefits of external data.

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