



Measures to Control Illicit Tobacco Trade

Hana Ross, Economics of Tobacco Control Project, University of Cape Town

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Introduction

The tobacco market, like many other markets, is subject to illegal activities, primarily related to tax evasion and counterfeiting of legal products. Since a sizable illicit tobacco market can both deprive governments of much needed revenue and undermine the effectiveness of tobacco control efforts, governments dealing with the issue have developed a set of strategies and measures for curbing tobacco tax avoidance and evasion. Many of these measures are called for in the Protocol to Eliminate Illicit Trade in Tobacco Products,¹ the first and, to date, only protocol to the World Health Organization's Framework Convention on Tobacco Control (FCTC).² This report provides a brief review of the nine key measures to control illicit tobacco trade: licensing, record keeping/control measures, enhanced enforcement, markers, tracking and tracing, legally binding agreements and memoranda or understanding with the tobacco industry, tax harmonization, public awareness campaigns, export tax and agreements with first nations and native American communities. Each measure has its rationale, its strengths and weaknesses in addressing particular aspects of illicit tobacco trade, and the best implementation strategy. The order in which the measures are described is based on the frequency of their current employment by governments.

Licensing

A license is a permission issued by a competent authority following the submission of an application and/or other documentation. Governments can require participants throughout the supply chain (e.g., tobacco growers, manufacturers, distributors, wholesalers, retailers) to be licensed, imposing obligations or restriction on them under the threat of administrative, civil, or criminal penalties. The cultivation of tobacco and the production of other materials necessary for the manufacture of cigarettes, such as filter tips and cigarette papers, is usually not

subject to licensing, with the exception of Australia that license tobacco growing.

Governments can also prohibit licensed operators from dealing with unlicensed ones, thereby creating a stronger chain of accountability. A license can be revoked if the holder breaks the law, creating economic disincentives for engaging in illegal business such as illicit production and/or evading taxes. There is also an option of a “negative licensing” scheme, where regulated entities can be specifically excluded from engaging in any tobacco business due to their previous noncompliance.³

Retail licensing is a useful tool for administering tax collection and point-of-sale laws. Linking licensing systems with recordkeeping, tax stamps/markings, and tracking and tracing system makes it more effective for reducing the quantity of contraband cigarettes sold in formal retail outlets. Background checks, enhanced enforcement, and zero tolerance also make licensing more effective. If inspectors are empowered to revoke licenses, retailers have an incentive to keep their stock clear of contraband.

Licensing should be implemented at costs as low as possible with one centralized registry and without undue administrative burden.⁴ Multi-jurisdictional licensing can create confusion and slow-response.³ Licensing will not prevent all illegal business, since some entities can decide to operate illegally without a license and some licensed entities with risk losing the license in order to engage in illegal activity.

Other control measures, such as requirements for recordkeeping and limits on quantities of tobacco products sold, can regulate the supply chain without explicitly requiring formal licensing.⁵

Recordkeeping/Control Measures

Up-to-date records should be kept by all players in the tobacco supply chain, from raw material producers to manufacturers to retailers, in order to facilitate government audits. Audits examine the

overall credibility of declared business operations in comparison with components purchased, machinery usage, declared losses, and financial transactions. Audits are often combined with physical controls that provide essential checks that operations are conducted in line with legislation and accurate records are kept of inputs, stocks, and outputs. Physical inspections should be unpredictable and made 24/7 to detect any undeclared ‘nightshift’ production.⁶

Record keeping and continuous monitoring are the most effective mechanisms to ensure that tobacco crops are not diverted to the illicit supply channel. Restricting the sale of raw tobacco to licensed/registered manufacturers can ensure that growers themselves are held accountable for the use of their crop.

In a majority of countries, tobacco manufacturers and tobacco exporters/importers must comply with recordkeeping and tax payment requirements under local legislation. Violations of these requirements may result in a civil fraud penalties or criminal prosecution.⁷

Recordkeeping by retailers should be required in order to document sales, especially to tax-exempt citizens or sales that are vulnerable to tax avoidance/evasion (e.g., sales via Internet or mail). This policy measure must be supported by an adequate number of audit officials and by enforcement. It could be difficult to administer on Aboriginal reserves, if it is seen as encroachment.³

The size of a business operation may determine its recordkeeping obligations. In the USA, for example, only those who ship, sell, or distribute more than 10,000 cigarettes or 500 single-unit cans/packages of smokeless tobacco in one transaction are subject to record keeping.⁵ The recordkeeping should not impose undue administrative burden on businesses. Therefore, it is important to evaluate and reconcile different recordkeeping requirements in multi-jurisdictional settings.³

In addition to supply chain participants, it is essential that government agencies (e.g., customs,

enforcement, tax authorities) maintain good historical records. Data assembled, for example, from custom and tax declaration forms, or during audits and tax evasion-related investigations should be kept in secure and searchable databases.

Even though recordkeeping requirements can exist without a licensing requirement, combining these two measures encourages compliance. Recordkeeping combined with adequate marking, tracking, and tracing will make enforcement simpler and cheaper. Countries can impose administrative, civil, or criminal penalties for the failure to keep adequate records.

In addition to record keeping, the government can impose various control measures such as restricting the sale of tobacco manufacturing machinery and/or the supply of other products in tobacco production only to licensed tobacco manufacturers. Similar controls could be placed on raw material inputs into cigarette production such as tobacco paper, filters, and acetate tow.

Enhanced Enforcement

Enforcement must be a part of a comprehensive strategy since it is primary designed to contain the problem, not to eliminate the root cause. Proper enforcement requires adequate manpower, both in terms of numbers and the level of training. It also requires that law enforcement agencies have the motivation, opportunity, necessary legal authority, and resources. Officials must be equipped with appropriate technology to monitor and assess the legal status of tobacco products and have the authority to directly penalize offenders.³

Enhanced border enforcement through X-ray scanners, spot checks, and strict penalties has high potential to disrupt illicit trade. However, controlling all entries to the country can require huge investments of resources given the high volume of imports to most countries, and will likely intercept only a small proportion of the illegal products crossing the border. Smugglers may consider border seizures as “the cost of doing business,” if most

shipments successfully enter the intended jurisdiction.³

Even though licensing and enhanced inspection are considered the most effective measures directed at retailers, the feasibility of licensing retailers is low in jurisdictions where retailers are too plentiful or mobile for licensing. In that case, officers should have sufficient inspection/seizure capacity to penalize the retailer in a meaningful way, potentially restricting the ability to sell any products. There should be step-up levels of punishment for first and repeat offenders.³ The effectiveness of enforcement can be improved by mandating an easily observable tax stamp or track and trace marker.⁵

Enhanced inspection and enforcement efforts should be publicized through public awareness campaigns to effectively notify consumers that distributing and/or purchasing tax-exempt or unmarked tobacco products is an illegal activity. Coupling public awareness leaflets with enforcement activities related to seizing illegal products and vehicles, and imposing large fines for distributing and/or purchasing tax-exempt or unmarked tobacco products might have a significant impact on both supply and consumer demand.³

Enhanced enforcement runs the risk of creating a larger informal distribution network. When sales move to the informal level, policy solutions become constrained, as enforcement officials can only rely on identifying illegal distributors and seizing and penalizing individuals caught selling illegal tobacco products.³

The legal system often perceives illicit tobacco cases not as serious as the possession of other illicit products, such as drugs or weapons, especially if the trade remains nonviolent. Thus, enforcement might be better directed towards the supply of illicit tobacco products, rather than the consumers. Even then, the illicit tobacco trade is usually a low priority for criminal prosecutions.³ Penalizing customers for the purchase or possession of illegal tobacco products for personal use is rare.

Additional challenges faced by enforcement efforts are the dynamic and adaptive nature of illicit tobacco markets and the need to coordinate across various agencies, participants, and levels of government.⁵

Many agencies are involved in enforcing tobacco laws, taxes, and regulations, creating immense coordination challenges for effective intervention in the illicit tobacco trade. Local, state, federal, and international agencies play overlapping roles and have different levels of interest in enforcement. Even in a single jurisdiction, cigarette regulation operates across a range of government agencies and programs. Different levels of government also have different enforcement strengths: local agencies have the most access to information about retailers, state agencies may have most familiarity with transport routes and methods, and the federal government has the greatest resources and range of enforcement powers.⁵

Although enforcement efforts may effectively reduce the size of the illicit tobacco market, the market may adapt and re-emerge in the absence of interventions that are comprehensive and coordinated. Enforcement activities must be flexible and responsive and focus on the aspects of the trade that present the greatest problems and are capable of being counteracted. Flexible enforcement can take advantage of the instability of illegal activities and intervene before new markets are established and illegal business has chance to reorganize.⁵

The impact of enforcement interventions should be systematically evaluated. It is important to keep in mind that goods other than tobacco also benefit from enhanced enforcement of anti-contraband policies.

Markers

Overview

Markers can serve up to three functions: as a product authentication tool, a tracking/tracing tool, and a revenue collection tool. They can be placed on a pack as a label or printed directly on the pack. The most commonly used markers are tax stamps, also called fiscal marks.

Markers can have overt, covert, and/or forensic security features. Overt features are intended to enable end users to verify the authenticity of a product without requiring specialized equipment. Covert features are accessible to authorized persons to authenticate a product using specialized equipment in order to protect commercially sensitive data. Forensic markers use covert markers in an overt context and provide court admissible evidence. The current best practice is to combine covert, overt, and forensic security features adding encryption and online verification as another layer of security.

There are seven main security features for printed documents:^{8,9}

- Security paper (i.e., embedded threads and watermarks)
- Special Inks and Coatings (i.e., color shifting, fluorescent inks, coatings, invisible printing)
- Complex Imaging (i.e., fine line graphical backgrounds and borders, watermarks, microprinting, embedded images)
- Secure Appliqués (i.e., optically variable devices such as holograms, foils, hidden marks)
- Informational Add-ons (i.e., magnetic strips and RFID chips that contain bearer or other unique information)
- Calculated or Changeable Content (i.e., check digit numbering and images that alter after copying)
- Laser coding
- Taggants

Product marking permits the unique identification and authentication of a product, thus providing an effective mechanism for enforcement by identifying illicit products and increasing the probability of their confiscation. The authentication process confirms the validity of a product's characteristics, and can be done in an offline or connected mode, with and without a device. Using only online technology can be limiting due to the reliance on network connectivity. Markers such as taggants or invisible inks can be used for offline authentication using special

equipment. There are also hybrid smartphone applications that allow users to confirm authenticity without a network connection, but the user can also connect to a wired or wireless network to send and receive data for authentication.¹⁰

Proper implementation of markers can help retailers avoid unknowingly selling contraband cigarettes but does not address sales via informal channels. Unfortunately, illegal products are often sold through informal networks, such as friends, which are outside the purview of formal retail inspection officers. Regardless, maintaining the formal retail channel contraband-free is important because it limits the distribution of illicit products and deters those consumers who are wary of purchasing cigarettes informally.

Markers can assist tracking and tracing if they contain data required by the tracking and tracing system. Markers can contain information on date and location of manufacture, manufacturing facility, machine used to manufacture products, production shift or time of manufacture, product characteristics, warehousing and shipping data, the intended shipment route, data on first and subsequent customers, and the intended market of retail sale. Data stored in a marker must ensure a unique identification that is not predictable. This is achieved by product serialization, the process used by manufacturers to assign and mark each of their products with a unique identifier. Encryption of the unique identifier will provide an additional security advantage for a traceability system while asymmetric encryption provides a mechanism to segregate keys used for encryption and keys used for decryption. Combining the authentication and the traceability roles of markers provides a robust mechanism to combat illicit tobacco trade.^{11,12} This is achieved because the traceability information is tied to the physical goods themselves.

Fiscal markers (tax stamps) are not only revenue collection tools but they also allow for trade and revenue analyses (e.g., revenue projections and actual amounts collected) and can be linked to other government data systems to assist with audits. Tax

stamps help authentication since they are easily recognized by the public. Some jurisdictions require different stamps on the same tobacco products to distinguish, for example, domestic products destined for local market, imported products, and products for duty-free shops.

Markers are applied at manufacturer or exporter/importer sites. Since marking imposes some additional costs, there can be some resistance to implementing it. Therefore, the process of applying markers should be as simple as possible, with minimal intrusion on smaller businesses in order to secure adoption. Experience from other sectors stresses the importance of collaboration between the industry and regulators.¹³ When changing to the a new system, there has to be a provision for dealing with products already in the market and the public, including distributors and retailers, needs to be informed/educated about the change and its purpose.

Markers are ineffective if they can be easily counterfeited, if the end users can be easily confused about the authenticity of the visible marking, if marks are not applied on all products (including those destined for export or duty-free zones),¹⁴ or if the marking policy is not adequately enforced. If the data imbedded in markers do not allow for full tracking and tracing, their impact in terms of combating illegal trade are limited.¹¹

Markers should be applied in such a way that they cannot be reused or removed without being defaced or causing damage to the pack—otherwise they may be recycled and give a false impression of authenticity. A 2015 analysis of the security features of EU tobacco trade¹² reports a strong preference for applying markers by means of label directly near the top of the tobacco pack over the opening, and under any clear wrap material. A label can capture a greater range of security features and it can be produced in a secured and controlled facility. A label provides implementation flexibility, choice of security elements and compatibility with different volume of production and packaging method. The report also recommends periodically (every 3 to 5 years) assessing and upgrading the security features.

In practice, fiscal markers carry a different amount of information and possess more or less advanced security features. For example, Romania has one of the most advanced tax stamps in Europe. It carries a unique serial number, a bi-dimensional bar code, the name and the ID number (or Country code and the VAT number in the case of registered consignees) of the economic operator, a generic product code, a hologram and other security features such as background aura and microtext. The scanning of the bar code allows access to metadata encrypted in the stamp.¹¹ On the other hand, UK prints a simple visible fiscal marker on cigarette packets and pouches of hand rolling tobacco. This marker cannot identify who produced/imported the pack.¹¹

Markers currently used for tracking and tracing tobacco products

*Barcodes*¹⁵

The first barcodes stored information in patterns of parallel lines of varying width and spacing from each other. The newer two-dimensional matrix barcode stores information in patterns of dots, circles and images. Most consumer goods bear barcodes that are printed directly on the packaging and are used mainly for sales and inventory tracking. A barcode stores a Unique Identifying Number (UID) that refers to a product's brand category and the country where the barcode was issued. Barcodes can be scanned at every stage of transport and that information is sent to a data server that allows the identification of a package's precise location at any time during its shipping. The advantage of barcodes is their low costs and international standardization (barcodes can be read by standard scanning machines or readers that don't need a specific computer program to transmit the data). Their disadvantages are labor intensity, because of the scanning of the codes, and a low level of security, because they are visible and easy to counterfeit or to cut.

Invisible ink

A new generation of high-tech, digital tax stamps use invisible ink and feature a unique, covert code with

data for each cigarette pack. The information imbedded in the tax stamp can be uploaded to a Central Data System and allows for authentication of products.¹⁵ In addition, invisible ink enables authentication without the use of a network, because marks can be made visible through heat, UV illumination, or infrared light.¹⁰

The advantage of invisible ink techniques is security: the ink is invisible and difficult to counterfeit. The disadvantage is that scanners for reading the code are developed specifically for each supplier of invisible ink and for each country. It means that law enforcement outside a given country cannot read the codes unless they are provided scanners for that particular country.¹⁵

Code Verification System (CVS)

CVS is a 2D barcode that uses a unique encrypted 12-character alphanumeric code to identify and authenticate a cigarette pack. The code, generated by the brand holder and linked to a digital signature, can be read by a human or by a computer. By entering the code in the database or scanning the code, a code-verifying computer program will determine whether the code is authentic or not. The code has information about the place of manufacture, the machinery, the date and time of production, and the brand.¹⁵

CVS is a part of the PMI Codentify system. PMI reports that the application of the codes to product packaging has a minimal impact on the manufacturing process. A similar system is also used for checking the authenticity of cigar boxes. The code is placed on a cigar box before it is sealed and on a paper ring put around each cigar before it is wrapped in cellophane. A cigar smoker taps the code into his mobile phone and gets back a text that verifies authenticity.¹⁵

CVS has relatively low cost¹², it is easy to administer, and it facilitates international collaboration since it does not require a country-specific device to read it, unlike invisible ink codes. However, codes on individual packs are not linked to the unique coding of the cartons or master cases, thus cannot be a part

of a tracking system. The CVS code is human-readable, thus easy to counterfeit,¹⁶ and counterfeited codes are detected only if the same code is submit for verification more than once.¹²

Holograms

A hologram is a 3D image that changes as the position and orientation of the viewing system changes. Holograms represent a major overt security element that cannot be reproduced using printing techniques, thus considerably undermining the counterfeiting risk. Visual authentication of holograms does not require any special skills or device, making holograms a reliable and convenient tool for prompt product authentication by both experts and ordinary customers. On the other hand, most people do not know what holograms should look like for most products and may recognize only the most famous hologram (e.g., Microsoft). Therefore, holograms do not protect consumers as well as optical ink technology.¹⁷ In addition, holograms are more expensive compared to ink technology. Holograms have been widely implemented in Euro banknotes, for example.¹⁸

Taggants¹⁹

A taggant is a chemical or physical marker added to inks or base materials that can be traced and used to authenticate a product by means of a proprietary miniature electronic reader. While invisible to the naked eye and generally irremovable and irreversible, taggants are uniquely encoded into the packaging. This technology disrupts the smooth functioning of the printing process and substantially increases production costs but can generate court admissible forensic evidence.²⁰ Taggant detectors, such as laser pens, UV light, or microscopes, operate offline, therefore are not dependent on network connectivity.¹⁰

Radio Frequency Identification (RFID)¹⁵

Radio-frequency identification (RFID) can be either passive (it stores data that can be read) or active (it sends data). The system transmits a unique serial number in order to identify an object wirelessly using

radio waves. It consists of readers and “smart tags” — microchips attached to antennas. When it nears a reader, the tag broadcasts information stored in its chip. Readers can scan smart tags automatically when pallets with products bearing the tags pass along conveyor belts and through loading bays. RFID systems are easier to manage than barcodes and don’t require manual scanning. However, the technology is more costly than using barcodes or invisible ink: RFID tags cost US\$ 1.55 to US\$ 2.06 a tag, and a reader costs between US\$ 100 and US\$ 1,000. As a result, RFID is currently cost-prohibitive at the pack level, but can be used for master cases.

Additional concerns are the security of the system and protecting privacy if the microchip tags remain on packs once they are purchased, potentially identifying individual consumers. The use of RFID is already widespread in many areas such as passports, transportation, ticketing, baggage tracking in airports, and livestock tagging. Lowering its cost and updating the technology will create new opportunities. If cost-effective tags enter the market, the possibilities for RFID would expand quickly. RFID has been used with limited success by Walmart.

*Cryptoglyph*¹⁰

Cryptoglyph is an alternative authentication technology that involves embedding an invisible digital marking on the packet or on any outside packaging, without changing the packaging design or flow of production. It adds a pseudo-random pattern of invisible micro-holes (60 microns) into the fabric of the packaging material. To authenticate a product, a smartphone app is positioned over the item and if the correct pattern is registered, a positive authentication message is delivered. This significantly reduces human error and the danger of phone or code hacking. In addition to a smartphone, other everyday electronic devices such as a flatbed scanner or a standard USB microscope connected to a regular PC operating system can be used. Cryptoglyph has the same advantages as a digital tax stamp, but it eliminates the need for complex installation machinery at production lines, and is therefore less expensive to implement.

Table 1 provides a comparison of various marking solutions employed by different industries.

Table 1**Comparison of marking solutions used by various industries²¹**

	Industry				
	Pharma- ceutical	Consumer products	Logistics/ postal service	Airline	Firearms
Criteria					
Marking systems used	2D DataMatrix second generation (Gen-2) electronic product code (EPC) ² RFID	1D DataBar 2D DataMatrix Gen-2 EPC RFID	1D DataBar 2D DataMatrix Proprietary marking	1D DataBar 2D DataMatrix	Proprietary markings
Human-readable?	Yes – serial number is always printed in plain text	Yes – serial number is always printed in plain text	Yes – serial number is always printed in plain text	Yes – serial number is always printed in plain text	Yes
Machine readable?	Yes	Yes	Yes	Yes	No
Unique identification?	Yes – serialized number	Yes – serialized number	Yes – serialized number	Yes – serialized number	Yes
Use of standard codes	GS1 codes: Serialized Global Trading Identification Number (SGTIN) ³ etc.	GS1 codes: SGTIN, SSCC, etc.	GS1 codes: SSCC Proprietary coding schemes	IATA proprietary coding	National proprietary coding systems

Notes: An Electronic Product Code (EPC) is a unique number used to identify a product at item level. It is electronically recorded in an RFID tag. SGTIN is Serialized Global Trading Information Number standard, an internationally recognized coding standard. SSCC, Serial Shipping Container Code, is used by companies to identify a logistic unit such as a case, pallet or parcel.

Tracking and tracing

Overview

The main objective of tracking and tracing is to facilitate investigations into tobacco smuggling and to identify the points at which tobacco products are diverted into illicit markets.

Tracking is a proactive crime prevention tool that involves systematic real time monitoring of the movements of products through the supply chain. It often involves the installation of an advanced anti-counterfeiting system at the start of production, systematic control throughout the supply chain, and audit measures at the point of sale. *Tracing* occurs during or after enforcement action (e.g., seizure or investigation audit) and involves reconstructing the flow of merchandise to identify the point of diversion into illicit channels. It increases the probability of identification of those involved in illegal activities.

Tracking and tracing monitors tobacco products produced and traded legally, provides an incentive for adherence to legal export practices, and identifies countries, areas, and ports where cigarettes are routinely lost.³ Although tracking and tracing will not be able to monitor production by illegal manufacturing facilities and counterfeit product manufacturers, it will be able to identify products that are not properly taxed.⁵ However, the majority of cigarettes seized globally are legally manufactured cigarettes.²²

An effective track and trace system needs to perform several functions:

- verify the volume produced/imported,
- verify the correct tax payment,
- track the products through the supply chain,
- trace the products back to its source, and
- authenticate the product.

The installation of automatic cigarette production counters at each production line permits the detection of trade anomalies and ensures that all duties/taxes are paid at the time the product is manufactured. Product markers applied at the manufacturer or at exporter/importer sites need to contain data that allow for tracking and tracing and assist the authentication process.

The minimum data needed for effective tracking and tracing required by the WHO Protocol to Eliminate Illicit Trade in Tobacco Products¹ are date and location of manufacture, manufacturing facility, the intended market of retail sale, and product description.²³ Other possible data that can be collected include data on the machine used to manufacture tobacco products, production shift or time of manufacture, data on the first and subsequent customers, and the intended shipment route.²⁴ A comprehensive system can also collect data on brand names, trademark holders, harmonized tariff schedule numbers, customs duties and payment record, taxes paid and payment records, information on whether the goods have been previously reported stolen, destroyed, seized or returned to the manufacturer, and information about the date and location of intended destruction.²⁴ One of the governing principles for global tracking and tracing proposed by the WHO Secretariat is that the systems be designed to prevent illicit trade, and not to access supply chain data.²³

Tracking and tracing systems must be tailor-made to fit the country's specific situation in terms of tobacco supply chain (both legal and illegal). Any variation of the system must ensure that all legally manufactured and imported unit packs are marked (including products for export) and that the aggregation is possible (i.e., individual packs codes are linked to the unique codes on cartons, master cases and palettes). Marks placed only on master cases or pallets help with business logistics, but do not offer the security provided by tracking and tracing.

The effectiveness of track and trace systems is enhanced by implementing features resistant to manipulation by using for example, irremovable and indelible markers, unique identifiers, apparently

random serialization or non-sequential numbering on packs. An individual algorithm may still be copied, but a quick check with the database will identify duplicates or invalid serials.⁹

Even elaborate tracking and tracing systems are generally non-intrusive and require only minor adjustments to production lines.²³ The costs of establishing a national tracking and tracing system vary by country. The main factor affecting the direct costs are the size of the market, the product mix, the scope of domestic manufacturing, imports and exports, the operational complexity, the comprehensiveness and the length of the contract with a vendor, the level of industry concentration, the implementation strategy, functionalities (e.g., integration with existing operational systems, required data analysis), financial factors (e.g., financing arrangement, and the degree of customization. In many cases the per-pack price of a comprehensive solution is lower compared to a simple tax stamp solution if the contract with the vendor providing the track and trace solution covers a sufficiently long period. There will also be costs associated with linking a national system to the global tracking and tracing system, but these can be reduced if a global information-sharing center develops a uniform software solution shared by multiple countries.²³ The indirect costs of tracking and tracing systems are related to the establishment of a legal/regulatory framework (e.g., enforcement costs and public information costs) and to stakeholders' resistance.²⁵ Countries can require the tobacco industry to bear the costs of adopting a tracking and tracing system. Financing arrangements with the system's provider are usually also an option.²⁶

A cost-benefit analysis on implementing a tracking and tracing system in the EU published in 2015 took into account costs of manufacturers, distributors, and state authorities and concluded that the benefits in terms of additional tax collection will be at least twice as large as the costs.¹² The solution that combined the tracking and tracing with the security markers would cost about 0.0090 Euro per pack.

Box 1

The best practices of tracking and tracing system²⁷

- Real time control on all production lines with real time secured data transmission to a government authority;
- Tracking and tracing codes activation on production lines;
- Independent real time control of aggregation on all production lines with real time data transmission to a government authority;
- Linking stock keeping unit (SKU) labels and logistic codes with the tracking and tracing code;
- Integration of the tracking and tracing system with a computerized system for monitoring movements of excise goods for which no excise duties have yet been paid. This will allow physical control of declared goods;
- A push-button device capable of immediate and unequivocal authentication of fiscal marks, confirmation of genuine products, fulfilment of excise obligation, verification of tracing information, and uploading information for reporting of audit results

The vital components of the tracking and tracing system are the independence, security, and reliability of the system; these require strict and exclusive control and enforcement by governments.²³ Tracking and tracing will only be effective where the manufacturing, export/import, and distribution of tobacco products are strictly controlled, products are authenticated and inspected with the transit document management in place, data are stored and managed by an independent entity, and the system allows for global/international information-sharing and collaboration of all stakeholders. The global

information sharing will require standards' harmonization across multiple markets, and might be vulnerable to hackers.

The system requires both digital and physical control of goods²⁷ and its effectiveness is enhanced by a licensing requirement for manufacturers and distributors. The best practices of tracking and tracing system are summarized in Box 1.

Tracking and tracing regimes serve several main stakeholders, but must primarily meet the needs of revenue authorities (including customs), police, and prosecutors. Tracking and tracing enhance tax revenue due to lower tax evasion, but also due to the reduced opportunity for forestalling (pre-purchasing of tax stamps with lower tax rate before the rate is increased is no longer possible, because the tax is due at the time of applying the tax stamp on the product). It facilitates tax collection and revenue planning by generating data that can be analyzed. Tracking and tracing helps with law enforcement and the fight against organized crime by providing court-admissible evidence. Further, it assists the Ministry of Health in promoting public health by reducing tax evasion, therefore increasing tobacco product prices. It helps legitimate producers deal with unfair competition, and facilitates supply logistics because greater transparency of inventories and demand patterns can improve efficiency and reduce costs of business.⁹

The success of tracking and tracing can be measured by an increase in tax collection, but since it is sometimes difficult to separate increases in tax collection from the impact of tax increases, an even better measure of success is the increase in legal production and in number of legal entities manufacturing tobacco products.

Treaties and agreements containing obligations for tracking and tracing other products already exist:²⁸ The Convention on the Marking of Plastic Explosives has been in force since 1991, and the Protocol against the Illicit Manufacturing of and Trafficking in Firearms, their Parts and Components and Ammunition has been in force since 2005. Under the Firearms Protocol Parties are obliged to require

unique markings to be placed on firearms in order to identify and trace them. The Firearms Protocol recognizes that various systems exist and allows Parties to adopt their own systems, as long as Parties agree to share the required information in the prescribed manner.

Other industries such as food, pharmaceuticals and postal shipments use tracking systems, but yet do not employ a fully operational international track and trace regime, with international standards. Even though industries sometimes use proprietary solutions, there has been a shift towards globally recognized standards such as GS1 (see below).

Companies offering tracking and tracing

There are two primary approaches to tracking and tracing. One is based on IT/data processing (digital security) and the other on security printing (material security).

IT/data processing companies focus on data collection and logistics capabilities that cut across different systems such as Enterprise Resource Planning (ERP). Their strength is the ability to deal with a large amount of data from various stakeholders in different stages of the supply chain.²⁹

Security printing companies offer product authentication and secure printing technologies (e.g., invisible inks, holograms, taggants). Some of these companies offer tax stamps with tax verification, authentication, and track and trace functions, which could be integrated into the existing business and IT processes and communicate effectively with other systems. For example, Quick Response (QR) codes or coding foil with data can be incorporated into holograms to provide integrated track and trace authentication solutions.²⁹ Most of these companies offer proprietary technologies to protect themselves from the competition and do not comply with open standards.²⁹

According to a KPMG report,³⁰ the IT/data processing approach is better placed to meet the WHO Protocol to Eliminate Illicit Trade in Tobacco Products for numerous reasons; it is capable of

handling the large volume of data produced by a high volume product such as cigarettes, has greater capacity to aggregate product units and preserve the parent/child relationship, can be operated by other parties (the printing companies prefer to retain direct control, which can hinder collaboration), and is compatible with open standards and a range of applications, which facilitates data sharing.²⁹

The following list of companies offering tracking and tracing is an attempt to order them in terms of their degree of experience with the tobacco sector, starting with the most established solution providers.

SICPA (Switzerland) and affiliates

SICPA offers a comprehensive tracking and tracing solution, including a combination of IT and security-ink technologies, that can be implemented as modules in phases. By acquiring Meyercord Revenue Inc, it strengthened its tax stamp proficiency. The SICPA track and trace system for cigarettes is currently implemented in 12 countries/states.³¹

SICPA's digital tax stamps allow for effective tracking and tracing; they carry information about the brand and manufacturer's name, the facility where the products are produced, the time the stamp was produced and purchased, and more. The system requires distributors to place an order for tax stamps with a designated government authority. After the authority verifies and approves the order, the distributor fulfills the order by delivering encrypted codes and authorizing digital stamps.³² The marking equipment is fully integrated into manufacturing operations, but is not owned nor operated by the manufacturing companies. SICPA marks the products with unique codes that are not human readable and cannot be altered by the manufacturer, to ensure integrity of the data.³³ The system allows for instantaneous transfer of cigarette production data to the designated government authority, linking the SICPA code with manufacturer's logistics codes such as the stock keeping unit (SKU) number, and aggregating packs to cartons. Distribution monitoring consists of the processing of shipment and reception

data, waste data, and random checks in retail outlets.³³ The government owns the data and often shares it with the producers, which assists them with quality control.

Meyercord Revenue offers stamps with multilevel security features (HD barcodes with dot patterns), enhanced adhesion, transfer properties, and optimized enforcement tools. It currently provides tobacco tax stamps for Ohio, Minnesota, Maryland and New York.

SICPA systems allow law enforcement to obtain court-admissible evidence such as legal proof of the illegitimacy of fraudulent products.

The system is designed for use at the national level, because it does not use international serialization standards. Opinions on its usefulness on the international level differ. There are suggestions that it can help to track and trace products internationally, but some claim that it does not allow for international data exchange, therefore cannot help investigators to trace the manufacturers and traders when cigarettes are seized abroad. Critiques of the SICPA system also point out that it may be cost-prohibitive for developing countries.³⁴

The costs of a SICPA marking and track and trace system varies based on multiple factors listed in the overview section but are primarily driven by the level of service provided and the required level of customization. The most comprehensive solution costs around US\$ 0.02 per pack/mark. Here are examples of SICPA prices in selected countries in selected years:

- Turkey 2007: US\$ 0.00436³⁵
- Brazil 2011: US\$ 0.01845¹⁵
- Kenya 2012: US\$ 0.02300–0.02400³⁶
- Malaysia 2013: MYR 0.055, or USD 0.02000³⁷
- Albania 2010: 0.03 Euro, or US\$ 0.04000 (a fiscal stamp with hologram cost 0.01 Euro, or US\$ 0.01300)³⁴
- SICPA bid in Philippines 2010: Po.62 (US\$ 0.01300)³⁸

In 2010, a SICPA stamp application machine cost US\$ 125,000 – US\$ 150,000 for manufacturers or large wholesalers; a scanner for retailers cost around US\$ 800.³⁴ SICPA offers financing for the system's implementation.

In its 2012 presentation to the EU Commission, SICPA assumed that its system will be self-financing if the declaration of taxable products increases by 1.6%, after which the system will be income-generating.²⁵

Codentify (global)

Codentify is marketed as a technological solution for tracking and tracing and digital tax verification.³² It is patented by Phillip Morris International (PMI), who licenses it free of charge to its three major competitors: British American Tobacco, Imperial Tobacco, and Japan Tobacco International). These tobacco companies signed an agreement in 2010 to collectively promote Codentify and to establish the Digital Coding & Tracking Association (DCTA).

Codentify is a digital marking system based on CVS code with a primary focus on authenticating products, not on tracking/tracing or revenue protection.³⁹ It uses a visible and unique encrypted 12-character alphanumeric code printed onto tobacco packs and cartons to identify and authenticate each package, but it does not currently incorporate any physical security features.²⁹ The code is automatically generated by a machine following a permission issued the brand holder and contains information on date and time of manufacture of the product, manufacturing facility, machine used to manufacture the product, brand information, pack type and size, destination market, and price and tax level. The code allows consumers and law enforcement agencies to check the authenticity of individual packs via phone line and/or website.³²

Codentify codes on packs and cartons are not linked with the markers of master cases and pallets, which are company specific, i.e., each tobacco company uses its own system for marking master cases and pallets⁴ following GS1 standard.¹² For example, PMI uses “U-track,” which marks each master case with a unique,

machine-scannable 2D barcode before selling it to a first purchaser. This barcode contain information such as the first purchaser's name, the order number, the shipment date, the destination of shipment, the point of departure from the factory or warehouse, the consignee to whom the product was shipped, and intended market of retail sale. This information can be linked to the sales price and the invoice of shipment to the first purchaser. In sensitive markets, where smuggling is likely, the database has information on second purchasers.¹⁵

The PMI master case database is searchable 24 hours a day by the order number or master case barcode number. The data is managed by PMI, but access can be granted to authorized persons (i.e., authorized members of relevant agencies) who can send an email to the database with the master case barcode number and get an automatic reply.¹⁵ In Europe, for example, OLAF has access to this data. The database also provides numerous benefits to the tobacco industry by helping it to build stronger relationships with customers via loyalty programs and promotions.⁴⁰

Codentify is frequently portrayed as less expensive than alternative systems developed by the security industry. A 2008 EU estimate shows the cost of US\$0.0001 per pack.⁴¹ The Codentify bid in the Philippines in 2010 demanded P0.10, or US\$ 0.002 per pack.³⁸

Codentify has multiple weaknesses. First of all, it does not allow for aggregation—the code printed on the pack is not linked to the unique coding of the cartons or master cases and is not part of the recorded data for the tracking and tracing regime.¹⁶ This means that it does not support tracking, even though it has some tracing capability.²⁶ Second, the codes are not stored and are visible/human-readable, thus easy to counterfeit.¹⁵ Counterfeited codes are detected only if the same code is submitted for verification more than once.¹² If a code is submitted twice, the system cannot determine which of the two products with the code is genuine. Third, smugglers became quickly aware of the coding system on the master cases and either repack the cigarettes into new master cases or cut the codes from them.¹⁵ Fourth, the verification of the product's authenticity

can only be done by linking to a network, therefore requires a phone call, sending SMS, a dedicated mobile app, or access to a website. This makes the system less reliable and secure compared to invisible ink or taggants.¹⁰ Fifth, smaller tobacco manufacturers seem to be reluctant to use Codentify because it would require them to provide sensitive data to their much more powerful competitors.⁵

Codentify is based on self-regulation and trust; it was developed in order to prevent the imposition of a neutral third-party technology. It leaves strategic fiscal data under control of the tobacco industry, which constitutes a conflict of interests.³² The evidence suggests that the industry's effort to promote Codentify is motivated by achieving these goals:

1. To establish alliances and partnerships with authorities at national and international levels to position the tobacco industry as part of the solution to the illicit tobacco trade and increase its ability to influence developments in this area.
2. To concentrate the debate on counterfeit instead of other elements of the illicit tobacco trade, notably the smuggling of cigarettes manufactured by the members of DCTA.
3. To keep tracking and tracing, authentication, volume control, and tax verification under industry control; replacing tax stamps with Codentify would require delegating the power and technology for tax collection from government to industry, which represents an obvious conflict of interest.
4. To ensure that intelligence on the illicit tobacco trade remains under tobacco industry control so that such data can be used as part of the industry's efforts to undermine tobacco control policies, such as plain packaging or tax increases.
5. To avoid the imposition of potentially superior solutions for tracking and tracing systems provided by independent third parties.

The tobacco industry promotes Codentify as a track and trace solution for the WHO Illicit Trade Protocol. Yet, when lobbying on standardized packaging, the industry claims that Codentify code on such packs would not provide product identification or security. These arguments are not consistent.⁴

A study commissioned by the WHO Secretariat points out that Codentify does not meet all the Protocol requirements, particularly the requirement that the tracking and tracing system be controlled by the Parties to the Protocol.²³ In addition, several government-authorized persons reported that they were granted access to a limited set of information that only enables users to verify the authenticity of the product.⁴²

Despite these weaknesses, the Codentify system has been endorsed by Interpol, which announced in July 2012 that it would make the system accessible via the Interpol Global Register (IGR). Prior to this endorsement, Interpol accepted a donation of €15 million from Philip Morris International, which raised serious concerns among public health advocates and Parties to the WHO FCTC.³⁷

As of 2014, the Codentify system has been applied only on approximately 5% of the total production lines within the EU. This is relatively low coverage given that the PMI agreed in 2004 to develop, adopt, and maintain a tracking and tracing system in the EU and tested it in March 2007.

ATOS (France)

Atos is an international information technology services company with 40 years' experience with public sector projects focusing primarily on European markets. It offers serialization, tracking and tracing, authentication, and verification of products. ATOS has developed the technology for Codentify.

GS1 (global)

GS1 provides an IT/data processing-based solution. GS1 is a neutral, not-for-profit global organization which designs and implements global standards aimed at improving the efficiency of supply and demand chains globally and across sectors.

The GS1 traceability standard is a process standard that defines business rules and minimum requirements to be followed when designing and implementing a tracing system and is independent from the choice of enabling technologies. The GS1

uses the open standard called EPCIS that defines interfaces enabling logistics events to be captured and queried as they occur in the supply chain. Although the EPCIS uses the Electronic Product Code (EPC) as identification schema, it does not apply any restrictions, can work with any ID schema, and can be adapted to a particular domain by, for example, an extension of the event format to capture new data fields in the event message or new event types. GS1 standards and certified event repositories also allow interoperability between systems sharing track and trace information.

GS1 is the most widely used open source supply chain standards system in the world, has member organizations in over 100 countries, and has been endorsed by the International Organization for Standardization (ISO) and the European Committee for Standardization.²⁸ The GS1 traceability standard is compatible with ISO standard 22005.

3M (USA)

3M Company offers both IT and security-ink technologies that allow for serialization, tracking and tracing. Their secure supply chain system creates and assigns a unique identifier, which is managed by a secure database and allows products to be followed from production throughout distribution and down to the retail level. A secure website allows consumers to validate the authenticity of their product. 3M uses Radio frequency identification (RFID) as its track and trace solution, and their main domains are libraries, power and mining installations, telecom, the oil and gas sector, railways, and airports.

De La Rue (UK)²⁴

De La Rue provides an IT/data processing solution based on secure stamps and unique codes. The codes are securely stored and applied to individual products; they permit the addition of new data and can be linked to other databases. They capture parent/child structures and allow consecutive consignees to authenticate the products and wholesalers or retailers to register them. Along the way, product specific information is transmitted back to the government agency that reviews and analyzes

the data, responds to alerts, and investigates revenue losses. The codes are stored in a Centralized Secure Data Center, which is government controlled and operated. The system enables government officials to track activity and verify products quickly in the field. De La Rue has a proven record of implementing successful government revenue programs.

EDAPS (Ukraine)⁴³

EDAPS offers a track and trace solution that uses security printing to prevent tax stamp counterfeiting combined with an IT solution system. EDAPS can provide tax stamps, software, project management, training as well as production machinery and tools.

EDAPS uses holographic security elements (HSE), encrypted information, electronic lithography, advanced demetallization technology, anti-scanner background grids, pseudo-embossed images, micrographics, microtext, elements printed with visible and invisible UV inks, thermochromic ink, and other security features. This makes any forgery of tax stamps immediately and easily recognizable.

EDAPS supports the printing, circulation, and verification of tax stamps. Tax stamps are printed or applied using universally available equipment that generally forms an integral part of packaging lines, making tax stamp serial number or barcode verification easy to do with the naked eye, via the Internet, SMS, or smartphone.

The tax stamps have a unique number that is a combination of a regional and a multidigit code and allows tracking and tracing of tax stamps throughout the supply chain. The tax stamp number is printed in special ink that changes its color when it is permeated through the entire layer of the stamp and is clearly visible on both sides

The track and trace system allows online and real-time reporting and accounting that links data on production, tax stamps, and tax revenues.

According to a SICPA representative, EDAPS is currently not a serious competitor for SICPA or any global companies offering track and trace systems.

*Complete Inspection Systems (USA)*²⁹

Complete Inspection Systems (CIS) offers security printing systems and claims that its 2D barcode is the most advanced in the world. It is a new encrypted HD barcode that can hold 175 times more data (703 KB) than traditional 2D barcodes such as datamatrix or QR, which are limited to 4 KB. This means that it can contain comprehensive information in multiple languages. For authentication purposes, the barcode can contain a stamp's alphanumeric serial number that matches the visible printed number, full color images of a security feature on the stamp such as a hologram, and covert features. It can be scanned and decoded via smartphone using a proprietary reader application available to authorized personnel only. The code is autonomous and does not require a database or Internet connection to a database.

HD barcodes work well in a track and trace system since they can hold the entire supply chain history of a product. First, an HD barcode is generated and applied with thermal transfer printing at the manufacturing facility. Warehouse and shipping data are added at the manufacturer's warehouse by scanning the barcode and applying a second label with a new barcode on top of the first barcode. The second label is scanned at the distributors' warehouse, new data such as the final point of sale is added, and a third label is placed on top of the second label.

*Bowater Holographics (UK)*²⁹

This company offers a security printing solution – next-generation kinetic reflection volume holograms. They are 3D images in full color suspended in a completely transparent polymer. This eliminates the potentially confusing rainbow effects of more common holograms, because the images are stable and switch between each other as the hologram is tilted. This type of hologram is more difficult to counterfeit—there are only 2 suppliers of the holographic photopolymer (DuPont and Bayer Material Science) and both of them have stringent supply control.

Bowater is developing covert security in the form of multispectral marking and imaging that can be embedded into the hologram and read with the help of a requisite reader. The numeric solution allows the hologram to be serialized with individualized data that can be biometric, alphanumeric, barcode, or graphic.

All these features are a part of a Holotronic seal, which combines hologram and RFID chip technology and is designed to facilitate track and trace or other data-intensive requirements.

*Andrews & Wykenham (UK)*²⁹

Andrews & Wykenham primarily offers a security printing system, but also has an integrated track and trace and anti-counterfeit solution. It uses high security labels with holographic and security print features and 2D QR-format barcodes with item-specific information. The codes are protected from unauthorized access and reproduction by electronic digital signature (EDS) technology. The system allows anybody to verify a product's authenticity and duty-paid status via an open Internet interface.

ArjoWiggins (France)

ArjoWiggins's expertise in interfacing physical and digital technologies stems from supplying secure electronic passports to many governments. It also offers tax stamps and security technologies on the packet level. ArjoWiggins authentication uses overt or covert security features that protect against counterfeiting and permit simple and appropriate verification of authenticity. The overt features include watermarks, security thread, holographic strips, iridescent stripes, and colored core paper. The company offers two types of covert features: security fibres, hilites, security features in bands, planchettes and fluoforms that are visible using a standard control tool, and taggants integrated into inks (instant verification, Tag'Spheres and Spot-Tag) that have to use a dedicated control tool. ArjoWiggins's traceability applications combine physical security and digital security.

Interpol Global Register (France)⁴⁴

The Interpol Global Register provides an IT/data processing-based solution. The Register is a searchable online database with descriptions of tax stamps, control stamps, and other security solutions and features that identify genuine products. The intended users are manufacturers, distributors, retailers, law enforcement, government officials, and the general public. They can use Internet-based and mobile applications to scan and receive information on a product to verify its legitimacy, access product information, and verify whether safety features are in place. Unlike the private sector and the general

Box 2

Questions for potential vendors:^{32,23}

- Is security the core business?
- Is there a thorough needs assessment relevant for this market, and if yes, can it be provided for a review?
- Does the solution involve open standards?
- Is the solution independent of the influence of the industry that is supposed to be monitored?
- Are other clients using a similar system?
- Are those clients satisfied with their systems?
- Does the system have a proven record of increasing revenue collection and protection?
- Will the system incorporate the existing government licensing, customs, finance, and commerce data? If not, why not?
- If the system will be linked with existing systems, are there any anticipated difficulties in creating a comprehensive system?
- Were there any hidden or unexpected costs in system implementation in other countries?
- Was the system in other countries

public, law enforcement officers and government institutions have access to the full contents of the database.

How to choose among companies offering tracking and tracing

It is important to review the business history of potential vendors and to understand the characteristics of the system software and system security. Governments are responsible for protecting not only their data, but also the proprietary data of the entire regulated industry, in this case, the tobacco industry.³²

Governments should encourage competition in the market by conducting open procurement, allowing multiple providers with varied technologies and services to offer their track and trace solutions.¹³ See Box 2 for possible questions for track and trace providers.

Each company has its own strengths. For example, SICPA's strength is its optical variable ink, De La Rue developed an advanced hologram, and 3M mastered RFID technology.

According to *A Guide for Policy-Makers* published by Interpol in June 2014, only 3 systems fully comply with Art 8(4) of the WHO Protocol to Eliminate Illicit Trade in Tobacco Products and offer the most comprehensive control solutions for governments: Codentify, ATOS and ArjoWiggins. Endorsing the Codentify system represents a conflict of interest due to a €15 million donation to Interpol of from Philip Morris International.³⁷ ATOS developed Codentify for Philip Morris⁴⁵ and it audits and promotes the system.⁴⁶ ArjoWiggins is a manufacturer of creative and technical paper with links to BAT⁴⁷ and has a partnership with Interpol.⁴⁸ The Interpol Guide has been criticized by SICPA for providing incomplete data and misinformation.⁴⁹

Legally Binding Agreements and Memoranda of Understanding (MOU) with the Industry

These agreements and MOUs outline the obligations of the tobacco industry and governments with respect to the tobacco market. The agreements have legislated enforcement mechanisms (thus provide incentives for the tobacco industry to control their supply chains), but MOUs are nonbinding (thus only encourage voluntary industry cooperation to avoid stricter government regulations). Legal agreements create potential liability and encourage the industry to cooperate with the authorities to limit illicit tobacco trade. They allow authorities to force manufacturers to cease distribution to illegal recipients, to provide a list of distribution points, and to demonstrate how they monitor and control their supply chain.³ MOUs have limited impact and are not particularly useful in practice.³

The industry is motivated to find legal loopholes in these agreements in order to limit its obligations. The industry also misuses these agreements by gaining access to policy makers and by offering their solutions to the problem.⁵⁰

Agreements and MOUs do not affect small-scale tax evasion, especially where manufacturers are small in size and where the opportunity cost of time for those engaged in the illicit supply chain is low (e.g., in low income countries or in countries with high level of unemployment).³

As of 2013, there were several binding agreements between the tobacco industry and FCTC parties: the EU Commission, 27 EU Member States, Canada, and Colombia. MOUs are much more prevalent (e.g., UK,⁴ British Columbia³).

Tax Harmonization

Tax harmonization is when jurisdictions agree to cooperate and try to equalize tax rates across jurisdictions. Harmonization can be based on a minimum tax burden (percentage of excise tax in the price) or a minimum value of tax. It can use either an

excise tax ceiling (i.e., requiring high-tax jurisdictions to reduce taxes in order to align with low-tax jurisdictions) or an excise tax floor (i.e., requiring minimum levels of taxation while also allowing jurisdictions to levy higher taxes).

A good example of a tax harmonization policy is the tobacco tax directives of the European Union that requires all member states to apply a minimum excise tax. This policy reduces the economic incentives for cross-border shopping and could reduce tobacco trade across jurisdictions, therefore minimizing the amount of products in-transit from where they can be diverted into illicit trade channels.

Tax harmonization is difficult to do in practice since it requires coordination not only domestically, but also at the regional and international levels. It can create incentives to harmonize with the lowest common denominator because of the difficulty to approve a tax increase in low-tax jurisdictions.³ A tax reduction due to tax harmonization can have adverse public health and revenue effects that may outweigh any positive effects on eliminating the illicit market. Tax harmonization agreements that set a high minimum floor could reduce the health harms of tobacco, increase revenues for governments, and mitigate illicit activities associated with tax avoidance and tax evasion.

Public Awareness Campaigns

These campaigns emphasize the negative impacts of illicit trade on government revenue and public safety, increased smoking rates (particularly among youth), and the unknown nature and content of counterfeit or illicit cigarettes. Campaigns are usually run by governments, retail organizations, or advocacy groups.

Campaigns might try to change the public attitudes by directly attacking the “culture of tolerance” for smuggling, which allows contraband to thrive. They might encourage citizen activism (e.g., by calling a hot line to report illegal activities) and discussion about the negative implications of smoking and illicit consumption, thus building support for tobacco

control in general. Some campaigns target disadvantaged communities where illicit trade is undermining tobacco control effort in general. Campaigns may also focus on retailers, explaining how to distinguish authentic from counterfeit tax markings and how to identify counterfeit goods (e.g., Canada³), or on government agencies to promote greater enforcement.

Public awareness campaigns underscoring uncertain ingredients and other risks associated with using illegal cigarettes have moderate impact on illegal tobacco use. An unintended consequence of such campaigns might be promotion of legal tobacco products, thus undermining tobacco control policies in general. The latest campaigns in the UK specifically avoided the “greater harms message” and focused on the illegality of counterfeits and their increased availability to children in an effort to address the illicit trade problem while not promoting legal cigarettes as less harmful. There are indicators suggesting that the campaign has reduced demand for illegal products, even though it was difficult to separate the impact of the campaign from a broader UK strategy to reduce illicit trade.⁵

Campaigns usually require significant investment, while having variable results.³

Export Taxation

Taxing tobacco export reduces the motivation for illegal re-import of exported products if these products have preferential treatment compared to the products destined for the local market. The export tax could be refunded if proof is provided that cigarettes reached the destination market and are being distributed there by a legitimate company. This policy is relatively easy to administer, but it could motivate the tobacco industry to relocate to neighboring countries without such taxes and continue supplying the original market with illegal cigarettes. The threat of moving production to a different country can also have significant political ramifications (loss of jobs and tax base). This policy does not address the supply of illicit products from other countries.³

The impact of the export tax will be enhanced if it is supplemented by cargo monitoring and/or by tracking and tracing all locally manufactured, even those destined for export. Tracking and tracing will make it easier to identify the offenders and can provide court admissible evidence for prosecution.

Agreements with First Nations and Native American Communities

Many First Nations and Native American communities are exempt from paying all or a portion of tobacco taxes. Agreements with First Nations communities are based on the notion that by equalizing the price between on-reserve and off-reserve retailers, incentives to smuggle tax-exempt products to the off-reserve communities will be undermined. This involves regulating and controlling the supply of tax-exempt tobacco products to First Nations reserves. Two main mechanisms have been employed so far to achieve this: a quota system or a refund system.³

A quota or allocation system predetermines the quantity of tax-exempt products to be distributed to reserve retailers, usually based on population and consumption estimates. This has not been proven to be an effective approach, because allocation formulas are often generous, and provide no mechanism to ensure that non-eligible consumers cannot purchase the product. If stringent controls and tight allocations cannot be guaranteed, quota systems become irrelevant.³

In a refund system, tobacco products are sold to on-reserve retailers with all taxes included and the retailer must apply to authorities for a refund on sales to eligible customers (e.g., Status Indians) who do not pay taxes. Selling fully taxed tobacco products in these communities will eliminate the economic incentive to purchase tobacco on reserves or to smuggle it off reserves. This approach can be combined with imposing “purchase quota,” whereby only a certain number of tax-exempt products can be purchased by the same eligible

individual at any given time, acting as a measure to stop the purchase of larger quantities of tax-exempt product for potential resale to non-eligible customers. Tobacco products sold under these conditions can be specially marked for ease of identification/enforcement and to prevent the diversion of tax-exempt products to retailers off reserve.³ To motivate collaboration with government officials, communities are usually allowed to keep the proceeds of the tax collection.

Refund systems appear to be slightly more effective than allocation systems because proof of Native status must be obtained before any tax-exempt retail sales can take place. However, if a retailer uses a paper-based system to track refundable sales, the refund system is prone to abuse because there is a time lag between the tax-exempt purchase and combined sales analysis. This allows some individuals to visit multiple stores to buy their personal quota at each without immediately being caught.

To prevent this, revenue officials need to analyze tax refund requests and categorize them by name, in order to identify offenders. Use of a real-time system of sales with purchases instantly uploaded into a database can prevent this. Installation of such a system would require significant investments by both revenue departments and retailers.³

It is also possible to combine the allocation and refund systems and manage both the overall supply and individual sales.³

The application process for tax-exempt retailers itself can provide additional control if an applicant must prove the demand in their community is not sufficiently met by existing retailers. This will limit the number of retailers eligible to sell tax-exempt products, limiting the ability of customers to abuse the system by jumping from store to store. Instead, consumers would be forced to either attempt to over-purchase at a single store (thus making it easier to catch the customer), or travel to a

neighboring reserve, which can add costs in terms of transportation.³

The agreements with First Nations requires regular auditing, which can lead to conflicts with the reserves where taxing is a sensitive issue; some First Nations ideologically oppose the notion of tax, regardless of who collects/benefits from the revenue. Taxing tobacco can also reduce tobacco sales on reserves with the associated adverse economic impacts.³

Conclusions

Given the complexity of the issue, countries need to take a comprehensive approach and implement their own unique combination of efforts to address their specific situation.⁵¹ This combination will be driven by the type of illicit trade, the characteristics of the supply chain for illicit products, and the type of consumers using these products. For example, if the primary source of illicit products is domestic, establishing a national track and trace system combined with licensing requirements and effective enforcement seems to be the best solution. If illicit products are coming from abroad, establishing a global tracking and tracing system while focusing on border protection and effective screening of imported goods should be a priority. The country level experience points to the importance of consistency in implementing comprehensive controls that encompass the entire country, because a partial rollout of any system does not bring long term results.

Tax stamps that used to be the golden standard of an efficient tax administration are no longer sufficient if applied in isolation from other measures. They perform best if accompanied by a tracking and tracing system. The degree of complementary between the fiscal marking and track and trace system depends on the technical features of both systems. Tax marking systems are national-level systems while track and trace systems apply mainly to cigarette manufacturers.¹¹

A national tracking and tracing regimen needs to apply to all products manufactured in or imported to

the country, including products destined for export or duty-free zones. The key is to account for all domestic production (including exports) and all imports, which requires implementing different procedures for these two different sources of cigarettes. If exemptions are made or if the fiscal marks can only be traced to a limited extent, the effectiveness of the track and trace regime will be compromised. Even though countries can develop their own domestic track and trace systems, such systems are best implemented at the regional or international level in order to facilitate tracking and tracking across border.

Track and trace system need to use markings that are secure, unique, and non-removable in order to protect against counterfeiting. Security is achieved by using both overt and covert security features, because they complement each other. Overt features enable distributors, retailers and the public to authenticate products without a special device. Covert features are used by law enforcers and provide multilevel protection against counterfeiting and tampering. Overt features are advisable as a basic solution, but they must be readily understood by end users. Adding covert features is more expensive since it requires an electronic device for authentication, but it adds more security.

In order to effectively track and trace products, the markings needs to apply to the pack level and the system must allow for aggregation, i.e., linking of a pallet to a master case to a carton and to a pack.

The most advanced marking currently used on cigarette packs is 2D DataMatrix electronic code that uses invisible ink and/or taggant and carries a unique serial number. The code is activated during its application onto a cigarette pack and allows to storage multiple data relevant to the product such as the manufacturer, manufacturing date, fiscal class, and the final destination of the cigarette pack. The information stored in the code is automatically relayed to a government-administered central database for fiscal and law enforcement purposes. Another possible technology is the use of RFID tags. These tags transmit a unique serial number in order to identity an object wirelessly using radio waves. Their advantage is that they do not require manual

scanning and would be feasible for individual package identification even when shipped in a container. However, RFID is still relatively expensive to be used at the pack level.

Markings are used to perform random or systematic checks of packages to verify their authenticity and adherence to the proposed line of transit.⁵² The process can operate in offline or connected mode. Using only online technology can be limiting due to the reliance on network connectivity. Taggants and invisible inks can be used for offline authentication. There are also hybrid smartphone applications that allow users to confirm authenticity without a network connection, but the user can also connect to a wired or wireless network to send and receive authentication statistics.¹⁰

The ease and costs of information sharing imbedded in the markings is an important consideration. WHO Protocol to Eliminate Illicit Trade in Tobacco Products¹ and experience from other sectors favor open standards for the coding system, because it promotes compatibility of national systems, increases adoption rates and drives down the costs of global track and trace regime by being system and provider agnostic. There are currently no agreed standards as part of the WHO Protocol.

On the other hand, the covert security features may need to use proprietary technology in order to convey the information only to restricted audience. Any standards, however, should not be “frozen” but open to adjustments to ensure the regime remains effective and up to date taking into account expected technological changes. This may require revisiting the standards periodically and establishing a dedicated forum to help develop a clear process for updating standards.¹³ The forum can also provide support and/or guidance to governments for implementation of a tracking and tracing regime.

The administrative measures imposed on the business sector should be as simple as possible with limited intrusion and capable of practical adoption even in smaller businesses in order to secure cooperation. Experience with tracking and tracing in other sectors also stress the important role of

collaboration between industry and regulators.¹³ The costs of the system implementation are often borne by the industry, and the industry is allowed to expense the costs to reduce its profit tax liability.

There are two main types of track and trace providers: companies with an IT/data processing background and companies with a security printing background. Security printing companies' strength is in authentication, but they are less able to meet the interoperability (due to their proprietary technologies), aggregation and unique identifier requirements of an effective tracking and tracing system. IT/data processing companies are capable of gathering data from across a range of supply chain partners, each potentially operating different systems, and tend to encourage open standards.¹³ However, their systems may be less secure since it is susceptible to hacking. Experience from other sectors demonstrates the benefits of competition among providers and transparency regarding the selection process since it leads to innovations, competitive pricing and builds trust among stakeholders.¹³ Even though other industries sometimes use proprietary solutions, there has been a shift towards globally recognized standards such as GS1. It is advisable to use a single technology provider to eliminate integration problems between multiple systems and to establish accountability.⁵³

The most widely used national cigarette track and trace system provider is currently SICPA. SICPA offers several modules that can be implemented in phases and offer a comprehensive tracking and tracing solution. Its system works well on a national level where it has a proven record of reducing illicit trade of tobacco products from local manufactures. It works less well on the international level, when smuggling is going on across borders. This is because it is not a global system; therefore products imported/smuggled from other countries may not have markings that would allow tracing them back to the manufacturer/distributor. In addition, the codes placed on products are not readable without a special device and may not be readable in another country, because SICPA does not use international serialization open coding standard.³⁴ Nevertheless,

countries that have SICPA seems to be satisfied with the system as evidenced by several expanded and renewed contracts with SICPA (e.g., Brazil, Turkey, California). SICPA secures other products as well. Its system is particularly effective for the tax collection on beer, because beer is usually produced and consumed locally.

Another widely used system is Codentify, developed by the tobacco industry. It is primarily an authentication system that does not use an open coding standard. It has potential to be a tracking and tracing system, but these features are not fully developed and currently not used by any government to track/trace products. Given the propriety nature of the system, there are no publically available records regarding the efficacy of the system, and there is only limited information about which features of Codentify are implemented in which countries.

In order to ensure transparency, the track and trace data processing and storage should occur independently of manufacturers of tobacco products. Competent authorities should interact with the tobacco industry and their representatives only to the extent necessary to implement the track and trace regime.

The speed and the ease of implementation of tracking and tracing system depend on its complexity. Global tracking and tracing can be particularly difficult to implement since it involves multiple markets with different systems in place.

A tracking and tracing regime alone will not eliminate all forms of illicit trade—for example, it cannot monitor production of illegal manufacturing facilities or counterfeit production. Therefore, tracking and tracing need to be a part of a wider effort to address tobacco illicit trade that includes enforcement, record keeping, data exchange, licensing, cross-sector collaboration and international coordination.

Irrespective of the source of illegal products, countries need to have a comprehensive legislative and regulatory framework that allows implementation of appropriate fiscal/taxation and enforcement measures. Sufficient punitive sanctions

that allow relevant authorities to detect, prosecute and punish illicit activities need to be adopted. The punishment must be sufficiently severe and announced to the public to deter engagement in illicit tobacco trade. Examples from the United Kingdom, Spain, Canada, Hungary, and Romania demonstrate that the dedication of tobacco-specific enforcement resources helps to combat illicit trade. However, it is important that the enforcement efforts are able to adapt as the illicit market changes, as practiced in the UK by its periodic renewal and revision of the tobacco action plan.

The enforcement efforts need to be accompanied by ongoing communication and education campaign in order to generate public support and reduce demand for illegal products, and in order to provide sufficient information and support to retailers. In communicating with the public, it is important to account for the potential unintended consequences on broader tobacco control policies, since the two are not always complementary in nature.³ For example, the experience from the UK indicates that it is a mistake to emphasize the health consequences of consuming illicit tobacco, because both legal and illegal tobacco products are damaging to health.

As evidenced by all case studies, it is important to develop local and regional partnership between tax authorities, customs, police, retail inspectors and public health community. Collaboration between various parts of the government and public engagement increases political feasibility of proposed solutions, their effectiveness and the likelihood of achieving long-term results. Cooperation between countries is required to develop effective information sharing about illicit tobacco products.

Efforts to address the illicit tobacco trade require governments to dedicate tobacco-specific resources that are sufficient to develop the systems, to enforce the measures, to monitor and evaluate the performance of those measures, and to stay in

communication with the key stakeholders and the public. It is very important to constantly monitor and evaluate the performance and effectiveness of the measures since they may change over time, often in response to anti-contraband measures.³ The evaluation needs to be location-specific, because a measure successfully implemented in one jurisdiction does not mean that it will be equally successful in another jurisdiction. Monitoring and evaluation require systematic data collection and scientific investigation. They must also address the large volume of misinformation and false information related to illicit trade. Data on illicit trade and on the effectiveness of measures taken to address it should be made publicly available to gain public support and to promote academic interest in the subject.

Governments must have the ability to adjust their strategies and approaches quickly in response to new developments. The government approach in the UK demonstrates that constant monitoring, evaluating, and adjusting its anti-illicit tobacco trade measures, accompanied by targeted public spending, is not only effective but also highly cost-effective with a gross return on investment of £10 for every £1 invested.⁴ Many countries report that measures addressing illicit tobacco trade are at least self-funding if not income-generating.

To summarize, the best results are generated by adopting comprehensive multifaceted intervention strategies that encompass a variety of regulatory, enforcement, and policy approaches that are location-specific and include the collaboration of a wide range of stakeholders.

About the Author

Hana Ross, PhD, is a Principal Research Officer at the University of Cape Town, South Africa. Her research focuses on the economics of tobacco control in Africa, South East Asia, and in the European Union. Dr. Ross supports several research capacity building projects in low- and middle-income countries.

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About the Economics of Tobacco Control Project

The Economics of Tobacco Control Project is hosted by the South African Labour and Development Research Unit at the School of Economics, University of Cape Town, in partnership with the American Cancer Society, the Bill & Melinda Gates Foundation and the African Capacity Building Foundation. The aim of this project is to expand current research efforts in the economics of tobacco control and to enhance the knowledge of economic and tax issues among tobacco control advocates and policymakers to strengthen support for tobacco tax and price increases in sub-Saharan Africa. Visit www.tobaccoecon.org or follow us at www.twitter.com/tobaccoecon.

About Tobacconomics

Tobacconomics is a collaboration of leading researchers who have been studying the economics of tobacco control policy for nearly 30 years. The team is dedicated to helping researchers, advocates and policymakers access the latest and best research about what's working—or not working—to curb tobacco consumption and the impact it has on our economy. As a program of the University of Illinois at Chicago, Tobacconomics is not affiliated with any tobacco manufacturer. Visit www.tobacconomics.org or follow us on Twitter www.twitter.com/tobacconomics.

University of Cape Town
Southern Africa Labour and Development Research Unit
Attn: Economics of Tobacco Control Project
School of Economics Building, Middle Campus (Rm. 4.13)
Cape Town, Rondebosch 7700
South Africa

tobaccocontrol@uct.ac.za

[@tobaccoecon](https://twitter.com/tobaccoecon)

www.tobaccoecon.org

University of Illinois at Chicago
Institute for Health Research and Policy
Attn: Tobacconomics
1747 W. Roosevelt Road
5th Floor (Room 558)
Chicago, IL 60608
U.S.A.

tobacconomics@uic.edu

[@tobacconomics](https://twitter.com/tobacconomics)

www.tobacconomics.org

References

- ¹ World Health Organization. Protocol to eliminate illicit trade in tobacco products. Geneva, Switzerland: FCTC – WHO Framework Convention on Tobacco Control; 2013. Available at <http://www.who.int/fctc/protocol/en/>.
- ² World Health Organization. Framework Convention on Tobacco Control; 2012.
- ³ Sweeting J, Johnson T, Schwartz R. Anti-contraband policy measures: evidence for better practice—summary report. Toronto, ON: The Ontario Tobacco Research Unit, Special Report Series; 2009.
- ⁴ Action on Smoking and Health United Kingdom (ASH UK). All party parliamentary group on smoking and health inquiry into the illicit trade in tobacco products; 2013. Available at: https://www.newcastle.gov.uk/sites/drupalncc.newcastle.gov.uk/files/wwwfileroot/business/trading_standards/appillicit20131_compressed.pdf.
- ⁵ National Academy of Sciences. Understanding the U.S. illicit tobacco market: characteristics, policy context, and lessons from international experiences. Washington, D.C.; 2015.
- ⁶ Allen E. The illicit trade in tobacco products and how to tackle it. *World Customs Journal*, Volume 6, Number 2; 2012.
- ⁷ Financial Action Task Force. Illicit tobacco trade.; FATF/OECD 2012. <http://www.fatf-gafi.org/media/fatf/documents/reports/Illicit%20Tobacco%20Trade.pdf>
- ⁸ U.S. Government Printing Office. A glossary of security features for printed documents. Washington, D.C.: Security and Intelligent Documents Business Unit. Available at: www.gpo.gov/projects/security.htm.
- ⁹ Power G. Anti-counterfeit technologies for the protection of medicines. WHO and IMPACT. Available at: <http://www.who.int/impact/events/IMPACT-ACTechnologiesv3LIS.pdf>.
- ¹⁰ Kutter M. Tobacco products directive (2014/40/EU): a look back; 2015. Available at: http://www.alpvision.com/anticounterfeiting_blog.html.
- ¹¹ Pedersen HS, Floristean A, Iseppi L, et al. Study on the measuring and reducing of administrative cost in imposing excise duties on tobacco products. European Commission; 2014.
- ¹² Analysis and Feasibility Assessment Regarding EU Systems for Tracking and Tracing of Tobacco Products and for Security Features. Final Report. No EAHC/2013/Health/11. 2013/S 068-112544. Eurogroup Consulting and Sovereign Border Solutions. March 2015.
- ¹³ KPMG and GS1 UK. Track and Trace. Approaches in Tobacco. April 2014. Available at <http://www.kpmg.com/UK/en/IssuesAndInsights/ArticlesPublications/Documents/PDF/Issues%20and%20Insights/track-trace-tobacco.pdf>
- ¹⁴ Bartomiejczyk L. SICPA Poland, personal communication; 2015.
- ¹⁵ Framework Convention Alliance. The use of technology to combat the illicit tobacco trade. FCA Factsheet; 2008.
- ¹⁶ Framework Convention Alliance Bulletin, issue 113; 2012.
- ¹⁷ Holography. Available at <http://en.wikipedia.org/wiki/Holography>.
- ¹⁸ Tobacco Reporter. Committed to quality; Issue 2. February 1, 2011. Available at <http://www.tobaccoreporter.com/2011/02/committed-to-quality/>
- ¹⁹ Muthaura EK. Tobacco tax administration country experiences in Kenya. Workshop on tobacco tax administration and collection in Benin and Togo; 2013.
- ²⁰ Jordan F. What viable solutions are there to verify the authenticity of tobacco packaging?; 2014. Available at: http://www.alpvision.com/anticounterfeiting_blog.html.
- ²¹ World Health Organization. INB 4. Analysis of the available technology for unique markings in view of the global track-and trace regime proposed in the negotiating text for a protocol to eliminate illicit trade in tobacco products; 2010.
- ²² World Health Organization. Combating the illicit trade in tobacco products from a European perspective. Regional Studies Series. Paper R/3. WHO; 2014. Available at: http://www.who.int/fctc/publications/Regional_studies_paper_3_illicit_trade.pdf.
- ²³ World Health Organization. Secretariat study of the basic requirements of the tracking and tracing regime to be established in accordance with Article 8 of the Protocol to eliminate illicit trade in tobacco products. WHO White Paper; 2014.
- ²⁴ Colledge JW. Tracing, tracking & the draft illicit trade protocol. CTFK webinar; 2012.
- ²⁵ SICPA. A full cost/benefit analysis intended for the unit “Tobacco Control” of the Directorate General SANCO of the European Commission; 2012.
- ²⁶ Colledge JW. Law enforcement mechanisms to deal with illicit tobacco trade. Botswana; 2012.
- ²⁷ European Parliament’s Committee on Budgetary Control. Workshop “Cigarette Smuggling” Proceedings. Brussels; 2014. Available at: <http://www.europarl.europa.eu/document/activities/cont/201401/20140116ATT77675/20140116ATT77675EN.pdf>.
- ²⁸ Interpol. Countering illicit trade in tobacco products: a guide for policy-makers; 2014.
- ²⁹ Tax Stamp News. Volume 6, No 5; 2014. www.taxstampnews.com.
- ³⁰ KPMG and GS1 UK. Track and Trace. Approaches in Tobacco. April 2014. Available at <http://www.kpmg.com/UK/en/IssuesAndInsights/ArticlesPublications/Documents/PDF/Issues%20and%20Insights/track-trace-tobacco.pdf>
- ³¹ SICPA. Global Presence. Presentation by Pierre.Viaud, Senior Director Public Affairs & Government Relations, SICPA October 30, 2014.
- ³² SICPA. Response to the exposure draft tobacco plain packaging bill 2011 by the Australian government and consultation paper including the proposals for plain packaging design; 2011.
- ³³ Review by SICPA of Interpol’s general counsel answer dated 13th November 2014 replying to SICPA’s comments relating to Interpol handbook on countering illicit trade in tobacco products; 2014.
- ³⁴ Likmeta B and Erebara G. Albania risks costly failure in illegal tobacco war; 2014. Available at: <http://www.balkaninsight.com/en/article/albania-risks-costly-failure-in-illegal-tobacco-war>.
- ³⁵ Bilir N, Cakir B, Dagli E, et al. Tobacco control in Turkey. WHO Europe; 2009.

-
- ³⁶ Wahome M. Taxman targets contraband traders with new duty stamps; 2012. Available at: <http://www.businessdailyafrica.com/Taxman-targets-contraband-traders-with-new-duty-stamps/-/539546/1304018/-/14k7v9v/-/index.html>.
- ³⁷ SEATCA. Measures to control the tobacco supply chain in the ASEAN; 2014.
- ³⁸ Agcaoili L. Chinese firm challenges SICPA, Philip Morris proposal on cigarette stamp tax; 2010. Available at: <http://www.philstar.com:8080/business/611967/chinese-firm-challenges-sicpa-philip-morris-proposal-cigarette-stamp-tax>
- ³⁹ Framework Convention Alliance Bulletin, issue 111; 2012.
- ⁴⁰ 3M Security Systems. Serialization and Tracking. http://solutions.3megypt.com.eg/wps/portal/3M/en_EG/SSD_EU/Security_Systems/Product/Five/Two/
- ⁴¹ Comments by Philip Morris International on the public consultation paper in preparation of a legal proposal to combat counterfeit medicines for human use; 2008. Available at: http://ec.europa.eu/health/files/counterf_par_trade/doc_publ_consult_200803/88_philip_morris_intl_en.pdf.
- ⁴² European Commission. Study on the measuring and reducing of administrative costs for economic operators and tax authorities and obtaining in parallel a higher level of compliance and security in imposing excise duties on tobacco products; 2014.
- ⁴³ Tobacco Reporter. Committed to quality; 2011. Available at: <http://www.tobaccoreporter.com/tag/edaps/>.
- ⁴⁴ Joossens L, and Gilmore A. The transnational tobacco companies' strategy to promote Codentify, their inadequate tracking and tracing standard. *Tobacco Control* 2014;23:e3–e6. doi:10.1136/tobaccocontrol-2012-050796.
- ⁴⁵ Atos. <http://atos.net/en-us/home/contact-us/luxembourg.html>. Accessed February 1, 2015
- ⁴⁶ Lequenne E. Applying technology to combat illicit trade and protect excise revenues. *Asia-Pacific tax forum*; 2011.
- ⁴⁷ Arjowiggins. History. http://www.arjowiggins.com/index.php?option=com_content&view=article&id=65:de-1888-a-nos-jours&catid=64:histoire&Itemid=59&lang=en. Accessed February 1, 2015
- ⁴⁸ Sequana Capital. A new Era. Annual Report. 2007. http://www.sequana.com/wp-content/uploads/2011/10/OK_SequanaRA2007_GB.pdf. Accessed June 9, 2015
- ⁴⁹ Analysis of the Interpol Office of Legal Affairs – Countering illicit trade in tobacco products, a guide for policy-makers. SICPA Security Solutions SA; 2014.
- ⁵⁰ Joossens L, Gilmore A, Stoklosa M, et al. An assessment of European Union's agreements with the four major transnational tobacco companies to address the illicit cigarette trade. *Tobacco Control*; 2015.
- ⁵¹ Royal Canadian Mounted Police. 2008 Contraband tobacco enforcement strategy; 2008. <http://www.rcmp-grc.gc.ca/pubs/tobac-tabac/tobacco-tabac-strat-2008-eng.htm>
- ⁵² Schefer K and Pieth M. Containing tobacco smuggling. University of Basel; 2014.
- ⁵³ Ngeywo CM. Kenya Revenue Authority. Kenya's experience in implementing and financing a tracking and tracing system. Presentation at the World Conference on Tobacco OR Health, Abu Dhabi; 2015.