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The strategic attributes of transnational smuggling: Logistics flexibility and operational stealth in the facilitation of illicit trade

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Abstract The clandestine transportation of contraband cargo across national borders is commonly known as transnational smuggling. Illicit market actors utilize smuggling as a key strategic operation to get their illegal goods to market. Transaction costs unique to smuggling, such as concealment and evasion costs create specific attributes intrinsic to the operations strategy deployed by professional smugglers. Strategic and logistics flexibility, as well as operational stealth enable smuggling rings to mitigate the risk of detection and apprehension by law enforcement authorities. In recent years, illicit supply chain actors have adopted advanced technologies, alternative currencies, and online distribution channels in order to facilitate illicit trade. This paper explores the key strategic attributes of strategic, logistics flexibility and operational stealth which are characteristic of transnational smuggling operations.

Keywords Transnational smuggling · Illicit trade · Logistics flexibility · Operational stealth · Silk road

Introduction

The global trade of illicit products and services represents a highly profitable, multi-billion dollar operation for international criminal organizations. Illicit trade involves money, goods, or value gained from illegal and unethical activity and encompasses a wide variety of activities including human trafficking, environmental crime, illegal trade of firearms, smuggling of excisable goods, and illegal drug trafficking (World Economic Forum 2012) The mechanics of illicit trade includes the morally charged politics of deviance and is focused on the issue of smuggling and the policing of smuggling, where politics, economics, and culture intersect often in explosive ways and with unanticipated and long lasting repercussions for society and foreign relations (Andreas 2013). Smuggling can be

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considered a strategic operation and core competency for global criminal enterprises (Basu 2013). Smuggling involves the clandestine transportation of illicit products across national and international borders to the final markets where they are consumed. Transnational smuggling is a highly complex operation, involving various supply chain actors across a structure of hierarchies and decentralized networks which facilitate illicit trade markets (Zaitch 2002; Williams 2001). This structure is diverse and spans the boundaries between the legal and illegal world. Illicit supply chain actors range from transportation specialists, farmers, and corrupt government officials to financiers, real estate brokers, lawyers, and IT experts (Reuter 2002; von Lampe 2008). Some government policy makers believe there is a direct connection between organized crime and insurgency. Third generation transnational criminal organizations reside at the intersection between crime and war (Manwaring 2005). Organizations involved in transnational smuggling often incorporate operations that utilize speed, flexibility, stealth designed for concealing contraband and evading customs and law enforcement authorities. Strategic management researchers and military historians offer normative recommendations for smaller organizations fighting much larger ones "to be flexible and move fast", "avoid meeting giants head on", and "retain competitive initiative by mounting guerilla attacks" (Cohn and Lindberg 1974; MacMillan 1980). Professional smugglers utilize similar operational strategies, in order to circumvent law enforcement controls, evade taxes, and illegally transport contraband across borders.

In the 21st century, criminal organizations have embraced the adoption of advanced technologies, created new digital distributional channels, and utilized innovative operational methods to smuggle contraband. These organizations now actively recruit and employ information technology specialists to maintain in-house capabilities for infiltrating information systems and acquiring sensitive data, related to transportation and financial infrastructure, as well as law enforcement systems (Hesseldahl 2013). The example of the October 2013 cyber-attack on the port of Antwerp by drug traffickers which breached the port's "secure" computer network and facilitated the illegal release of eight ocean containers, containing several tons of cocaine, highlights the changing subtleties of smuggling operations (Dunn 2013). In recent years, black markets have expanded their presence to the online world. Matchmaking services for firearms, weapons, illicit drugs, hackers and assassins for hire are now operational on the internet (Friedersdorf 2013). The Silk Road, an electronic marketplace for illegal narcotics illustrates an interesting case of this modern phenomenon.

The strategic choice of transnational smugglers involves risk minimization decisions in the continuous battle against law enforcement. While customs organizations aim to establish patterns in smuggling operations and develop new techniques and technologies to make borders less permeable for contraband goods, professional smugglers strive to avoid detection by becoming less predictable, increasing their level of sophistication, switching their means of transportation, moving smuggling routes, and changing their modus operandi (Decker and Townsend Chapman 2008; Caulkins et al. 2009). The operational strategies employed by smugglers share unique strategic attributes, such as operational stealth, strategic, and logistical flexibility, which enable the functioning of illicit trade markets. This article delves deeper into these attributes, which are at the core of transnational smuggling operations.

Research objectives

The primary research objective of this paper is to explore the strategic attributes of transnational smuggling operations, in order to elucidate a better understanding of the global smuggling phenomenon. The operations strategies and associated levels of operational stealth, strategic, and logistics flexibility, employed by professional smugglers provide significant challenges for international law enforcement and customs organizations. These attributes are significant in facilitating global illicit trade and increased complexity for interdiction efforts, thus it behooves transportation security researchers, international law enforcement, and customs officials to gain further insights into the problem. The author aims to provide these insights, which in turn may help customs and law enforcement authorities in combatting these illicit operations.

Research methods

Academic research on transnational smuggling from a logistics or operations management perspective is sparse, thus this research is exploratory in nature. Obtaining primary data for criminal activity is notoriously difficult and there are many hurdles in doing research on smuggling, as successful smuggling operations are highly dependent on not being seen or counted (Naylor 2004). Archival data analysis of secondary data sources, such as academic and newspaper articles on crime and smuggling, public records, as well as customs, intelligence, security, and government reports was initially conducted to identify key research constructs. Archival data analysis can play a valuable role in exploratory research as a preliminary step to developing a new hypothesis and uncovering aspects of a research problem that require additional attention and to provide substantiation for hypothesis revision (Calantone and Vickery 2010). Subsequently, semi-structured interviews were performed with various members of the United Nations Office of Drugs and Crime (UNODC) and the Finland Customs Authority (TULLI) to validate the research constructs and acquire a level of empiricism in the study. The author used multiple research methods (archival data analysis and semi-structured interviews) for triangulation purposes, with the aim of strengthening the study.

Strategy, structure, roles and responsibilities in illicit supply chains

The strategy structure performance model focuses on the design of an organization through which the enterprise is administered, including lines of authority and communication and information flows between the different administrative authoritative elements of an enterprise (Chandler 1962). In addition to the formal authority and communication, structure includes allocation of work into roles, techniques of coordination, relationship among organizational sub-units, methods of reward and punishment, policies and activities occurring within and across organizations, and social and political networks 7(Chandler 1962; Galbraith and Nathanson 1978; Miles and Snow 1978; Rumelt 1974). Supply chains are inter-organizational by nature, thus the supply chain structure

implies the level of integration and coordination across multiple organizations within the chain. The critical elements of supply chain structure include technology, communications, standards, decision making authority, reward, punishment, and the delineation of functional process activities across the supply chain (Cooper et al. 1997; Mentzer 2004; Closs and Mollenkopf 2004). In the context of supply chain management, several authors from the logistics and operations management discipline have concurred that the strategy structure performance paradigm is highly relevant for global supply chains (Chow et al. 1995; Bowersox et al. 1999).

Irrespective of the legality of the supply chain, the strategy structure performance model applies both to licit and illicit supply chains. *An illicit supply chain can be defined as a group of organizations or actors engaging in one or more illegitimate activities pertaining to the sourcing, procurement, production, logistics, or distribution of illegal or prohibited goods or services* (Basu 2013). Most transnational criminal enterprises have clearly delineated roles, responsibilities, and protocols within their respective criminal organizations from security and intelligence to communications, logistics, and money laundering (Paoli and Reuter 2008; Williams 2001). Criminal networks across national borders sometimes occur in the absence of any pre-existing ties (Felson 2003). Illicit supply chain actors are involved in the operational planning, coordination, execution, and risk management activities that facilitate the transfer and exchange of illegal commodities and services. Since the nature of illicit supply chains are inherently in violation of law, the structural and strategic attributes of these supply chains encompass very distinct characteristics. This is primarily due to the unique transaction costs and inherent risks associated with conducting business in the informal or underground economy (Boulding 1947; Freeman 1999; Paoli 2002). International drug trafficking organizations contain a combination of institutional and structural elements of networks, markets, and hierarchies (Naylor 2004; Williams 2001; Basu 2013). Within this structure, multiple illicit supply chain actors execute various responsibilities, in order to facilitate a range of services across the value chain, such as management, financing, sourcing, production, quality control, transportation, warehousing, sales and distribution (Table 1).

Strategic and logistics flexibility attributes

In dynamic and uncertain environments, strategic and operational decisions need to be continually reevaluated and reassessed. Faced with greater environmental uncertainty, organizations are required to be more innovative and flexible (Krijnen 1979). No company exists whose management states that it doesn't want its organization flexible enough to adjust quickly to changing market conditions (Hammer and Champy 1993). Flexibility options aim to mitigate environmental, demand, supply, and operational risk and uncertainty. Firms can use either strategic or operational flexibility, in order to create a source of competitive advantage, improve responsiveness, service levels, and levels of adaptability (Day 1994; Upton 1995; Simchi-Levi 2010). Criminal organizations utilize both forms of flexibility, in order to mitigate the risk of detection, adapt to an uncertain legal and regulatory environment, and as a response to operational routines by law enforcement and border controls.

Table 1 Illicit supply chain actors, roles, and responsibilities Source: Finland Customs Authority – TULLI and United Nations Office of Drugs and Crime - UNODC (2013)

Illicit supply chain actors	Description of roles and responsibilities within the illicit supply chain
The kingpin	The individual who is in charge of the operations and responsible for paying salaries, setting up strategic alliances and partnerships, and takes capital risks.
	This person is usually isolated from the day to day operational activities.
The matchmaker	An individual or a service that matches buyers and sellers of illicit goods and services and helps facilitate the transaction.
The manager	A person who actively manages the operational activities and oversees recruitment, training of mules, and scheduling of operations.
The partner	An individual that is involved in some part of the illicit operational activity and takes a share of the profits from the sale of the drugs.
The farmer	An agricultural specialist who supplies the primary agricultural commodity for further refinement and processing of the drug (i.e.) cocoa leaf, poppy.
The refiner/mixer	People who are involved in the processing and mixing of the raw material commodity and pre-cursor chemicals into a more refined state for sale.
The quality tester	Individuals who are in charge of the quality assurance process and tests the quality and purity of the drugs.
The international smuggler	The person who is involved in the transportation of the drug contraband across international borders.
The stash house manager	A warehouse manager of the illegal drugs who is responsible for the storage and inventory of the contraband between purchase and sale.
The transporter and runner	People who transport the contraband between locations and various supply chain actors usually within local or regional geographies.
Narcotics wholesaler	There are several levels of wholesalers in the illicit drug supply chain; international wholesalers will purchase the drugs outside of the country of sale and arrange the international logistics and sell the drugs within the national borders; national wholesalers are not involved in the cross border smuggling operations but arrange the purchase of drugs within national borders; local wholesalers buy and sell drugs within a specific geographic area such as a city or county.
Legitimate professionals	These are people with legitimate backgrounds who facilitate the drug trafficking operations and include lawyers, accountants, bankers, real estate brokers, and logistics service providers.
Law enforcement officials	Individuals who work in a law enforcement function that may aid in the facilitation of the drug trafficking operations through bribery or other corrupt practices, They include customs and border officials, local and national police, and intelligence professionals.

Strategic flexibility dimension

Flexibility from a strategic perspective has several dimensions which include responding to the competitive environment through an adaptive or flexibility capability, ability to rapidly change game plans, capability to precipitate intentional changes and continuously respond to unanticipated changes and adjust to the unexpected consequences of predictable changes

(Harrigan 1980). For the purpose of this paper, we define strategic flexibility as the ability of the organization to adapt to substantial, uncertain, and fast-occurring environmental changes that have a meaningful impact on the organization's performance; the focus is upon environmental changes that are substantial enough to impose long term constraints and/or to create a need for strategic adaptations (Aaker and Mascarenhas 1984). Strategic flexibility approaches may include diversification of the product portfolio, decentralization of decision-making authority, design of operating procedures to be able to handle environmental changes, avoid reliance of few customers, maintain liquidity in the asset base, and structural changes to trading partner relationships (Ackoff 1977; Krijnen 1979). Criminals dealing with illegal goods and services must cope foremost with the formal institutional environmental constraints deriving from the circumstance that they operate against state laws and regulations. This makes the environment that criminals operate in extremely tempestuous, unstable, and uncertain. Criminal activities are very reactive to their environment uncertainty and rapidly transform themselves as the environment changes (Paoli 2002). Due to considerable levels of environmental uncertainty in criminality, firms engaging in illegal activities avoid long entanglements that could prove to be wrong later and will instead favor structures that are more flexible with less binding relationships (Crocker and Masten 1988; Williams 2001). Another form of strategic flexibility employed by international criminal organizations is the diversification of the product portfolio of crime can be expanded through core operational capability of smuggling and clandestine transport of multiple illicit commodities and services (Basu 2013). In the 1980s, tighter interdiction rates by U.S. law enforcement forced Latin American drug smugglers to the switch from marijuana to cocaine: as risk and uncertainty increased, drug traffickers calculated it made more financial sense to transport a more compact and profitable white powder (Andreas 2013). The emergence of new psychoactive designer drugs has flooded the European market in the last decade; approximately 650 types of new "legal high" drugs have been manufactured to mimic the hallucinogenic effects of illegal drugs often with dangerous or lethal side effects to users (The Telegraph, August 25 2013). Drug traffickers frequently utilize regulatory arbitrage and strategic flexibility to expand their product portfolios.

> "In recent years, there has been an introduction of designer drugs or "legal highs" into the market. Criminal organizations are very agile with responses to changes to national or international legislation. If one substance suddenly becomes prohibited, a new substance with a slight change in the chemical formula is invented and introduced to the marketplace." - Senior Narcotics Investigator Finland Customs Authority

The constant cat and mouse game between law enforcement and criminal organizations has facilitated a technological battle. Advanced technologies initially designed for military purposes have now been adopted by customs and law enforcement agencies. Airborne Warning and Control System surveillance planes began to monitor international drug flights; the North American Aerospace Defense Command which was built to track incoming Soviet bombers has been refocused to track drug smugglers; X-ray technologies initially designed to detect Soviet missile warheads in trucks is now adapted to find drugs in cargo containers; and the Defense Advanced Research Projects Agency began using its research on anti-submarine warfare to develop listening devices

to detect drug smugglers in a maritime environment (Andreas 2013). In response, international criminals have evolved operationally and technologically. Criminal organizations actively recruit and employ information technology specialists, in order to gain a level of technical expertise for a range of services, from infiltrating transportation and financial information systems to the retrieval of sensitive data for criminal intent, utilizing special computer networks to achieve a level of anonymity to avoid the risk of detection and apprehension, and the creation of electronic marketplaces for matching buyers and sellers of illicit products and services (Dunn 2013; Hesseldhal). In addition to this, transnational smugglers are astute at gathering information and counter-intelligence regarding operational routines of customs and border patrols in order to gain knowledge of transportation flow patterns and calculate the optimal timing of border crossing (Caulkins et al. 2009; von Lampe 2008). Pretty, young women have particular uses for smuggling rings, as they are sent on many missions to collect information about rivals, police, border patrols, politicians, and anything the cartel wants to find out about (Grillo 2012). The counter-intelligence serves as input into the professional smuggler's calculus of risk minimization strategies.

> "Organized crime conducts counter-intelligence and they are well aware of the loopholes in customs controls. They use smaller airports with fewer controlling resources or ones where there are none. At the land borders, they are aware of the work shifts of the customs officers and when there are less controlling personnel on duty. Smuggling organizations are testing new concealment methods and transportation routes before they are operationalized." - Senior Narcotics Investigator Finland Customs Authority

Logistics flexibility dimension

Similar to strategic flexibility, logistics and operational flexibility is a response to environmental uncertainty. Operational flexibility can be considered as a form of meta-control aimed at increasing control capacity by means of an increase in variety, speed, and amount of responses as a reaction to uncertain future environmental development (Kickert 1985). Criminals involved with transnational smuggling face a great deal of uncertainty and risk due to the prohibitive regulatory and legal environment. Professional smugglers adapt to this uncertain environment by incorporating flexibility in their supply chain operations. Supply chain flexibility in the criminal context entails *sourcing* illegal goods and services from multiple suppliers (e.g.) poppy famers, endangered wildlife poachers; *producing* multiple illicit products in one factory (e.g.) manufacture of numerous counterfeit pharmaceuticals within the same plant; quickly adapting the *packaging* of contraband for effective concealment; constant and rapid changes in transportation routings used for smuggling illegal goods. Each of the flexibility options have a different set of supply chain costs and benefits associated with the system design (Simchi-Levi 2010). Supply chain flexibility can be used in variety of supply chain processes (planning, sourcing, production, logistics, servicing). Criminal enterprises may utilize aspects of supply chain flexibility in a similar manner as their legitimate counterparts for augmented variety, speed, capacity to control for environmental uncertainty. However, it should be noted that the objective function for an illegal operation is to minimize the risk of detection, apprehension, and disruption.

Logistics flexibility can be defined as the ability of a firm to respond quickly and efficiently to changing needs in inbound and outbound delivery, warehouse and storage locations, consumer packaging, and adapting logistical solutions to changing customer and supplier requirements (Zhang et al. 2005; Day 1994; Davis 1993). Flexible logistics operations have two interdependent dimensions – a time dimension focusing on the speed of response to market needs and a range dimension concerned with the ability to meet customization and volume requirements. Flexible competence is internally focused and provides the processes and infrastructure that enable the organization to achieve the desired levels of capability (Zhang et al. 2005). Logistics flexibility is a key strategic attribute for organizations engaged in transnational smuggling. Cross-border smuggling typically involves multi-mode, multi-leg transportation shipments with various transport assets used for the smuggling operation. Drug smugglers have been quite agile in shifting their transportation routes when customs and border interdiction rates increased (Finland Customs Authority 2013, personal communication). Colombian cocaine traffickers traditionally smuggled contraband via Caribbean routes in the 1980s; as interdiction rates rose, smugglers shifted routes by utilizing Mexico as a transshipment route to move drugs into the U.S. Trans-oceanic smugglers adapt their transportation routes to risk minimizing considerations, targeting for example ports and transshipment areas with a long tradition of contraband, especially where they can buy authorities and harbor employees, or have access to strong local groups (Zaitch 2002). As the transport routings became more dynamic, the interchangeability of transport assets were enhanced for flexibility based on the modal characteristics of the smuggling operation. Logistics flexibility is also exemplified in the various forms of packaging used for contraband concealment, rapid changes in transshipment, storage, and distribution based on counter-intelligence, as well as the logistical solutions used to move and accommodate specific product characteristics (endangered wildlife, toxic waste, narcotics, weapons, illegal migrants) or special customer requirements (Table 2).

> "Once a particular smuggling route or method has been discovered by law enforcement, new routes and methods are introduced very rapidly by criminal organizations. While the authorities discover the new route, the old one might be in use by another smuggling organization with different methods and products." - Senior Narcotics Investigator Finland Customs Authority

Operational stealth

The famous military strategist, Sun Tzu stated; "All warfare is based on deception which assures that decisive blows may be struck where the enemy does not expect them and is consequently not prepared." Stealth can manifest itself in various forms and is most commonly referred to in the context of military applications. The tactics of operational stealth are essentially designed to surprise, confuse, and gain a competitive advantage over adversaries. Stealth is defined as a technique or a technology that allows for the control of observability and challenges the enemy across a gamut of war related activities by significantly increasing the enemy's difficulty in detecting, tracking, guiding, or controlling valuable war time assets and resources (Kacena 1995). The U.S. military developed stealth

Table 2 Flexibility dimensions and attributes of cross-border smuggling

Flexibility dimensions	Flexibility attributes related to cross-border smuggling
Strategic flexibility - Environmental uncertainty - Relationship structures - Diversification - Evolution of technology	• Adaptation to legal, regulatory, competitive environment uncertainty by smuggling rings • Relationship structures between illicit economic actors constantly changing due to incarceration, death, role changes within the criminal network • Diversification of illicit product and service portfolio • Evolution of law enforcement processes and technologies precipitate flexible strategic responses by criminal organizations (counter-technology designed for evasion & concealment, corruption, infiltration by criminal moles)
Logistics flexibility - Transportation - Product & inventory - Warehousing - Customer orientation - Information/Intelligence	• Ability to shift transport routes quickly based on customs and border patrol interdiction rates • Ability to change transport modes (air, marine, road, rail) based on legitimate commercial traffic flows for improved camouflage. • Ability to interchange transport assets (vehicles, planes, boats) • Ability to rapidly shift transshipment points for consolidation or deconsolidation of contraband cargoes • Rapid location changes in warehousing and distribution facilities (stash houses) due to risk of detection and law enforcement raids • Use of different packaging types used for smuggling • Stocking redundant inventory of contraband goods • Flexible logistical solutions to accommodate unique customer requests (human smuggling, narcotics, endangered wildlife) • Intelligence gathering of border control operational routines by smuggling rings to ensure appropriate timing of crossing and knowledge of transport flow patterns

aircraft, capable of reducing thermal and radar detection, in order to gain an advantage in combat operations (Rao and Mahulikar 2002). Commercial businesses can also utilize stealth to surprise competitors and grab market share. Stealth in the context of new product development, market entry, or changes in distribution channels enable smaller firms and individual persons to compete with larger competitors (Chen and Hambrick 1995). Due to very nature of illicit business, professional criminals use operational stealth tactics, in order to mitigate the risk of detection by law enforcement authorities.

> "Stealth can take many forms in the facilitation of illicit trade. Smuggling illegal goods through legitimate and legal distribution channels offers anonymity and cover for criminals. Attacks on IT systems of transportation networks and law enforcement databases are real threats. The use of advanced technologies and the internet are playing a more and more important role in the flow of illicit goods and services in the global economy. The combination of secrecy of money laundering flows, the introduction of alternative monetary currencies, such as Bitcoins, coupled with the piggybacking/hitchhiking on legitimate financial and transportation infrastructure aids in hiding illicit goods and services flows within licit flows and this presents a tremendous challenge for global law enforcement and customs agencies."- Head of Intelligence Operations of Finland Customs Authority

Stealthy distribution channels

The structure and configuration of a distribution system represents a long lasting strategic decision and has major implications for a firm's operations (Inkiläinen 1998). The explosion and adoption of electronic commerce during the last decade has created a transformational evolution in distribution management. Modern business models, focusing on digital distribution channels like eBay and Amazon.com have experienced exponential growth and have been eroding market-share from traditional bricks and mortar businesses (Brandt 2011). Never before has the world seen firms grow so fast or spread their tentacles so widely; the digital revolution has bought huge benefits for customers and businesses, promoted free speech, the spread of democracy, yet they provoke fear as well as wonder (The Economist 2012). Electronic hubs (e-hubs) focus on a particular industry, match buyers and sellers, facilitate the transaction, and collect a transaction fee (Gordijn and Akkermans 2001). These e-hubs act as online marketplaces; add value by reducing transaction costs (search), standardize systems, and improve matches between buyers and sellers (Amit and Zott 2001). Black markets and illicit traders have adopted these types of online marketplaces in recent years. Several electronic commerce sites, specializing in illicit products and services, ranging from illicit weapons and drugs sales to assassins for hire, have been created by criminal entrepreneurs seeking to exploit digital distribution channels.

The introduction of anonymous computer networks and online marketplaces make it easy to browse the internet anonymously and conceal the identities of buyers and sellers (Friedersdorf 2013; Hesseldahl 2013; Christin 2013). Anonymity through the obfuscation of location and identity epitomizes operational stealth. Anonymous computer networks provide an element of stealth that makes it extremely difficult for individuals outside the network to identify the persons engaged in transaction (Christin 2013). The Silk Road is an anonymous online marketplace and digital distribution channel that provides the infrastructure for buyers and sellers to conduct transactions online for illegal narcotics, fake documents, and other illicit products and services. The process works as follows: the site's users fund their accounts with Bitcoins, an untraceable digital currency; upon making a purchase, the necessary funds would be held in escrow by the Silk Road; once the transaction complete, funds were transferred; illicit narcotics are shipped, and various measures were taken to protect the anonymity of all parties involved during the transaction lifecycle (Friedersdorf 2013). The site had approximately 220 distinct product categories, with over 24,385 unique items and contains an online forum that ranges from between 30,000 to 150,000 active customers with estimated sales revenues of approximately $1.2 billion in 3 years of operations (Christin 2013; Friedersdorf 2013). From a logistical perspective, transportation deliveries of the narcotics were shipped primarily via postal or parcel carriers, such as UPS or Federal Express and instructions on the web site gave guidance to sellers on "best practice" shipment concealment methods (Anderson and Farivar 2013). Based on the postal markings on seized packages, purchases appear to have been filled by vendors located in multiple countries, thus exposing the transnational nature of the operations (Hesseldahl 2013; Christin 2013).

The Silk Road exemplifies stealth in the modern world and is part of wider phenomena known as the "Dark Web". The Dark Web is an open source platform, which is not indexed by standard search engines is often used for clandestine purposes to facilitate anonymity and is used by underground firms that sell illegal drugs, guns, hackers for hire,

as well as political activists trying to conceal their communications from a repressive government, or law enforcement doing surveillance work (Hesseldahl 2013). Web sites like the Silk Road operate on a computer network called the Onion Router (TOR), which enables individuals the ability to obfuscate their identity to remain anonymous, as the traffic between the users and the host server of the web site travels through a randomized network of nodes, thus no single link in the traffic chain can linked back to the individual accessing the web site (TOR Network 2013). Due to the very nature of criminal activity, secrecy and anonymity are held in high regard, thus it would be natural for criminal entrepreneurs to gravitate towards these types of networks (Fig. 1).

Ultimately, the Silk Road operations were shut down on September 2013, with the arrest of Ross Ulbright, the mastermind behind the enterprise. However, it is unlikely criminal entrepreneurs will withdraw their presence from the online world. Anonymous online marketplaces, similar to the Silk Road, specialize in a multitude of illicit products and services from stolen credit information and, weapons sales to child pornography and prostitution and these are not going away anytime soon (Anderson and Farivar 2013). The degree of operational stealth in modern digital distribution channels via anonymous computer networks and the use of alternative virtual currencies, such as bitcoin, represent a new level of identity and transactional concealment by illicit supply chain actors. Technology-driven crime innovation has become organized and industrialized and many of the problems that law enforcement forces face in controlling it are made more acute online, due to factors ranging from network externalities to global scale.

Stealth logistics

Operational stealth can also be exploited in the logistics function. A professional smuggler's primary objective is to transport contraband, escape detection, and evade arrest; therefore stealth is a smuggler's best friend. Stealth logistics involves a gamut of transportation methods, modal choices, specific coordination protocols, and specialized transportation assets that optimize concealment, minimize suspicion, and the risk of detection. Contraband can be moved either through legitimate commerce and traffic flows (e.g.) commercial airlines, vessels or via dedicated transportation routes and assets away from commercial conveyances and flows (Reuter 2002; Decker and Townsend Chapman 2008). Over the years, smugglers have developed very sophisticated and innovative logistical methods to illegally transport illicit goods to market.

Transnational smugglers occasionally prefer areas that are inaccessible and difficult to monitor, in order to increase their probabilities of a successful operation (Caulkins et al. 2009). The level of stealth increases if the smuggling routes are secluded, poorly

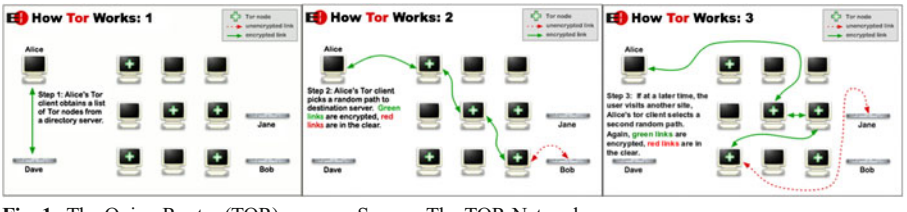

Fig. 1 The Onion Router (TOR) process. Source: The TOR Network

monitored, or surrounded by difficult terrain such as mountainous regions or large spaces of desert. This does not preclude the use of underground methods of transportation. On the borders of Gaza and Israel, as well as Mexico and U.S., smugglers dug tunnels as a means for clandestine transportation of humans, firearms, and illegal drugs. In October 2013, U.S. Immigrations and Customs Enforcement (ICE) and Customs and Border Patrol (CBP) discovered several highly sophisticated underground tunnels equipped with lighting, ventilation, and rail equipment that was utilized to smuggle narcotics from Tijuana to San Diego (U.S. ICE 2013). It should be noted that this form of smuggling is becoming more difficult, as technological advances in the monitoring and reporting of movements across remote border areas and the cooperation amongst international law enforcement authorities have increased greatly in the last decade (UNODC 2010).

The maritime mode of smuggling encompasses several stealthy transportation methods. The drug smugglers utilize various marine transport asset types to move contraband such as fast boats, fishing trawlers, semi-submersibles, and fully submersible vessels. High speed "go-fast" boats have been used by drug smugglers for several decades and prior to that by alcohol bootleggers, during the prohibition era (Andreas 2013). Speed can be considered as a form of stealth, as high speed transport assets act as evasive mechanisms against apprehension by border patrols. Utilizing go-fasts, smugglers adopt a "scatter gun" approach by moving concentrated consignments in solo runs, where loads are dispersed and smuggled by stages; this method is designed to maximize security for each payload by shortening the response time available to interception craft and reducing the statistical probability of losing the entire cargo to one dedicated seizure (Chalk 2011). Deep fishing trawlers are typically used to smuggle larger transport lots. Fishing trawlers have sophisticated navigation and communication systems and are typically retrofitted to smuggle narcotics by various concealment methods, such as hiding the contraband in metal containers welded to the shipping hull, false bulkheads, or storing it in secret engine compartments (Decker and Townsend Chapman 2008; Caulkins et al. 2009; Andreas 2013). Colombian drug traffickers have been known to use semi-submersibles for smuggling. Typical characteristics of semi-submersibles are single or twin engine, 12 to 24 m long, speed of 6-8 knots, spanning of range of up to 3,500 km, capable of carrying a cargo payload of 4-12 t of brick form cocaine that can be operated with a crew of 3-4 people, and do not emit radar traces and effectively eliminate infrared signatures by dissipating engine heat through keel coolers (NY Times- September 9 2012). Fifty four of these crafts have been seized since 1993 (McDermott 2010). Semi subs have a unique evasion capability, in the face of impending interdiction. The vessels contain a scuttling valve which is designed to sink the ship in approximately 12 min, thus the traffickers jump overboard, forcing the interdiction team to perform a search and rescue mission (required by international law); by this time the semi sub, along with the incriminating cargo is most likely lost, leaving the authorities little option but to release the any apprehended crew (Chalk 2011). In 2010, the DEA reportedly seized a fully functional completely submersible vessel which had been constructed for transoceanic voyages and authorities assert this marks a quantum leap in drug smuggling evasion technology (Bajak 2010).

The integration of smuggling contraband into the legal cross-border movement of commercial goods is an approach utilized by illicit traders who tend to move larger transportation lots (Caulkins et al. 2009; van Duyne 1993). While piggybacking on legitimate transportation infrastructure seems less stealthy when compared to other

methods, trade relationships between "inside" actors, such as port staff, transport clerks, cargo handlers, logistics service providers and professional smugglers are kept secret in order to facilitate the crime (Williams 2001; Basu 2013). Stealth in the form of secretive relationship ties enables the expedition of smuggling and is highly relevant for strategy, structure, performance paradigm of illicit supply chains. The October 2013 incident of a successful narcotics smuggling operation at the port of Antwerp illustrates the case of piggybacking on legitimate transportation infrastructure, technology savvy, secretive relationships, and stealth logistics. An international smuggling ring concealed a large shipment of cocaine inside eight ocean containers of legitimate cargo, destined for the port of Antwerp; concurrently, the organization hired IT hackers that secretly installed equipment hidden inside electrical power strips and external hard drives to steal login credentials and release codes from the port's computer system, and then used wireless controllers to regulate the port's logistics system in real time, in order to falsely release the contraband containers to corrupt drivers that moved the goods onwards (Europol 2013).

Logistics stealth encompasses multiple transportation strategies: piggybacking on commercial conveyances by blending into legitimate transport flows versus the utilization of more remote or inaccessible routes via dedicated logistical assets. The decision can be influenced by a variety of factors, such as the intensity of law enforcement controls, interdiction rate patterns, criminal resource allocation, counter-intelligence, optimal timings of border crossing, and specific logistics requirements of the product being moved. These factors also determine the modal, asset specificity, and frequency characteristics of the smuggling operation.

Conclusion

Transnational smuggling has evolved in response to an assortment of economic, political, social, and technological forces. Transaction costs, such as concealment and evasion costs, as well as the continuous interaction between law enforcement authorities and professional smugglers have created key attributes for operations strategies employed by organizations engaged in cross-border smuggling. Strategic flexibility enables smuggling organizations to mitigate environmental uncertainty and adapt rapidly to market, regulatory, and structural conditions. Logistics flexibility allows smugglers the ability to swiftly change transportation modes, routes, and logistical assets to accommodate for fluctuations in operational conditions and real time interdiction efforts from law enforcement. Operational stealth in modern logistics and digital distribution systems represent new levels of anonymity and highly advanced technical capabilities, designed to obfuscate location and identities of illicit supply chain actors, circumvent law enforcement, and infiltrate sensitive transportation and financial infrastructure systems. The attributes of operational stealth, strategic, and logistics flexibility, inherent to transnational smuggling operations, enable the facilitation of global illicit trade and present key challenges to international law enforcement and customs organizations. In order to combat, control, and disrupt illicit trade, it is necessary to understand the underlying attributes of the operations strategies, employed by transnational smuggling organizations.

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