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ILLEGAL INTERNATIONAL TRADE OF E-WASTE - EUROPE

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ABSTRACT

The poor management of growing amounts of e-wastes has given rise to a series of consequences. One of the major consequences relates to illegal international trading of the wastes. This trade is a means for brokers, smugglers and organized crime groups to meet the demands of the waste producer for cheap disposal of used electronic products. The process is therefore frequently implemented through illegal means, with workers undertaking gross extraction processes in importing countries. The consequences of this include environmental harm, poor working conditions, yields for organized crime groups and loss of economic opportunities for exporting countries. This paper is focused mainly on e-wastes produced in Europe. To analyse and discuss a feasible solution to combat the illegal market, the article presents the three main reasons, i.e. European integration, corruption and ineffective customs inspections, underlying delivery of these wastes by criminals to the European continent, concluding that the best means of combating this trade is to apply a take-back system.

1. INTRODUCTION

Internationally, the most important legal instrument that describes electronic wastes (e-wastes) subjected to transboundary movements is the Basel Convention (BC). The latter movements relate to transport from an area under the national jurisdiction of one State to an area under the national jurisdiction of another State (UNEP, 1989). In terms of e-waste, this paper considers all types of discarded electrical and electronic equipment (EEE) (Adrian et al., 2014).

This type of waste is deemed hazardous by the BC mainly, in accordance with Annex I, due to the content of constituents such as mercury, copper, brominated flame-retardants and lead. Moreover, e-waste production has featured a steady growth, due to its fast obsolescence and increased production. It has been estimated that by the end of 2018, global production will have grown to 49.8 mega tons, i.e. , 6.7 kg/inhabitant, a 19% growth in relation to the 41.9 mega tons produced in 2014 (Baldé et al., 2015).

Therefore, this problem compels States to set up valid governance plan to cope with this issue because, since legal disposal is frequently expensive, disposers tend to seek cheaper solutions. One of these is the illegal international trading of the wastes and lack of relevant notification to all States concerned (UNEP, 1989).

These trades are concerning first and foremost as they are often outsourced to organized crime groups (OCGs) and small smugglers, both generally involved in other illegal activities in different parts of the world (Naim, 2006). Secondly, these trades result in gross handling of the waste and, hence, impact negatively on working conditions and the environment in importing countries (Geeraerts et al., 2015).

Accordingly, the BC was established with the aim of creating a legal responsibility for the European nations in terms of waste disposal and, thus, reducing illegal trading of the same and related consequences (UNEP, 1989).

Furthermore, the importance of analysing the illegal trading of e-wastes is linked to the challenges encountered in managing the wastes following inappropriate disposal, largely due to the complexity of the latter (UNEP, 2011). Governmental actions previously enacted in an attempt to thwart these transboundary movements are no longer effective (Naim, 2006). As a consequence, more adequate approaches should now be identified.

Based on these premises therefore, this paper concludes that the most feasible manner of addressing these trades is through the improvement of take-back systems for the collection and processing of e-waste either through direct regulation or by providing the necessary incentives (Mccann and Wittmann, 2015). To support the latter, section 5 will demonstrate how the European Integration, corruption – accepting bribes or undue advantages (Council

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of Europe, 1999), and ineffective customs inspections hamper the implementation of several governmental enforcements, consequently underlining the feasibility of adopting a take-back approach.

This approach is of considerable importance due to the complexity of e-waste transboundary movements (Bisschop, 2012) and, secondly, to the fact that concerted legal efforts are made to punish those involved in the illegal e-waste chain, European laws regarding transboundary movements of e-waste are not particularly effective. Moreover, the nature of environmental crimes itself is not punitive.

Moreover, due to the shortcomings in boundaries monitoring, there is no guarantee that enforcements, such as increase of trade bans, will succeed in coping with these trades (Rucevska et al., 2015). Hence, a focus on enforcements such as take-back systems, aimed at preventing the e-waste from reaching its international chain, is less costly.

Finally, it should be taken into account that the notion whereby illegal trades are merely a criminal issue is a misconception (Naim, 2006). It is also a matter of asymmetries in development and access to resources (Geeraerts et al., 2015). Consequently, the efficient solutions are those that counter the demand for these illegal services, such as take-back.

2. THE ILLEGAL INTERNATIONAL TRADE OF E-WASTE

By 2050 the waste sector is expected to employ between 23 and 26 million people, considering both legal and illegal activities (UNEP, 2011). This steady growth in the waste sector is concerning mainly in view of the crimes committed to illegally trade wastes, featuring a broad chain of legal operations, with criminals taking advantage of loopholes in control capacity (Rucevska et al., 2015).

These operations are executed by a series of agents and, with regard both legal and illegal operations, the e-waste chain is comprised of waste generators, waste collectors, waste management companies, transport and shipping companies, waste treatment operators, shipping agents, waste brokers, smugglers, small groups of people, and OCGs (Europol, 2015; Rucevska et al., 2015). In the case of these three last groups, particularly the latter, evidence has demonstrate bonds with the private and public sector, mainly in importing countries (Center for the Study of Democracy, 2012; Naim, 2006).

It should also be taken into account that illegal trades are facilitated by the cooperation established with both legitimate business, such as those in the financial, trade services and metal recycling industry; and illegitimate concerns, such as those specialized in document forgery for the acquisition of permits (Europol, 2011). However, even in the lack of a similar cooperation, legitimate businesses such as banks, carriers, lawyers and exchange offices (Bisschop, 2012) may participate unintentionally in this process (Naim, 2006). This unintentional nature however may be questionable, as the companies involved will know their customers and, hence, could use blacklists to avoid the transportation of illegal waste. Due to the cover provided by legal activities, this type of trade entails low risks of culminating in fines or prison, and results in the gaining of substantial profits (Bisschop, 2012).

When addressing the issue of why agents work in the e-waste chain, this should be viewed as a standard commodity, (Bisschop, 2012). In the case of a commodity, the producer sells the product to the consumer in return for money. In the case of e-waste, the producer provides both the waste and the money. This is a push factor for those involved to work on.

An additional push factor is represented by the fact that an increased environmental awareness has led to the development of new and more rigid laws, at the same time raising the costs of appropriate management of e-waste, primarily in developed countries (Bisschop, 2012). These circumstances have led to the creation of opportunities to get rid of the wastes quickly and cheaply, generally by means of illegal export (Naim, 2006). Italian companies, for instance, might pay about € 60.000 to legally dispose of a container of 15.000 tons of hazardous waste. Illegally, the same quantity could be disposed for approx. € 5.000 (Ciafani, 2012). These illegal exports therefore are linked to serious environmental crimes.

More specifically, agents who handle the e-wastes may vary according to factors such as place and quantity transported. OGCs, for instance, are generally more loosely structured than traditional mafia-like groups. Accordingly, small groups of up to ten people organized for a short period obtain financial benefits and then rapidly dissolve to form new groups (Europol, 2011; Geeraerts et al., 2015). Governmental enforcement plans also reveal how some criminal groups trafficking e-waste are involved in crimes related to human trafficking, fraud drugs, theft, firearms, and money laundering (Environmental Investigation Agency, 2011).

However, OCGs are not necessarily involved in the trafficking of e-wastes, with this role even being covered by other groups, including brokers. A pertinent type of broker is the waste tourist who, buys second-hand electronics and ships them to their relatives or business partners in developing countries. These people may be resident in the country of origin, carrying false passports and visas, and buy the products in thrift shops (Bisschop, 2012; Environmental Investigation Agency, 2011; Rucevska et al., 2015).

Furthermore, the widespread availability of Internet allows criminals to sell wastes on e-commerce websites. In Europe, over 70% of detentions relate to articles being shipped by express or postal services (European Commission, 2014). The high quantity of detentions in these services is a consequence of the high quantity of companies registered in free zones. These companies are neither public nor legally accessible, which makes it easier for them to hide illegal trades and delete evidence (Naim, 2006; Rucevska et al., 2015).

Finally, although these people may engage in illegal trades for several reasons, the main reason is related to economic aspects (Naim, 2006). For instance, in the Netherlands, second-hand televisions can be bought for US$ 4-5 each and sold in Africa for around US$ 10 per unit (Rucevska et al., 2015). Accordingly, the illegal disposal of e-waste

economically attracts both the disposers and criminals who want to sell the waste. Moreover, low profitability of formal recyclers limits their financial ability to compete with informal collectors, who often purchase e-waste (Chi et al., 2011).

To conceal their illegal activity and products, actors in the e-waste chain adopt a series of methods (discussed below) to breach customs systems.

3. METHODS APPLIED TO BREACH CUSTOMS SYSTEMS

Article 4 of the Basel Convention gives parties the right to prohibit the import of hazardous waste and states that countries shall not permit its export. Ergo, to illegally trade in these wastes, criminals need to adopt methods to breach customs, notably in Europe, where all countries adhere to the convention (UNEP, 1989).

The two main methods brokers use is to mingle e-waste with legal materials and thus obtain a false classification (Rucevska et al., 2015). Together with this false classification, documents may also be forged (Naim, 2006).

In the strategy of mixing wastes, criminals attempt to hide illegal goods in the cargo, or, at least, hinder access to the same. Examples of this are doors of vehicles containing soldered e-waste (Rucevska et al., 2015). According to this strategy, criminals may even attempt to transport illegal wastes together with other illegal materials. For instance, INTERPOL (2015) has succeeded in seizing weapons concealed in illegally exported wastes in France.

In the case of false classification, it must be considered that, in the ambit of international trades, products are coded under a Harmonized System (HS), delineated by the World Customs Organization (WCO). Nonetheless, as Rucevska et al. (2015) stated, the HS does not encompass all existing wastes. Accordingly, the decision of whether the product traded is second-hand EEE or simply waste is a highly arbitrary decision, a situation that hampers the tasks of the inspectors (Geeraerts et al., 2015; Naim, 2006; Rucevska et al., 2015). Therefore, either by a lack of coverage in HS or by implementing an illegal trade, exporters may opt to provide a false declaration as to the nature of the waste or to use customs codes associated with goods falling outside the scope of the Basel Convention (Rucevska et al., 2015).

Exemplifying this situation empirically, the import of batteries and metal scrap mingled with other hazardous wastes (under the BC definition) to Indonesia (Japan Ministry of Environment, 2011) may be mentioned. Exporters used the code 7204 indicating ferrous waste and scrap; re-melting scrap ingots of iron or steel (Foreign Trade Online, 2018).

A cooperation has been set up between the Basel Convention Secretariat and the WCO to address this problem and to fill the loopholes in codes (Basel Convention, 2011). Nevertheless, since the main methods to breach customs systems are misclassification and the mixture of products, the creation of new codes would likely fail to constrain these breaches. Firstly, misclassification is not applied due to the lack of proper HS codes, but, rather, as an attempt to conceal goods. Therefore, it would still be possible to mingle the illegal e-waste with legal materials and trade them using the HS code of a legal material.

A series of governmental responses have been forthcoming with the aim of countering these methods. One of these is represented by the review of the WEEE Directive, adopted in June 7th, 2012, with specific regard to burden-of-proof. Following this revision, countries are able to request from the exporter evidence including a copy of the invoice and contract, to prove that the equipment is earmarked for direct re-use, and certificate of testing (European Commission, 2013). However, these documents are remarkably susceptible to forgery and corruption (Europol, 2011, 2015; INTERPOL, 2015; Naim, 2006).

When the illegal methods succeed, the exported waste generally reaches its destination; however, in addition to the waste, the trader also contributes to the creation of environmental and social problems (Vail, 2007). To analyse these issues, the subsequent section will focus on the waste importers and consequences produced by these trades, particularly with a view to promoting the application of take-back systems.

4. E-WASTE IMPORTERS AND CONSEQUENCES OF THIS TRADE

In agreement with the literature on illegal international trade of electronic waste, including those originated in Europe, the major destinations are Africa and Asia (Bisschop, 2012; European Environmental Agency, 2012; Geeraerts et al., 2015; Li et al., 2014; Lundgren, 2012; Rekenkamer and Voorhout, 2013; Rucevska et al., 2015). In general, small-scale exports are destined for West Africa, whilst the larger and sometimes more structurally organized transports are directed to South-East Asia (Lundgren, 2012).

Geeraerts et al. (2015) and Rekenkamer and Voorhout (2013) have indeed pointed out that the majority of European e-waste sent to Asia ends up in China. This is largely intended to boost the demand for raw materials created by a rapid economic growth in these importing countries (European Environmetanl Agency, 2012). E-waste is a valuable source of raw materials and China, as Early (2013) pointed out, controls approx. 70% of the global recycling market, a fact that is highly attractive for the e-waste market in this country.

However, due to the preferential status of a handful of countries for e-waste recycling, some, such as China, tend to strictly monitor the situation. In an attempt to overcome these monitoring processes, exporters have been seen to avoid the most common international flows of e-waste and use other sites as intermediaries to alleviate the suspicion of illegality (Geeraerts et al., 2015). For instance, Lundgren (2012) states that exporters often use Hong Kong, Taipei or the Philippines as entering sites and then transit the e-waste to smaller ports in China. Correspondingly, Dubai and Singapore also serve as intermediaries for the same purpose (Kalra, 2004).

On the other hand, the Chinese economic growth may also turn the tables and place the country as an e-waste exporter, since Chinese consumers increasingly buy new

EEE instead of second-hand products. As a consequence, African brokers go to China to collect second-hand EEE and ship them to African countries (Geeraerts et al., 2015).

Another source of attraction for the import of e-waste is the profit that informal recyclers make by dismantling these wastes. From this process, they extract precious metals such as gold, copper, nickel and rare materials, such as indium and palladium (Lundgren, 2012; Rucevska et al., 2015), thus creating a demand for the waste in both exporting and importing countries. The former feature a demand to get rid of waste cheaply, and the latter a demand to obtain revenue from waste by dismantling it.

In accordance with Geeraerts et al. (2015), exportation of the waste will result in an economic loss to the nations and enterprises that generate the waste. Sound recycling of 1 million cell phones can recover about 24 kg (50 lb) of gold, 250 kg (550 lb) of silver, 9 kg (20 lb) of palladium, and more than 9,000 kg (20,000 lb) of copper (Electronics Take-Back Coalition, 2014). Moreover, literature studies and data presented by Bisschop (2012) have reported how legal extraction is capable of achieving a 500% higher efficiency in terms of quantity of materials extracted, being able to extract approximately 280% more gold from a mobile phone as demonstrated , respectively, in part A and B in Figure 1.

Following the extraction of components from e-waste, these can easily be restored to a legal status, as the complexity of the chain makes it extremely difficult to learn the actual origin of the gold or copper extracted. Furthermore, the workers involved often have bonds with the manufacturing industry to sell the extracted materials (Geeraerts et al., 2015).

Considering the issue of workers, it is important to highlight that although for some this has become a lucrative industry, others it has served to reinforce inequalities, which intersect gender, race, class and age (Geeraerts et al., 2015). In terms of human health, Li et al. (2014) stated that these e-waste disposals, particularly in China, are responsible for the introduction of large amounts of pollutants into the air, drinking water, and food supply. With regard to working conditions, Pickren (2014) and Wang et al. (2013) affirmed that the majority of recycling labourers are rural migrants from outlying agrarian regions who have informal and precarious jobs and receive around $1.5 per day, many of whom women and children.

Furthermore, the environment is impacted by the consequences of this waste mainly due to the gross recycling methods used, which include:

- Heating circuit boards by blowtorch method (Puckett et al., 2002);
- Stripping of metals in open-pit acid baths to recover gold and other metals (Wong et al., 2007);
- Open-air burning of cables in order to recover copper and burning unwanted materials (Wong et al., 2007).

However, although informal and gross methods are much less effective, Chi et al. (2011) assert that they are highly 'cost-efficient' due to the use of non-skilled manual labour, and disregard any hazards to environment or health. Moreover, these informal practices contribute to the release of toxic metals and, consequently, expose workers to acids, lead and toxins released from burned debris (Naim, 2006).

Briefly, this analysis demonstrates, as mentioned previously, that the e-waste business reflects both the economic and social realities of different countries, and not only a criminal issue apropos of OCGs, small smugglers or brokers (Naim, 2006).

To analyse why these illegal trades are conducted in Europe, the next section will discuss three specific reasons and relate them to use of a take-back system.

5. REASONS UNDERLYING THE ILLEGAL TRADE

In addition to the above-mentioned reasons underlying the illegal international trade of e-waste, this paper will hereafter focus on three reasons encountered in a European context. This additional analysis will also serve as the groundwork to justify implementation of a take-back system. Firstly, European integration will be examined, followed by corruption and, finally, ineffective customs inspections.

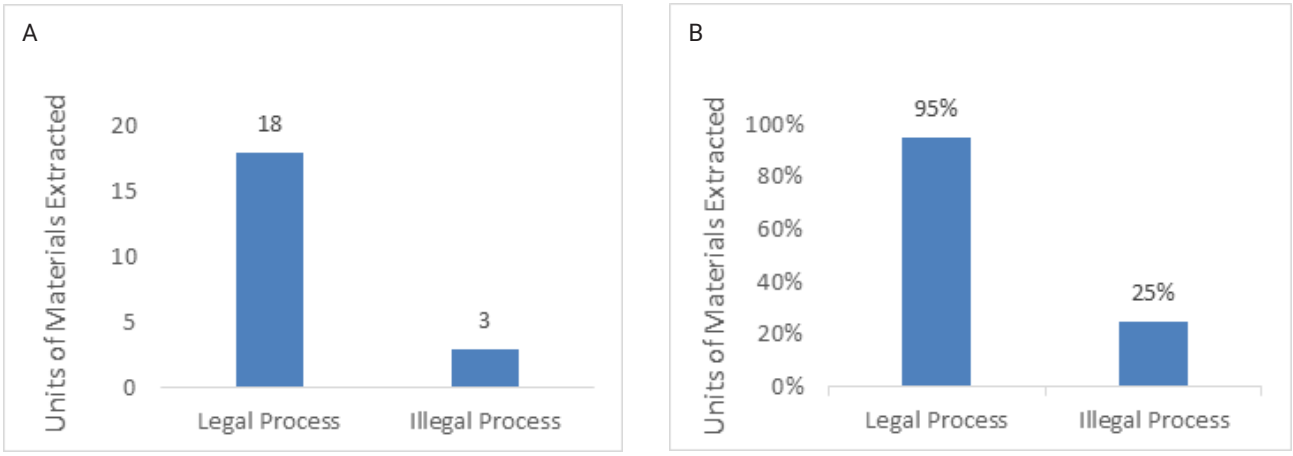

FIGURE 1: Extraction of materials from mobile phones and percentage of gold extracted from mobile phones - Adapted from Bisschop (2012).

5.1 The European Integration Process

The European Union (EU) is a customs union. According to the European Commission (2014), a customs union is created when a group of countries joins together to apply the same rates on import duties from the rest of the world. Additionally, the EU applies a wide set of common rules to imports and exports, and has completely removed all controls between member states (European Commission, 2014).

In legal terms, The Treaty on the Functioning of the European Union (TFEU) enshrines this removal of control and free movement. In Part Three, Title I, Article 26 the treaty states that the internal market shall comprise an area without internal frontiers in which the free movement of goods, persons, services and capital is ensured in accordance with the provisions of the Treaties (Official Journal of the European Union, 2008). However, despite this removal of barriers, inspections may be implemented between internal borders (Center for the Study of Democracy, 2012).

Consequently, although valuable for free trade between countries, this integration process may at times facilitate the action of e-waste brokers. IMPEL-TFS (2013) points out, on the one hand, that this process provides a lot of shared information between inspectors and organizations in the ambit of the EU. However, on the other hand, Rekenkamer and Voorhout (2013) and Geeraerts et al. (2015) state that the involvement of multiple organizations creates challenges with regard to enforcement, underlining how many Member States (MS) do not have well-trained staff, technical equipment or money to implement these inspections or enforcement. Indeed, even nations with more resources may face financial limitations and staffing issues (Lundgren, 2012). Moreover, the broad definition of waste used by the Waste Shipment Regulation (WSR) (internalization of BC into EU) may limit information sharing (Geeraerts et al., 2015).

Additionally, the prosecution of environmental crimes remains a national competence and MS do not have the same level of enforcement (Bisschop, 2012). This in turn leads to a process referred to by the cited author, port hopping, implying that brokers may choose ports in which controls tend to be less stringent.

For instance, the Netherlands is one of the busiest e-waste exports hubs in the EU and, consequently, is considered to have good enforcement policies (Geeraerts et al., 2015; Rekenkamer and Voorhout, 2013). In response to this, agents tend to look for ports in other countries.

As reported by Naím (2006), this process hampers the tracking of illegal cargoes, furthermore resulting in corruption at Border Crossing Points (BCP).. However, one important form of corruption with regard to the practice of port hopping is the overlooking of travel bans, as described by the Center for the Study of Democracy (2012), thus allowing criminals to move more freely throughout Europe.

The above issue however is aggravated by the fact that the legal system fails to prosecute all environmental crimes, with only a handful of countries having specific prosecutors for these sorts of crimes (Eurojust, 2014). Accordingly, in terms of WSR violation, prison sentences are very rare. In most cases, the offender is either fined or the charges are dropped (Rekenkamer and Voorhout, 2013). This may occur as waste crimes are frequently regarded as victimless crimes, which in most cases leads to waste crimes going unreported (Baird et al., 2014). Therefore, the loopholes in EU enforcement and legislation also act as driving forces of e-waste illegal trades (Geeraerts et al., 2015; Lundgren, 2012).

Accordingly, some ports may evolve into ports of transit, such as the port of Antwerp (Bisschop, 2012). The majority of waste handled at the port is in transit from countries such as Germany, Austria, Switzerland, France and the Netherlands. Antwerp is moreover used as an intermediary due to the presence of limited staff and limited availability of resources (Bisschop, 2016). Moreover, the author affirms that port hopping occurs largely between the ports of Rotterdam, Antwerp, Hamburg, Felixstowe, Le Havre and Bilbao. Following this process, the waste is forwarded to its main destination: Africa and Asia.

The occurrence of crimes in European countries is a crucial issue as the EU produces a substantial part of global e-waste. According to Baldé et al. (2015), this represented 22.72% in 2014. In addition, only one third of WEEE is appropriately disposed of in the EU, either in the country of origin or in other states (Eurostat, 2018). The remaining wastes might be collected by unregistered enterprises and properly or improperly treated or even illegally exported abroad (Eurostat, 2018).

The issue of European integration is likewise of importance in view of the contribution provided by waste transport policies and practices within individual nations and throughout the EU to the phenomenon of illegal waste shipment (Vail, 2007). Indeed, a tougher approach to recycling or treatment by the individual European countries may even encourage illegal shipment rather than stimulating appropriate management, particularly due to the relatively free flow of goods.

It is likewise important that, since illegal e-waste trades are a global problem, it was hoped that a European regionalization would be able to better identify the best solutions for the problem, since the efforts made would involve global measures rather than merely local and national actions (Naim, 2006). Nevertheless, as discussed above, this integration process may also facilitate an illegal trading in Europe, which produces a significant share of global e-waste.

Concisely, these loopholes, related mainly to inequality in enforcement among European countries, are one of the reasons for advocating the use of take-back systems as an efficient manner of combating illegal trades.

Finally, it should be borne in mind that not all illegal trades benefit from this integration process and relative free movement of goods. However, they may still be susceptible to corruption, as discussed in the next section.

5.2 Corruption

Corruption involves both legal and illegal activities in the e-waste chain and relates to both exporting and importing countries. Corruption involves a variety of individuals, including border guards, customs officials and port operators (Chêne, 2013). As reported by Chêne (2013), there is a

broad consensus in the literature that port and border corruption may exert a detrimental impact on shipping costs and OCGs.

Sequeira and Djankov (2013) divided public officials in charge of public services according to the possibility of participation in collusive or coercive corruption. The first was related to the division of rent generated by an illicit transaction between public and private agents, and the second to the payment of an additional fee in order to gain privileges.

These two types of corruption produced a series of different reactions amongst the different agents. Some legal firms, for instance, are willing to travel additional distances to avoid coercive corruption at ports, chiefly as it may raise the cost of products (Sequeira and Djankov, 2013). Illegal businesses, however, tend to look mainly for collusive corruption, firstly because it is related to illicit transactions and, secondly, because it may represent a means of avoiding physical inspection of containers (Chêne, 2013; Sequeira and Djankov, 2013). Hence, it is an opportunity to reduce the possibility of customs discovering illegal activities.

With regard to OCGs, as stated previously, these groups commonly use intermediaries and native people who are better acquainted with the situation of the country in order to make corruption more effective. This outsourcing allows them to quickly withdraw their names from the transactions (Center for the Study of Democracy, 2012; Naim, 2006). In addition, a specific category of intermediaries is comprised of legitimate logistics and professional service experts, some of whom are employed (willingly or otherwise) by organized criminals to bribe border guards (Center for the Study of Democracy, 2012).

In the specific case of e-waste transport, corruption may include bribery, cybercrime, document forgery, identity theft and use of intimidation and violence (Geeraerts et al., 2015). During the 2000s, customs agencies around the world established a series of inspectorates to fight corruption. However, whilst they received no reward for fighting corruption, they were at risk of being 'rewarded' with death by OCGs (Michael and Moore, 2010).

As a result, according to the findings of the analysis of the European Integration process, corruption may also be capable of turning the country involved into an intermediary hub of e-waste export. One example of this is Italy. As a consequence of corruption, both in the public and the private sectors, mainly in the issuing of false certificates by laboratory technicians, the country has become a transit site of e-waste to Africa and Asia (Europol, 2011).

Illegal actions committed by border guards fall into categories including the sale of information, overlooking of travel bans, provision of false alibis and obstruction of investigations either actively or in a more passive manner. Active involvement could entail the providing of information about patrols, for instance, whilst passive involvement may relate to overlooking the presence of illicit goods after receiving bribes (Center for the Study of Democracy, 2012). By acting thus, these public agents clearly promote the action of OGCs, small smugglers and other agents in the illicit e-waste chain.

With regard to importing countries, the following factors should be taken into account in order to better understand corruption: presence of weak institutions, poor governance, under-resourced customs, operations in geographically dispersed places, lack of supervision, lack of training, low level of automation and limited staff (Chêne, 2013). In many African ports, for example, Omondi (2007) demonstrated how certifications and valuations are hugely prone to corruption, with bribes frequently being based on the consignment value. Moreover, in many of the importing countries, agents involved in the illicit chain may infiltrate the bureaucracies (Naim, 2006).

A similar form of corruption is also present in Asian countries, where governments are at times complicit in the actions undertaken by OCGs (Naim, 2006). Indeed, in the aftermath of attestation of the latter, the government of China created a rotation system of officials along the border with Vietnam (Geeraerts et al., 2015).

To counteract these problems, literature reports relating to corruption and anti-corruption in the customs area maintain that technology is one of the best means of achieving this goal, particularly as the processes would subsequently be automated (Michael and Moore, 2010; WCO, 2003). However, this specific use of technology may also aid the work of criminals, as demonstrated by the application of e-commerce described in section 2 of this paper. Moreover, technology has contributed towards a considerable geographical expansion of these illegal markets. Lastly, those operating illegally are often more flexible than governments and, consequently, are more willing to to take advantage of the benefits provided by technology (Naim, 2006). This in turn implies that automation may prove beneficial to both sides, and frequently may particularly enhance the work of those involved in illegal activities.

An additional factor heavily implicated in combating corruption is related to the raising of customs barriers or liberalization of trade. In the first case, the scarce flexibility of the waste should be taken into consideration. The use of barriers tends to raise the price of e-waste, whilst the market demand remains relatively unaffected (Baird et al., 2014). Additionally, illicit trades expand insofar as the profits increase. Consequently, in the presence of additional barriers, the traders tend to receive greater profits (Naim, 2006), due to the relative inflexibility of the product and the scarce effectiveness of customs barriers in hampering these trades.

Conversely, the onset of free trade, which may contribute towards reducing collusive corruption, largely due to the removal of tariffs (Chêne, 2013), would likely result in a decrease in the profits of illegal e-waste trades (Naim, 2006). However, Sequeira (2013) reported that liberalization may also be capable of replacing corruption by applying coercive methods to perform routine processes. Furthermore, although liberalization of trade may indeed result in a decrease in the illegal gains, this would in turn render customs more pervious to these crimes.

In addition to the aspects discussed above, other issues relate to the creation of codes of conduct, promotion of campaigns against corruption and customs investigations. Very few anti-corruption expert have ever been able to produce firm evidence demonstrating that the outcomes

of these actions aimed at combating corruption, have outweighed their costs (Michael and Moore, 2010). Accordingly, the authors affirm that customs officers are rarely subjected to disciplinary actions following a breach of the code of conduct due to a somewhat abstract formulation of the former.

Consequently, corruption further underlines the need to implement effective take-back systems. Despite the presence of numerous anti-corruption programs and campaigns throughout customs, as demonstrated, the national governments are not able to counteract illicit trades (Naim, 2006).

In a nutshell, efforts such as campaigns against corruption and creation of codes of conducts should continue in the fight against corruption. However, based on the arguments presented, mainly relating to the lack of efficiency of these programs, it would be more appropriate to focus increasingly on take-back systems. This would undoubtedly represent a more effective way of preventing corruption and impeding the entry of e-waste into the international chain.

Analogue to the loopholes in the European integration, corruption will not always prove beneficial to all cases of illegal trading of e-waste. However, at any given time, the illegal activities will undoubtedly take advantage of the subject discussed in the next section: ineffective customs inspections. A scarce evolution in the efficiency of inspections throughout Europe indeed further supports the use of a take-back system.

5.3 Inefficiency in Customs Inspections

Given that a huge quantity of products pass everyday through customs worldwide, it is impossible for custom officers to inspect all shipments. For this reason, based on the methods illustrated previously in part three, it may be possible for illegal shipments of e-waste to pass through customs without being subjected to inspection.

This has been empirically demonstrated in Europe by the IMPEL data. Periodically, the organization performs Enforcement Actions (EA) to gather data relating to inspections as shown in Table 1 (IMPEL-TFS, 2011, 2013, 2015).

The actions undertaken in 2011 and 2013 focused solely on the physical inspections as part of the analysis. However, data illustrated in Table 1 has been adapted in line with the IMPEL reports, to consider both physical and administrative inspections. Data analysis failed to identify an improved efficiency in the inspection of e-waste shipments, although some countries have started to use data and other intelligence in preparing for inspections, as recommended by IMPEL-TFS (2015).

In EA II, for instance, 14.59% of all inspections related to waste, with 21.37% revealing a breach of some description. This detection of violations by waste shipments increased by approx. 10.6% from EA II to EA III. However, in EA IV, although the percentage of waste inspections had increased by 14.55% of all inspections conducted compared to EA III, the percentage of breaches detected had fallen by 15.42%.

Hence, despite the possibility of e-waste shipments undergoing inspection based on the findings of intelligence resources, data obtained in Europe continue to evidence a lack of customs efficiency. This may be linked to a problem with funding, as mentioned in section 5.1. Indeed, in spite of the market availability of new technologies to assist in the efficient inspection of cargoes, IMPEL-TFS (2011, 2013, 2015) has demonstrated that not all countries have access to sufficient resources to allow for a consistent carrying out of inspections.

In terms of technologies applied to improve customs inspections, with regard to e-wastes, some of these may give rise to controversy. For example, non-intrusive inspection equipment using x-ray and gamma-ray technologies are being deployed at border crossings and sea and airports to reduce the time taken in examining cargo shipments (European Commission, 2014).

Although useful for other crimes, in many cases x-ray and gamma ray are not specific enough to uncover the concealing of e-waste by pretending it is second-hand material. Moreover, as demonstrated in section 5.1 and above, not all countries have sufficient funding to implement these methods.

The inefficiencies highlighted are crucial, as until loopholes allowing the free trade of wastes labelled for recycling, coupled with weak enforcement procedures, are closed, there will continue to be a high probability of successful illegal transport (Vail, 2007).

All the aforementioned arguments demonstrate how even in the presence of improved monitoring and inspections, customs will still not be in a position to detect a substantial quantity of e-wastes illegally traded; this is largely due, to reasons such as the intense flow of products transiting through countries, inefficiency in inspections, shortfall of funding and inefficiency in targeting cargoes. Consequently, it would be a significantly more cost efficient solution to prevent wastes from reaching this point by reducing the flow of e-wastes and investing increasingly in take-back systems.

6. DISCUSSION

To enhance the understanding of the results of this study, a multidisciplinary approach should be applied. International trade is fundamental as it allows brokers to dispose of a huge quantity of illegal e-wastes. Further, a

TABLE 1: Waste violations detected by customs inspections in the European Union.

	Enforcement Action II 2008-2010 (IMPEL-TFS, 2011)	Enforcement Action III 2012-2013 (IMPEL-TFS, 2013)	Enforcement Action IV 2014-2015 (IMPEL-TFS, 2015)
Total Inspections	26705	22414	17183
Waste Inspections	3897 (14.59%)	3162 (14.1%)	4923 (28.65%)
Waste Violating WSR	833 (21.37%)	1011 (31.97%)	815 (16.55%)

detailed analysis of the trade has confirmed the unfeasibility of expecting customs to be effective in identifying all e-wastes subjected to illegal trading.

Additionally, the EU itself may unwittingly promote this illegal trade by allowing a relatively free flow of goods. Briefly, these considerations provided valuable insights into the disposal of e-waste through illegal trade routes.

Based on this multidisciplinary feature, we conclude that the best way for countries to counteract illegal e-waste trades is by preventing influx of these wastes into the international chain; indeed, once the wastes reach the distribution chain governmental enforcement systems are called upon to cope with much more complex scenarios. These scenarios highlight a need for international cooperation, increased financial availability and increased efforts. To conclude, in spite of the failures of the take-back system, the investment of capital aimed at improving the system, and widespread application of the same would undoubtedly prove to be the most feasible measure in combating these illegal trades.

Of course, there may be other means of preventing the entry of e-waste into the international chain. However, these means would necessarily imply considerable changes in economic dynamics, such as decrease of production and consumption of EEE, and, consequently, be associated with a need for long-term changes.

Long-term changes may likewise be required to improve the take-back system. That might also be true. However, as explained previously, valuable materials may be extracted from e-waste, and consequently, public policies implemented in this context may serve to stimulate enterprises to collect wastes, profit from collection and avoid a huge part of the impacts caused by the illegal international trading of the same. An empirical example is provided by Apple, which in 2015 recovered 2204 pounds of gold and 6612 of silver via take-back initiatives. The value of these extractions was pegged at $ 40 million (Szathmary, 2016).

Based on the investigations undertaken in this study however, any public policies implemented will need to make participation in take-back systems more profitable for the brokers than selling the wastes illegally. A successful empirical example is the Chinese Home Appliance Old for New Rebate Program. The program involved the setting up of a governmental fund for recovery; through this fund, people would get a ten percent discount on a new home appliance on delivering an old appliance to an authorized collection company (China, 2009). According to Rucevska et al. (2015), twenty months into the program, 49.9 million obsolete home appliances had been collected. Additionally, this process raised the sales of new products because the governmental funds allowed enterprises to sell with discounts and still profit.

7. CONCLUSIONS

The importance of studying the illegal international trades of e-waste is irrefutable, notably when considering those generated in Europe, where only one third of these wastes are appropriately managed (Eurostat, 2018).

Specifically, the multidisciplinary analysis of this article provides relevant insights to the subject by filling gaps in the literature with regard to this issue. Indeed, future research should focus on the definition of an economically feasible take-back approach for both the national authorities and disposers. This would consequently serve to attract government-certified agents rather than illegal brokers, with the agents or companies being in a position to profit from the legal extraction of valuable materials from e-wastes, and consequent reduction in the illegal trading of these wastes.

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