Trade in Counterfeit and Pirated Goods

MAPPING THE ECONOMIC IMPACT

OECD

EUIPO
EUROPEAN UNION
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Preface

The capacity to develop and fully value innovation is at the heart of a productive and forward-looking global economy. Intangible assets such as ideas, know-how or brands play an instrumental role in rewarding the efforts of rights holders, innovators and investors. But these intangible assets are at risk, as the potential for infringement and the resulting damage to the economy have also expanded in recent years, due to new trends in international trade and governance gaps across countries. To fully grasp the challenge of counterfeit and pirated trade, policy makers need to know the facts. Solid evidence is crucial for governments to fully understand the benefits to the global economy of "clean trade", and how to strive for it.

We are very pleased that our two institutions were able to work together to analyse a unique set of global customs seizure data to assess the damages to world trade caused by counterfeit and pirated goods. We are also grateful to the World Customs Organization, the European Commission's Directorate-General for Taxation and Customs Union, and the United States Department of Homeland Security for providing the customs data, without which this study could not have been conducted.

We are confident that this research will make a major contribution to the understanding of counterfeit and pirated trade. We trust that it will help decision makers formulate innovative policies to counter and deter this scourge.

António Campinos,

Executive Director, EUIPO

Angel Gurría,

Secretary-General, OECD

Foreword

Trade in counterfeit and pirated goods is a major challenge in an innovation driven global economy. These practices have negative effects on the sales and profits of affected firms, while also having adverse revenue, economic, health, safety and security effects for governments, businesses and consumers. Organised criminal groups are seen as playing an increasingly important role in these activities, by benefiting significantly from profitable counterfeiting and piracy operations.

The current study was conducted jointly by the OECD and the EU Intellectual Property Office (EUIPO), to measure and analyse the scale of counterfeit and pirated trade in order to provide policymakers with robust empirical evidence about this threat. The results show that trade in counterfeit and pirated goods amounted to up to 2.5 % of world trade in 2013. This was even higher in the EU context where counterfeit and pirated goods amounted to up to 5 % of imports.

This report builds on two equally valid policy concerns. The first is the impact of crime and illicit trade activities on good governance, public safety and the rule of law. The second is the negative effect that counterfeit trade has on legitimate competitive advantage of rights holders, and consequently on innovation, employment and long-term economic growth.

This study was conducted under the aegis of the OECD Task Force on Countering Illicit Trade (TF-CIT), which is part of the OECD High Level Risk Forum (HLRF). The TF-CIT and HLRF focus on evidence-based research and advanced analytics to assist policy makers in mapping and understanding the market vulnerabilities exploited and created by illicit trade. This report was shared with other OECD committees that have relevant expertise in the areas of trade and innovation.

The quantitative analysis shown in this report is based on a unique, global set of half a million customs seizure data over the period of 2011-13. It also benefitted from structured interviews with trade and customs experts. The main dataset on customs seizures of counterfeit and pirated products was provided on behalf of the global customs community by the World Customs Organization (WCO). It was complemented by the European

Union data provided by the European Commission's Directorate-General for Taxation and Customs Union (DG TAXUD), and by the US data received from the United States Department of Homeland Security (DHS).

Economic and policy research on counterfeit and pirated trade will benefit from the significant investments made by this study. Both the dataset and the methodology developed for this report can be used for more detailed analyses in the future, for example at country or sector level. Currently, the OECD and EUIPO are embarking on further research, to develop more in-depth studies to understand its damaging impacts on firms, consumers and economies as a whole, as well as its implications for governments and for good public governance.

ACKNOWLEDGEMENTS

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The quantitative research in this study relied on rich, global database on customs seizures, provided by the World Customs Organization (WCO) and supplemented with regional data submitted by the European Commission's Directorate-General for Taxation and Customs Union, the US Customs and Border Protection Agency and the US Immigration and Customs Enforcement. The authors express their gratitude for the data and for the valuable support of these institutions.

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Executive summary

This study offers unique up-to-date analysis of the impact on **global trade of counterfeit and pirated products,** known as "**fakes**" by the general public. Using statistical analysis and drawing on a global dataset covering almost half million customs data on seizures, the study estimates the huge share of international trade commandeered by **counterfeit and pirated goods. In 2013, international trade in such products represented up to 2.5% of world trade, or as much as USD 461 billion**. This is the equivalent of the GDP of Austria, or the combined GDP of Ireland and the Czech Republic. Above all, it highlights that right holders, governments and the formal economy as a whole suffer from significant economic and social losses. It also gives an idea about the potential financial revenues collected by criminal networks that are behind such trade.

More specifically, **counterfeit and pirated products amounted to up to 5 % of imports in 2013 in the European Union, or as much as EUR 85 billion (USD 116 billion).** This suggests that the relative impact of counterfeiting is twice as high for a group of developed countries, such as the EU, than it is for the world as a whole. The scope of the phenomenon appears to be greater than a decade ago. Back in 2008, a previous OECD study estimated that counterfeit and pirated goods accounted for up to 1.9 % of world imports, or up to USD 200 billion, relying on the best data and more limited methods available at that time. In the context of today's revival of international trade in the global economy, there is no shortage of opportunities for counterfeiters and criminals. Counterfeit and pirated trade is a major threat to any modern, knowledge-based economy.

Counterfeiting and piracy matter in an innovation driven global economy. Intellectual property (IP) is a key value generator for firms, helping them succeed in competitive markets. At the macroeconomic level, IP protection and enforcement is one of the main drivers of innovation, which contributes to long term economic growth. Given the fundamental economic importance of IP, counterfeiting and piracy must be directly targeted as a threat to sustainable IP-based business models.

A wide range of products are affected, from luxury and business-to-business goods to common consumer products. Any product for which IP adds economic value to rights holders and that creates price differentials becomes a target for counterfeiters. Counterfeit products range from high-end consumer luxury goods such as watches, perfumes or leather goods, to business-to-business products such as machines, chemicals or spare parts, to common consumer products such as toys, pharmaceuticals, cosmetics and foodstuffs. Every IP-protected product can be counterfeited. There are even records of seized counterfeit (trademark infringing) fresh strawberries, bananas, cinnamon or coconut oil. Some counterfeit products, such as pharmaceuticals, spare parts and toys, are of low quality, and create significant health and safety threats.

All market segments are targeted. Counterfeiters and pirates maximize their profits by targeting all potential market segments. This includes *secondary* markets, in which consumers willingly purchase infringing products from counterfeiters and pirates, and *primary* markets, where buyers of counterfeit goods are deceived, believing they purchase legitimate items.

Counterfeit and pirated trade is a global and dynamic phenomenon. Recently, markets for IP-infringing products have become increasingly globalized and are affected by global trends. The post-crisis revival of trade, including growing market openings in many regions, the emergence and globalization of value chains, and booming e-commerce in global trade, underpin global market dynamics for both legitimate and counterfeit goods.

Counterfeit and pirated products originate from virtually all economies on all continents, even if middle-income and emerging economies tend to be important players. These are identified as "provenance economies", either as important transit points in international trade, or as producing economies. **China appears as the largest producing economy** when relying on detailed data analysis of EU data. Middle income and emerging economies both tend to have sufficient infrastructure, productive and technological capabilities that enable large-scale trade. Yet, they may not have developed sound institutional frameworks, including IP-related legislation and enforcement practices.

Most brands are hit by counterfeiting. While many are located in OECD countries, China has also been targeted. A detailed analysis shows that the majority of companies producing branded goods targeted by counterfeiters are registered in OECD countries – primarily the United States, Italy, France, Switzerland, Japan, Germany, the United Kingdom and Luxembourg. Emerging economies are also seeing an increase of registered

rights holders that suffer from counterfeiting. Recent data show that the IP rights of Chinese companies have been frequently infringed. All innovative companies that rely on IP to support their global development strategy are at risk, whether they are in developed or emerging economies.

Trade routes in counterfeit and pirated goods are complex and subject to dynamic changes across transit points. An analysis of counterfeit and pirated imports into the EU identified a set of important intermediary transit points. Some of these, such as Hong Kong, China, or Singapore, are important hubs of international trade in general. Other transit points include economies with very weak governance and having a strong presence of organised criminal or even terrorist networks (e.g. Afghanistan or Syria). The analysis shows significant changes from year to year, as traffickers exploit new governance gaps. This reflects the ability of counterfeiters and criminal networks to quickly identify weak points and gaps and consequently leverage opportunities for arbitrage.

The share of small shipments, mostly by postage or by express services, keeps growing. This is apparently due to shrinking costs of such modes of transport and the increasing importance of Internet and e-commerce in international trade. For traffickers, small shipments are also a way to avoid detection and minimise the risk of sanctions. This, in turn, raises the costs of checks and detention for customs and presents additional challenges to enforcement authorities. Managing such a huge volume of seizures, from processing to destruction in an environmentally friendly way, represents a significant burden on the operations of customs and costs to taxpayers.

More investigations are needed to address the challenge, so that countries can, individually and co-operatively, design policy and enforcement solutions. Information on the magnitude, scope and trends of counterfeit and pirated trade is critical in understanding the nature of the challenges faced by governments and right holders. However, the current results rely on customs seizure observations and do not include domestically produced and consumed counterfeit and pirated products, and pirated digital products of the Internet, which calls for complementary analysis.

Section 1.

Scope and definitions

Background

The current growing economic importance of intangible assets, booming trade, and complex globalisation processes has turned the attention of industry and policy makers to intellectual property (IP). For modern industries, IP is one of the key value generators and enablers of success in competitive markets. For policy makers, IP plays a crucial role in promoting innovation and driving sustained economic growth.

The broadening scope and magnitude of counterfeiting and piracy, and counterfeit trade in particular, is a key concern for intellectual property. It is seen as a significant economic threat that undermines innovation and hampers economic growth. Substandard counterfeit products, such as toys, pharmaceuticals or spare parts, can pose significant health and safety threats for consumers. In addition, organised criminal groups are playing an increasing role in these activities and benefiting significantly from highly profitable counterfeiting and piracy operations; risking relatively light penalties in some jurisdictions.

Policy makers are placing renewed emphasis on combating counterfeit and pirated trade. This has been paralleled by increased efforts by the private sector to raise awareness of this threat. However, initiatives to counter counterfeit trade have been hampered by a lack of robust, quantitative information on the magnitude and scope of the problem worldwide. The illicit nature of infringements and the consequent difficulties in developing statistical information have been key obstacles in this regard.

The OECD study, The Economic Impact of Counterfeiting and Piracy, published in 2008, was a key step towards developing a better understanding of counterfeiting and piracy, and counterfeit trade in particular. Its major contribution was the development and application of a rigorous methodology to estimate the incidence of counterfeited and pirated items in

world trade. However, the quantitative findings of this study became dated, particularly as they reflect the pre-crisis situation. Furthermore, several recent economic phenomena, such as the post-crisis changes of trade patterns or the emergence of global value chains, call for a refreshed analysis of the phenomenon of counterfeit trade.

The current study is intended to fill this gap and to provide quantitative evidence on counterfeit and pirated trade. In particular, the main goal of this study is to quantitatively assess the value, scope and trends of trade in counterfeit and pirated tangible products.

It should be noted that this study largely relies on statistical data on counterfeiting and piracy that, just like data on any other clandestine activity, are largely incomplete and limited. Consequently, the quantitative results presented in this study illustrate only certain parts of the phenomenon of counterfeiting and piracy. However, in order to make sure that this picture is factual, clear and unbiased, and to maximise its potential, the methodological apparatus was tailored to the available dataset. All data limitations and methodological assumptions are clearly spelt out.

Definitions and parameters of the report

Counterfeiting and piracy are terms used to describe a range of illicit activities related to intellectual property rights (IPR) infringement. Following the OECD (2008) study, this report focuses primarily on the infringement of copyright, trademarks, design rights, and patents, as described in the World Trade Organisation Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS Agreement).[1] Consequently, this study uses the term "counterfeit" to describe tangible goods that infringe trademarks, design rights or patents; and "pirated" to describe tangible goods that infringe copyright. It should be highlighted that this project does not include intangible infringements, such as online piracy, nor infringements of other intellectual property rights.

In particular, this report covers infringements of the intellectual property rights outlined below, to the extent that they involve tangible products: trademarks, copyrights, patents and design rights. All these rights are summarised in Table 1.1.

Table 1.1. Key characteristics of intellectual property rights concerned in this study

Trademarks, copyrights, patents and design rights, to the extent that they involve tangible products

	Trademarks	Copyrights	Patents	Design rights
Coverage	Goods or services	Creative works	Inventions	Ornamental design or aesthetic aspect of a good
Registration needed?	Yes (in most cases)	No	Yes	Yes (in most cases)
Minimum duration	Seven years	Generally 50 years after creators death	20 years	Ten years

Trademarks

A trademark is a distinctive sign that identifies certain goods or services as those produced or provided by a specific person or enterprise. Trademarks may include words, personal names, letters, numerals, figurative elements and combinations of colours, as well as any combination of these signs.

In general, trademark protection is geographically limited. Depending on the national law of a country, a trademark may be a registered or unregistered mark. The right holder can prevent the trademark from unauthorised use for goods or services that are identical or similar to those with a registered trademark, if there is a risk of confusion. In order to ease the administrative burden for applicants who need trademark protection in several countries, the Madrid System, administered by the World Intellectual Property Organisation (WIPO), allows for an existing application designating one jurisdiction to be extended to multiple jurisdictions through WIPO's International Bureau. Furthermore, applicants requiring protection in multiple members of the EU can use the EU Trade Mark system administered by the EUIPO.

While the period of protection varies, the initial term of registration should be seven years or longer. The registration may be renewed indefinitely, on payment of additional fees.[2]

Copyright and related rights

Copyright is a set of exclusive rights, subject to limitations, related to the creative works of authors. The rights pertain to, among others, the reproduction, distribution, translation and adaptation, public performance

and communication to the public of the work. The kinds of works that may be covered by copyright include: literary works, such as novels, poems, and computer programs; musical works; works of visual art, such as paintings, drawings, photographs and sculpture; dramatic works, such as plays; films, and compilations, including databases. Related rights are the rights of performers, producers of phonograms, and broadcasting organisations in their respective performances, phonograms, and broadcasts.

Unlike trademarks, creative works do not have to be registered in order to be protected: copyright applies from the moment the work is created. However, in some economies, formal registration may provide additional protection in case of infringement

Copyright protection is time-bound. The international minimum standard for the term of protection for individually authored works is the life of the author plus 50 years. For films and anonymous and pseudonymous works, the minimum period of protection is 50 years from publication. Photographic works receive widely varying terms of protection around the world, ranging from 25 years to 75 years.

It should be noted that this study analyses infringements of any kind of copyrighted material, including recorded music, motion pictures, software, books, and journals, to the extent that they involve the use of physical media, such as optical discs or paper books. In other words, this study does not deal with piracy over the Internet, direct computer to computer transfers, local area network (LAN) file sharing, and mobile phone piracy etc.

Patents

A patent enables the patent holder to exclude unauthorised parties from making, using, offering for sale, selling or importing the protected inventive subject matter.

Patents are generally available for any inventions, whether products or processes, in all fields of technology, provided that they are new, involve an inventive step and are capable of industrial application. The criteria that are applied to determine patentability tend to vary among countries, as do the technical requirements that must be fulfilled in order for a patent to be granted.

Patent rights are geographically bound, which means that a party must apply for a patent in every jurisdiction in which it wishes to protect, and possibly market, its new product or process. In order to alleviate some of the burden of multiple applications for patents throughout the world, a

centralised application procedure through the Patent Cooperation Treaty (PCT) process is available.

The patent right is offered for a period of at least 20 years from the date of filing an application.[3]

In the context of this study, it should be kept in mind that the dataset the analysis relies on covers only a fraction of patent infringing goods. In particular, legal procedures related to infringements and seizures of patent-infringing products tend to differ from similar procedures related to tangible goods that infringe trademarks, copyright or design rights.[4]

Industrial designs

Industrial design is defined as the outside appearance of a product. The design may consist of three-dimensional features, such as the shape or surface of a product, or of two-dimensional features, such as patterns, lines or colour. Industrial designs are applied to a wide variety of products of industry and handicraft, including technical and medical instruments, watches and jewellery. An industrial design does not protect any technical functions of the article to which it is applied.

Based on the exclusive rights conferred, the right holder can prevent third parties from making, selling or importing articles bearing or embodying a protected design without authorisation. Design protection does not exclude other manufacturers from producing or dealing in similar products with the same utilitarian functions, as long as these products do not embody or reproduce the design in question.

As a general rule, in order to be registered the design must be "new". Different economies have varying definitions of such terms, as well as variations in the registration process itself. Generally, "new" means that no identical or very similar design is known to have existed before. As in the case of trademarks, WIPO provides a mechanism to facilitate design registration in multiple jurisdictions, the Hague System.[5] Within the EU, the EUIPO provides the Registered Community Design which gives the design owner protection in all EU Members.

The TRIPS Agreement requires that the duration of protection should be at least 10 years.[6]

Section 2.

The economic and policy landscape

This chapter outlines how markets for counterfeit and pirated products operate and sheds light on some recent economic developments that have impacted how these markets function, and hence affect counterfeit trade. First, the operation of markets for counterfeit products is described, and the key factors that drive the demand and supply of counterfeit and pirated products are presented, as outlined in OECD (2008). Second, the major recent economy-wide phenomena that influenced the dynamics of counterfeit trade are discussed.

The analysis of how markets operate uses the distinction introduced in OECD (2008) between primary markets, where buyers of counterfeit goods are deceived and believe that they are purchasing legitimate items, and secondary markets where consumers willingly purchase infringing products from counterfeiters and pirates.

Factors that drive counterfeit trade include the following demand and supply drivers (OECD, 2008).

The demand for counterfeit and pirated products is driven by drivers related to:

- The product itself (e.g. its price or perceived quality).
- The individual consumer characteristics (e.g. attitude towards counterfeiting and piracy).
- The institutional environment in which the consumer operates.

The supply of counterfeit and pirated products is driven by factors related to:

- Market opportunities.
- The technological and distribution challenges associated with an undertaking.
- The risks involved.

There are also some economic developments that have been taking place over recent years that may have impacted the environment in which counterfeit and pirated trade operates. These refer to the growth in the economic importance of intangibles, including IP rights, and to some trade-related developments, such as post-crisis change of trade patterns, development of profound and complex global value chains, and the rapid growth of e-commerce. These are discussed in the following sections.

Counterfeiting and piracy: Economic drivers

The markets in which counterfeit products operate consist of demanders for these products, and suppliers. Demanders can be consumers (individuals), but also firms in cases where a given counterfeit or pirated product is an intermediary component in the production process.

Demanders may be unaware that they are purchasing a counterfeit good. This implies that, for analytical purposes, markets for counterfeit products can be divided into primary and secondary submarkets. In the primary submarket, demanders (individuals and firms) demand genuine, non-IP-infringing goods. Suppliers of counterfeit goods can get access to this market by deceiving consumers that their products are authentic (see Box 1). In the secondary submarket, counterfeit and pirated products are demanded and purchased knowingly (see OECD, 2008).

Box 1. Consumer deception and awareness

Some counterfeit or pirated goods compete head-on in the primary market with the genuine products and intend to deceive a consumer. A successful deception can occur when a given product appears to be genuine to a consumer. This depends on a set of factors, including the physical appearance of the product, and consumer awareness and ability to identify its counterfeit or pirate nature.

Consumer awareness of counterfeit and pirated products is related to availability and access to relevant information about IP infringement, and the individual capacity to comprehend this information. If there are no indications on the infringing nature of a product, consumers are less likely even to suspect it – even if they hold the capacity to comprehend the information, had it been available.

Moreover, consumer awareness is not only related to the context of sale of counterfeit and pirated goods (suspicious circumstances), but also the degree to which information about the phenomenon of counterfeit goods becomes available. Informational or educational campaigns on the importance of IP, and on the threats that counterfeiting and piracy pose, facilitate consumer awareness and thereby reduce the potential size and profitability of markets for deceptive infringing products.

Demand drivers

As identified in OECD (2008), three main factors are driving the demand for counterfeit and pirated products:

- The features of the product (for example its price and quality).
- The individual consumer (for example, a consumer's general economic situation, or any concerns related to the purchase and consumption of counterfeit and pirated goods that he or she may have).
- The institutional environment in which the demander operates (for example, risk of discovery in jurisdictions where penalties for demanders exist, or the availability and ease of acquisition of counterfeit and pirated products).

Demand drivers are relevant only in the secondary market, where purchasers knowingly choose to buy counterfeit and pirated goods. In the primary market, demand for infringing goods does not exist, as customers are deceived and believe that they are purchasing original products.

Product features include the price of the legitimate good and its general quality, as perceived by the demander. The importance of product features for consumer decisions of whether or not to buy counterfeit products was confirmed in several empirical economic studies that relied on "hedonic price regressions". These regressions assume that the price of a product reflects its embodied features valued by some implicit pricing (Rosen, 1974). In the context of counterfeit goods, several studies found that the perceived quality of an infringing good and its price, relative to the perceived quality of a genuine product and its price, is a key component in consumers' decision making process (Qian, 2008; Mishra and Shukla, 2015).

Regarding the individual consumer, factors that drive the demand for counterfeit or pirated goods include his or her general economic situation and, consequently, budget constraints. They also include any concerns related to the purchase and consumption of a counterfeit or pirated good a consumer might have. These concerns could be either ethical or associated with any health and safety risks related to consumption of a counterfeit or pirated (i.e. potentially substandard) product.

The last set of factors that affect demand for counterfeit products refers to the institutional environment in which the demander operates. It encompasses the risk of discovery, prosecution and penalty with respect to the conscious consumption of counterfeit or pirated goods, in jurisdictions that impose penalties for consumers of these goods.[7] The institutional

environment also encompasses the availability and ease of acquisition of counterfeit and pirated products. It should be noted that while the availability of counterfeit goods varies significantly across and within countries, the perceived risk of discovery and the expected penalties for purchasing counterfeit and pirated goods are low for most product categories, in jurisdictions where penalties exist.

Supply side

As in any business, suppliers engage in commercial counterfeiting to make a profit. The essential component that the commercial supply of counterfeit products relies on is "free riding" on the economic value associated with a given intellectual property right. While counterfeiters may face the same market challenges as legitimate businesses (e.g. production costs, distribution channels), they enjoy significant competitive advantages over legitimate right holders as they usually do not incur the research and development costs, marketing and advertising costs, nor costs of compliance with environmental and safety regulations. However, suppliers of IP infringing products may risk prosecution if their operations are detected, depending on the strength of criminal laws in that jurisdiction and how frequently they are applied by the enforcement authorities.

Three main factors that shape the supply of counterfeit goods were identified in OECD (2008):

- Market characteristics (for example, size or mark-ups that can be earned).
- Technological and logistical considerations.
- The institutional environment (for example, sound legal frameworks and strong deterrent penalties).

Regarding market characteristics, the incentives to supply a given counterfeit or pirated product depend on the size of the market that can be exploited and on the mark-up that can be earned on one infringing product. Mark-up refers to the value that a supplier of a counterfeit good adds to its marginal cost of production. Higher mark-ups generate stronger incentives for infringers to enter the market. Large markets offer higher profits, and hence create higher incentives to engage in infringements.

Technological and logistical considerations refer to conditions that determine whether the production and distribution of a counterfeit and pirated product are technically feasible. For example, the production of some products may require advanced and costly equipment, and hence can limit the number of parties that could infringe the IP rights. Sales and

distribution channels are another important factor in this context: complex sales and distribution structures that are difficult to monitor can provide greater opportunities for infringers to infiltrate the system.

Institutional factors refer to the legal and regulatory frameworks that impact the behaviour of counterfeiters and pirates, in particular sound legal frameworks that provide public institutions and right holders with instruments to counter the production and supply of infringing goods. These regulations can impact the supply of counterfeit and pirated goods only if they include sound deterrent penalties that are adequately enforced. If the resources devoted to enforcement are inadequate, or if these laws are not enforced by public authorities, the effective value of nominal laws is limited and there is a risk that weak enforcement of IPR frameworks could be viewed as effectively permissive.

Recent developments

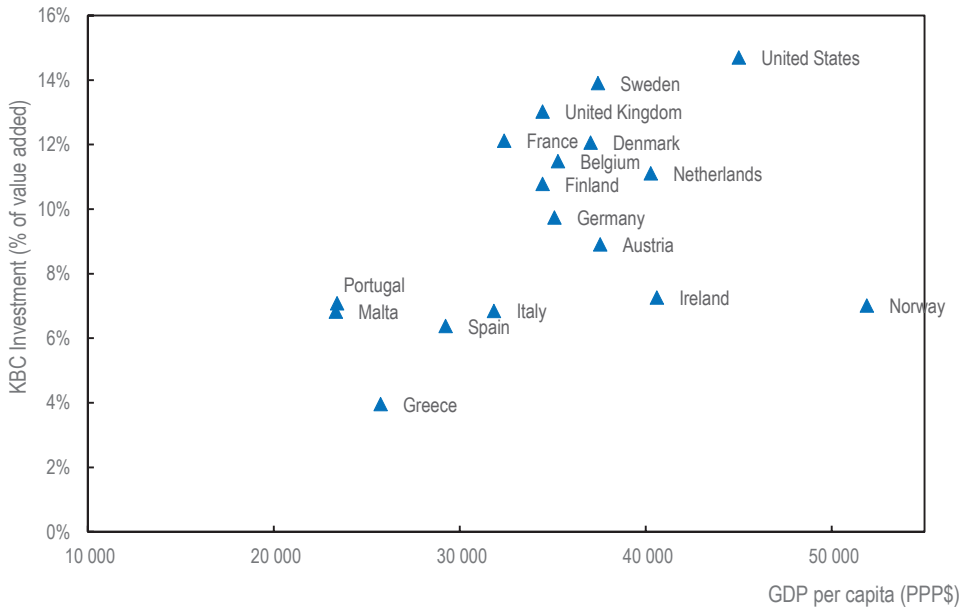
Markets for infringing products develop dynamically and have been affected by several economic developments over the past ten years. Although they are all interrelated, some major patterns can be distinguished, including:

- Growing economic importance of IP rights (especially trademarks) and consequently growing economic incentives for free riding.
- Post crisis revival of trade.
- Globalisation of value chains.
- Rapid growth of e-commerce in global trade.

Growing importance of IP rights

Over the past 25 years, intangibles have become a major economic asset for OECD countries. Countries that invest more in intangible assets also tend to be more effective in terms of innovation performance. This is because investment in many types of intangibles creates knowledge spill-overs, which allow for the creation of an original investment to be adapted throughout several sectors of an economy. Recent studies have shown that business investment in intangibles contributes up to 27% of average labour productivity growth in the European Union and the United States (OECD, 2013a). The power of investment in intangible assets to boost GDP per capita is shown in Figure 2.1, which shows that, generally, the more a country invests in intangible assets as a percentage of value added, the greater its GDP per capita:

Figure 2.1. Business investment in intangible assets and GDP per capita, average 2000-2010



Statlink: http://dx.doi.org/10.1787/888933345854

Source: OECD (2013a), *New Sources of Growth: Knowledge-Based Capital [Phase 1]*, Synthesis Report, OECD, Paris, www.oecd.org/sti/inno/knowledge-based-capital-synthesis.pdf.

Intangible assets are becoming a more tradable asset that is taking over the core of the global economy. For example, most of the value in technology products and medicines is not in the physical materials with which those goods are made, but in the research, testing, and innovation required to develop these goods. As globalisation continues, the intangibles inherent in those products are reaching and emanating from more and more markets. The amount invested in intangible assets equates to between 5% and 12% of GDP in surveyed OECD countries (OECD-WTO, 2013).

Intellectual property right is the key instrument that grants the legal protection of rights to intangible assets. For knowledge-based capital, the protection of IP rights is a key framework condition. Intellectual property rights give the owners of intellectual property the legally enforceable power to prevent others from using a creation or invention, or to set the terms on

which their creation or invention can be used. In today's industrial economies, IP rights are part of the institutional infrastructure that encourages private investments in formal research and development (R&D) and other inventive and creative activities.

The exact size of the IP market place is difficult to estimate, but existing indicators show that intellectual property right is a vibrant and economically sound tool. Recent studies highlight that the value of IP royalty payments (including trademarks) is well above the growth rate of GDP. For example, in the United States, active corporations reported gross royalty receipts of USD 171 billion in 2008 vs. USD 115.8 billion in 2002 (OECD, 2013a).

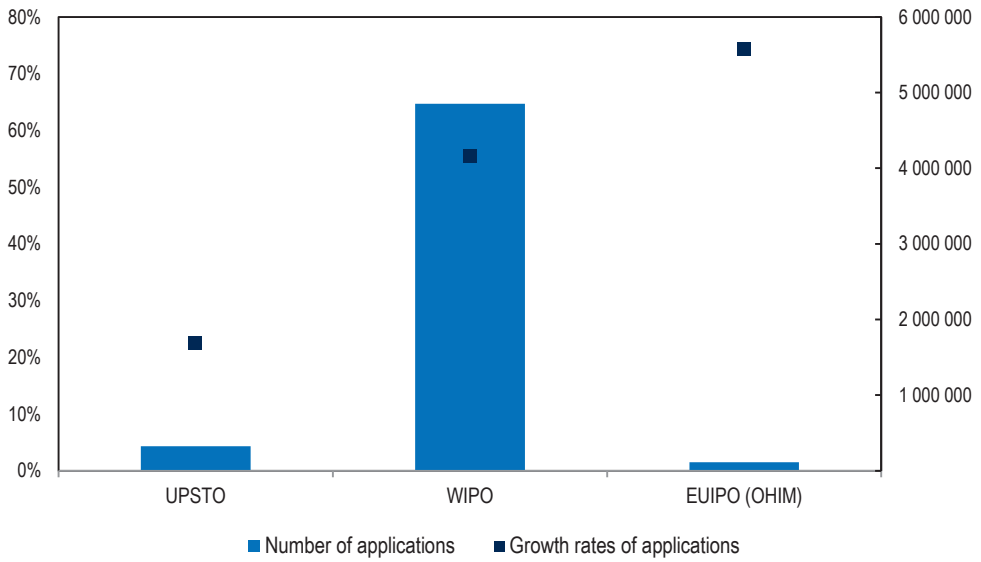
Among the different types of IP rights, trademarks play a key role as they help customers and businesses to identify products that meet their expectations in terms of quality or price, thereby fostering trust between economic agents. For consumers, trademarks function as information tools that enable them to easily and efficiently choose products that are expected to meet certain standards and levels of satisfaction. For firms, the value of a trademark is influenced by a number of variables, including the investment of the right holders in production standards, product development, and marketing efforts. It also depends on past consumer experience of products with the associated brand name (see Economides, 1988).

The important economic role of trademarks has been reflected in available statistics. For example, in the United States, trademark-intensive industries accounted for 24.7% of total employment in 2010, which is the most among all IP-intense industries (ESA-USPTO, 2012). A similar study for the European Union highlighted that IP-intense industries accounted for almost 26% of all jobs in the EU during the period 2008-2010, with almost 21% in trademark-intensive industries (OHIM-EPO, 2013).

The economic impact of trademarks is significant and has grown considerably over recent years. Between 2005 and 2013, the three main offices for accepting trademark applications, WIPO, the United States Patent and Trademark Office (USPTO) and the European Union Intellectual Property Office (EUIPO), reported an increase in applications of between 1% and 7% per annum (Figure 2.2). Given the economic downturn occurred during this period, these growth rates are a clear signal of the sound economic importance of trademarks.

Figure 2.2. Trends in trademark applications (WIPO, EUIPO, USPTO; 2005-2013)

Growth in applications and the most recent number of applications

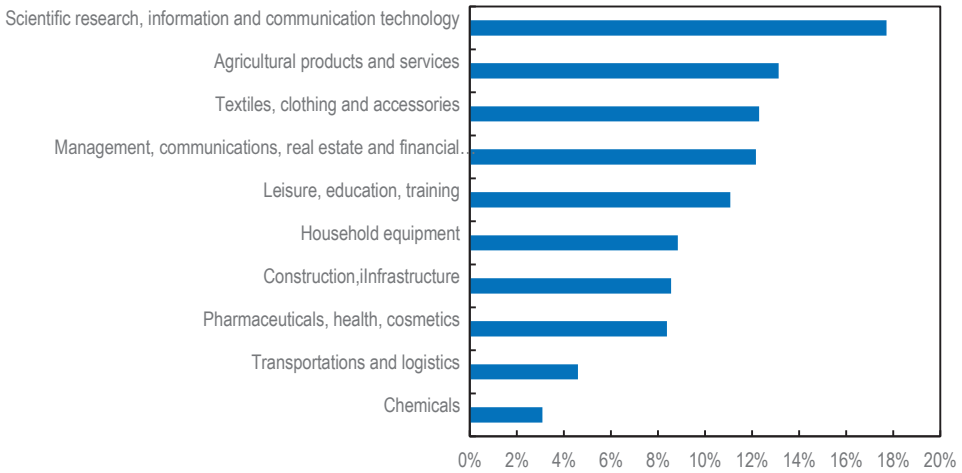


Statlink: http://dx.doi.org/10.1787/888933345862

Sources: WIPO (World Intellectual Property Organisation) (2016), Intellectual Property Statistics, www.wipo.int/ipstats/en (accessed on 18 February 2016); EUIPO (European Union Intellectual Property Office) (2016), Community trade mark applications, https://oami.europa.eu/ohimportal/en/the-office (accessed on 18 February 2016); USPTO (United States Trademark and Patent Office) (2016), US Trademarks Dashboard, www.uspto.gov/dashboards/trademarks/main.dashxml (accessed on 18 February 2016).

The economic importance of trademarks can also be observed in terms of their use across economic sectors. Available statistics point to the wide use of trademarks across all the industry sectors of modern economies, with scientific research, information and communication technology, and agricultural products and services being the most trademark-intense sectors (Figure 2.3).

Figure 2.3. International trademark registrations by industry sector (2014)



Statlink: *http://dx.doi.org/10.1787/888933345875*

Note: Industry sectors based on class groups are those defined by WIPO. For full class definitions, see www.wipo.int/classifications/nice/en/.

Source: WIPO (World Intellectual Property Organisation) (2015), *Madrid Yearly Review*, International Registration of Marks.

For an individual company, the monetary value of a trademark can be defined as the net present value of expected future income attributable to the trademark, less the costs of sustaining it. Trademark values are hence derived from sales and price. Even though these estimates are not straightforward, existing numbers show that the value of trademarks can be immense (Table 2.1).

The effective protection of intangible assets has become an important policy issue. Due to their intangible nature, these assets can be highly valuable as they can be employed simultaneously and repeatedly on a mass scale, for example, a design. However, their nature also makes it difficult to appropriate the associated economic benefits and they are vulnerable to copying, theft or misappropriation. In order to provide incentives for the development of intangible assets, many governments have extended property rights and other protection to cover these assets and related products.

Table 2.1. Estimated values of trademarks (2014)

Rank	Brand	Value (USD billion)
1	Apple	118.8
2	Google	107.4
3	Coca Cola	81.5
4	IBM	72.2
5	Microsoft	61.1
6	General Electric	45.5
7	Samsung	45.4
8	Toyota	45.4
9	McDonald's	42.2
10	Mercedes Benz	34.3
11	BMW	34.2
12	Intel	34.1
13	Disney	32.2
14	Cisco	30.9
15	Amazon	29.4
16	Oracle	25.9
17	HP	23.7
18	Gillette	22.8
19	Louis Vuitton	22.5
20	Honda	21.6

Statlink: http://dx.doi.org/10.1787/888933346062

Note: The estimates are produced annually by Interbrand for the journal Business Week and assess the values of presented trademarks on a variety of issues, i.e. strategic brand management, marketing budget allocation, portfolio management, brand extensions, mergers and acquisitions, licensing and investor relations.

Source: Bloomberg Business Week (2014), "*The 100 Top Brands"*, www.bloomberg.com/ss/06/07/top_brands/index_01.htm.

Post-crisis revival of trade

Following the 2008 crisis, OECD economies were faced with a major change in trade patterns. Even though the crisis hit the development of global trade hard, these patterns have resumed in recent years. Two main world trade patterns seem to be critical for the case of counterfeit trade:

- The general re-birth of trade, well reflected in a general increase in merchandise trade volumes.
- The general increase in market opening for trade that resulted in a general increase in global trade patterns, as opposed to "north-south" trade.

Regarding the re-birth of trade, following the 2008 crisis, nearly all OECD countries suffered a fall in GDP, and consequently in trade flows. In the OECD area, GDP fell by 2.1% in the first quarter of 2009. In the same period, the export volumes of the G7 countries[8] fell by 13.6%. Nevertheless, according to World Trade Organization (WTO) estimates, this drastic reduction of trade was followed by a subsequent increase in merchandise trade: imports in the fourth quarter of 2013 grew by 2.8%. Furthermore, developing economies registered the fastest growth in exports among the major groups (4.2%), followed by developed economies, including OECD countries (3.2%) (WTO, 2014).

This revival of trade has also been observed in terms of market openings in many areas. While OECD countries have led the way in trade liberalisation efforts, a number of emerging markets have advanced in this area. Successive rounds of multilateral trade liberalisation, regional free trade agreements, and various preferential arrangements have provided developing economies with more trading opportunities. In this regard, local co-operation through Regional Trade Agreements (RTA) plays a key role in the expansion of trade. These agreements have received increased international attention in recent years, prompted by the economic growth and development in several middle-income economies (See Box 2).

Box 2. Regional Trade Agreements

As of early 2016 there were about 420 Regional Trade Agreements in force that reported to the WTO. Most countries have multiple agreements, each consisting of its own set of trade rules. In spite of the costs of negotiations and the implementation of diverse agreements, as well as the difficulties of navigating through this "spaghetti bowl of trade rules and commitments", RTAs continue to increase. While multilateral trade liberalisation remains the goal for the WTO, and non-discrimination its core principle, countries are allowed to form free trade areas or customs unions to promote free trade among the members, as long these do not raise barriers to third countries.

Regional agreements have advanced far and deep enough for it to be assumed that they will play a role in the global economy, and continue to exert important influence on the trade policy agenda of the 21st century. RTAs can be credited for speeding up progress on incomplete or unresolved issues in the WTO, such as measures on export restrictions or e-commerce that could be diffused more widely and consistently across regional negotiations, and ultimately be multi-lateralised. RTAs have made significant strides towards deeper integration and have generated new rules that are essential to modern trade and the efficiency of global production networks.

Sources:
OECD (2013b), *Triangular Co-operation: What's the literature telling us?*, OECD, Paris, www.oecd.org/dac/dac-global-relations/triangular-cooperation.htm.

WTO (World Trade Organization) (2016), Regional Trade Agreements Information System web page, http://rtais.wto.org/UI/PublicMaintainRTAHome.aspx (accessed 21 March 2016).

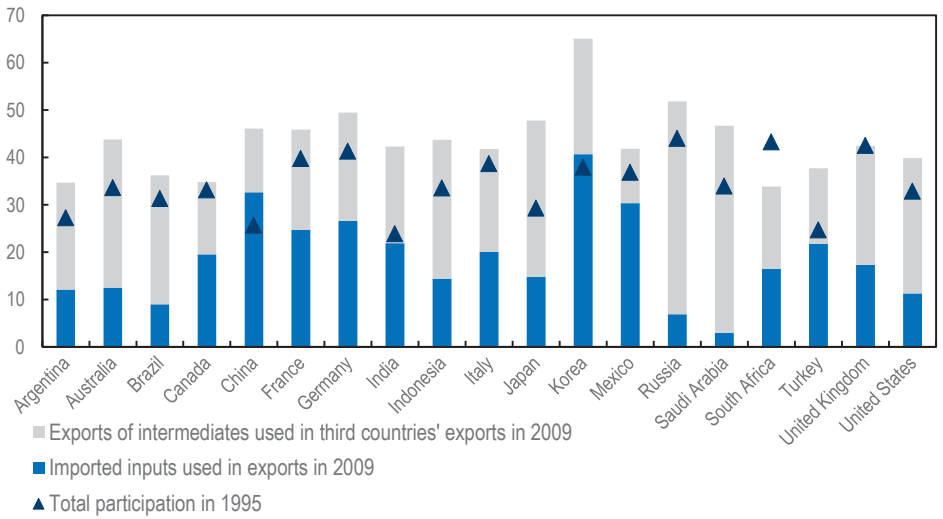
The globalisation of value chains

In recent years, the development of global trade has contributed to shaping production around "global value chains" (GVCs).[9] Dramatic technological progress, growing trade liberalisation, and easy access to resources and markets, have facilitated the geographical fragmentation of production processes across the globe, following local comparative advantages. Today, more than half of the world's manufactured imports are intermediate goods (primary goods, parts and components, and semi-finished products), and more than 70% of the world's services imports are intermediate services (OECD-WTO-World Bank, 2014).

The concept of outsourcing activities is not new, but technological changes have led to a fragmentation of production that was not possible before. As presented in Figure 2.4, the participation of most economies in

global value chains has dramatically increased. It should be noted that the phenomenon of GVC concerns not only OECD countries; today most economies have comparable levels of participation in GVCs. The main observable differences are that large economies rely less on international trade and production, and small open economies are more inserted in global production networks. While most studies on GVCs have focused on Asia; Europe shows a comparable, if not higher, level of participation in GVCs.

Figure 2.4. Participation by economies in global value chains, 1995 and 2009



Statlink: http://dx.doi.org/10.1787/888933345885

Note: The index is calculated as a percentage of gross exports and has two components: the import content of exports and the exports of intermediate inputs (goods and services) used in third economies' exports.

Source: OECD-WTO-World Bank (2014), *Global Value Chains: Challenges, Opportunities and Implications for Policy*, www.oecd.org/tad/gvc_report_g20_july_2014.pdf.

The emergence of GVCs results in the international fragmentation of production and shifts attention to IP rights help as a way of capturing value in a fragmented and complex production process. The distribution of value along the chain depends on the ability of participants to supply sophisticated, hard-to-imitate products or services that can be reinforced with strong IP rights. The highest level of value-creation is often found in highly IP-intense activities, both upstream, such as new concept

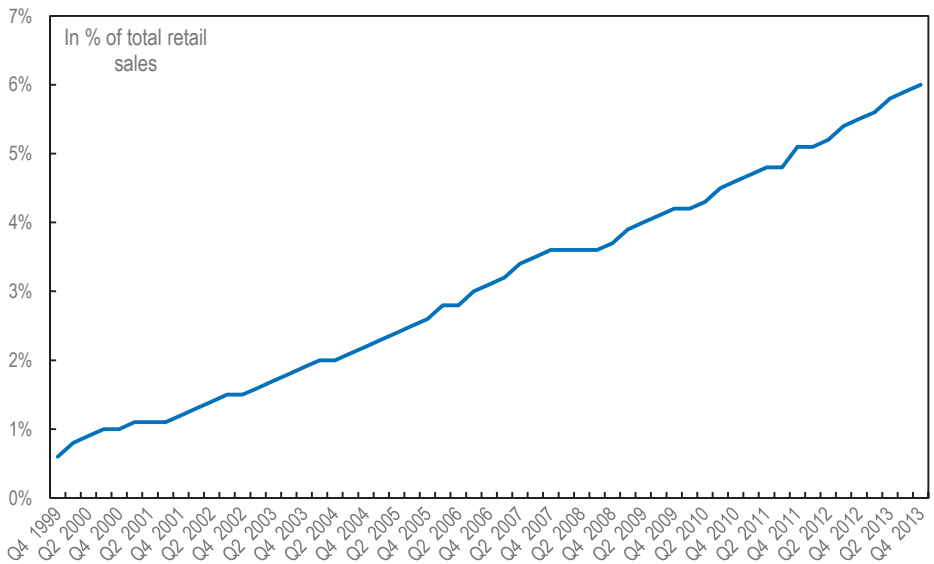
development, R&D or the manufacture of key parts and components; and downstream, such as marketing, branding, or customer services.

IP dependence generates additional profit opportunities and creates incentives for counterfeiters to free ride and enter production processes in economies where IP enforcement may be weak. This new market opening has boosted international trade, but value chains have complicated the pattern of production and are vulnerable to counterfeit intermediary products, including business-to-business (B2B) counterfeits.

The rapid growth of e-commerce in global trade

E-commerce has grown steadily over the last 15 years and offers numerous benefits to industry. Between 2004 and 2010, total e-sales grew from 9 to 14% of turnover of non-financial enterprises in the European Union (OECD, 2013c). Similar trends were observed in the United States, where e-commerce accounted for almost 7% of total retail sales in 2014 (see Figure 2.5).

Figure 2.5. E-commerce in total retail sales in the United States



Statlink: http://dx.doi.org/10.1787/888933345897

Source: United States Census Bureau (2016), Monthly and Annual Retail Trade, available at http://www.census.gov/retail/index.html#ecommerce (accessed on 07 December 2015).

Initially, e-commerce solutions were limited to communications between large firms in specific industries that had opened dedicated communication channels. Approximately 20 years ago, the benefits of e-commerce were extended to any firm with an Internet presence, allowing them to complete transactions with end customers using a fixed Internet connection. Today, a new wave of e-commerce growth is underway, supported by the rapid increase in mobile phones and portable devices. This has substantially contributed to new economic potential for economic success for companies.

E-commerce introduces clear advantages for businesses and consumers. For businesses, e-commerce improves efficiency by enlarging the scope of the market and lowering operating barriers and costs, and consequently intensifying competition. For consumers, e-commerce provides information on goods and services, helps locate sellers, facilitates price comparisons, offers convenient delivery, and allows goods to be purchased easily, from any location, via a computer or mobile device. E-commerce reduces the costs of information search and exchange, which in turn leads to a shortening of traditional commerce channels.

While e-commerce introduces certain clear benefits for businesses and consumers, it also leads to some risks in the context of counterfeit trade. Consumers are drawn to e-commerce sites because they are available non-stop and the access is relatively easy. E-commerce has therefore become a major enabler for the distribution and sale of counterfeit and pirated tangible goods as it opens new possibilities to get access to such goods in areas that were traditionally beyond the scope of counterfeiters. In addition, counterfeiters are able to function across multiple jurisdictions, evading capture, and are also able to take down and set up new websites overnight without losing their customer base. Some websites are of such high quality and sophistication that they rival those of the right holder (OHIM-Europol, 2015).

Section 3.

Data and methodology

Data overview

Information on the magnitude, scope and trends of counterfeit and pirated trade is critical to understanding the nature of the problems being faced and how the situation is evolving. Information is also essential for designing and implementing effective policies and measures to combat illicit operations.

One of the principal objectives of this report is to explore methodologies and techniques that could be employed to improve the measurement of the magnitude of counterfeit trade, both overall and in specific sectors. To this end, this study follows the OECD (2008) approach that was based on two sources of information:

- International trade statistics.
- Customs seizures of infringing products.

Trade statistics

The trade statistics are based on the United Nations (UN) Comtrade database (landed customs value). With 171 reporting economies and 247 partner economies (76 economies in addition to reporting economies), the database covers the largest part of world trade and is considered the most comprehensive trade database available. Products are registered on a six-digit Harmonised System (HS)[10] basis, meaning that the level of detail is high. Data used in this study are based on landed customs value, which is the value of merchandise assigned by customs officials. In most instances this is the same as the transaction value appearing on accompanying invoices. Landed customs value includes the insurance and freight charges incurred when transporting goods from the economy of origin to the economy of importation.

In most economies, import statistics are compiled from the records filed with local customs authorities. This is particularly important in the context of this report as all three datasets used in the statistical exercise (imports statistics and data on customs seizures of infringing products) originate from the same source – customs offices at the destination.

Trade statistics may entail certain biases that should be fully understood. These refer in particular to methodological discrepancies between exports and imports data, and to misrepresentation of the points of origin (See Box 3). This reinforces the choice for import statistics as the reference point for this exercise, as both imports data and seizure data refer to the same observed incoming trade flows.

Box 3. Statistical discrepancies between export and import data

Trade statistics are not free from certain biases, in fact, there are numerous identified methodological issues related to these data.

First, observed export statistics rarely perfectly match the corresponding import statistics. This is due to a number of reasons. For example, some economies exclude free trade zones from their statistics; there may be time lags between registrations of exports and imports; re-exports or transit may be taken into account by some reporting economies; and transportation and insurance costs can bias the results as they are included in the import value but not in the export value.

Second, some studies highlight that certain biases and inaccuracies may also arise because of misreporting by some exporters and local governments. This could happen if an exporter expects to get some tax rebate related to exports, or attempts to evade controls on financial inflows to a given economy. Local governments may misreport exports in order to improve their position regarding central government, especially in the context of larger export-promoting campaigns.

These biases and inaccuracies call for the use of import statistics as the reference point for this exercise as they originate from the same source (customs office of destination economies) as the seizure data.

Sources:

Ferrantino, M.J. and Z. Wang (2007), "Accounting for discrepancies in bilateral trade: The case of China, Hong Kong, and the United States", in China Economic Review, Vol. 19/3.
Huenemann, R.W. (2000), "Anomalies in the Sino-Canadian Trade Data, with Particular Reference to the Hong Kong Re-export Trade", in Journal of Contemporary China, Vol. 9/24.
Morgenstern, O. (1974), "On the accuracy of economic observations: foreign trade statistics", in J.N. Bhagwati (ed.), Chapter 7: Illegal Transactions in International Trade, Amsterdam.
UN (United Nations) (2010), International Merchandise Trade Statistics: Concepts and Def initions 2010, http://comtrade.un.org/db/mr/rfGlossaryList.aspx.

Seizure data

Data on customs seizures originate from national customs administrations. These data are aggregated and harmonised at the national or regional level and then submitted to international agencies that hold datasets on seizures. Two agencies and two datasets will be used as inputs into the analysis of this study. These datasets were received from:

- The World Customs Organization (WCO)
- The European Commission's Directorate-General for Taxation and Customs Union (DG TAXUD)

The analysis in this study also uses a dataset received from the United States Department of Homeland Security (DHS) containing the seizure data from the US Customs and Border Protection (CBP), the customs agency of the United States and from the US Immigration and Customs Enforcement (ICE).

The WCO dataset includes data from 92 economies around the world,[11] each observation contains the following information: year of seizure; the exact date of offence (seizure); reporting economy; conveyance method; departure economy; destination economy; import/transit; status (stopped, seized); type of infringed IP right; general category of goods; detailed description of seized goods; name of trademark owner; quantity; reporting unit.

WCO data are gathered on a voluntary basis; hence, not all seizures are reported. In some WCO regions, data collection processes are co-ordinated by Regional Intelligence Liaison Offices (RILO).[12] The role of RILOs includes: 1) issue instructions on data collection methods (e.g. on the threshold values below which data should not be reported[13]); and 2) collect data from local and national customs administrations and process them into the Customs Enforcement Network (CEN) database.

It should be highlighted that some data in the WCO database reflect customs dedicated actions, such as regional and international enforcement operations in some developing economies that were promoted and co-ordinated by the WCO. During these one- or two-week actions, customs officers in these economies focus intensely on specific products or product categories (e.g. pharmaceuticals). Data for some economies, particularly for those where the overall number of observations is low, are keyed in to the CEN database only in relation to those dedicated actions.

The DG TAXUD dataset includes data from 28 EU members,[14] each observation contains the following information: reporting economy; product category (35 categories); type of good (only for 2012 and 2013); brand

owner; mode of transport (only for 2012 and 2013); type of IP right that is infringed; provenance economy; quantity and value of seized goods (replacement value).

DG TAXUD data are gathered on a mandatory basis, meaning that all seizures should be reported. Data are entered directly by customs officers into the anti-counterfeit and anti-piracy information system (COPIS) database.

The CBP-ICE dataset contains only US data, with each observation reporting information on: the date of seizure; provenance economy; HS category of the seized good at a seven-digit level; description of the seized goods; their value (manufacturers suggested retailed price); and the number of seized products.

The three datasets were merged and harmonised into one uniform dataset on customs seizures. Table 3.1 presents a comparison between the DG TAXUD, CBP-ICE and WCO datasets.

Table 3.1. Datasets on customs seizures

	DG TAXUD	CBP-ICE	WCO
Years covered	2011 - 2013	2009 – 2014	2011 - 2013
Time reporting	Quarterly data	The exact date of seizure	The exact date of seizure
Geographical coverage (number of reporting economies)	The European Union	The United States	Worldwide (the number of reporting economies varies per year, the total number is 92)
Voluntary reporting?	No	No	Yes
Taxonomy of product categories	35 product categories + other (description of "other available")	HST, seven-digit level	18 product categories with complementary exact description of detained product
Seizure values?	Yes (replacement value)	Yes (replacement value)	Yes (for some economies only; no specific guidelines)

Seizure data: Contributions and limits

The DG TAXUD, CBP-ICE and WCO datasets rely on data entries collected and processed by customs officers. These data are primarily designed to improve the work of customs, e.g. prepare risk profiling processes and share national experiences. As with any other administrative data they need careful consideration before application in quantitative analysis.

The data entries are, in most cases, originally created by customs officers at checkpoints. Given their high workload and demanding time constraints, some entries may occasionally be imprecisely created. For example, some of the IP-infringing products that pose health risks (e.g. counterfeit medicines or cosmetics) may sometimes be classified as hazardous goods rather than IP-infringing goods.

A detailed analysis of data revealed a set of limitations that generally refer to:

- discrepancies between DG TAXUD, CBP-ICE and WCO datasets
- product classification levels
- outliers in terms of seized goods or provenance economies
- seizures of patent-infringing products
- valuations of seized goods

For the purpose of this study, a statistical solution was proposed and applied for each issue. These issues are summarised below and discussed in more detail in Annex A.

Discrepancies between datasets

Even though all datasets refer to customs seizures of IP infringing products, a descriptive analysis of both databases highlights certain discrepancies in terms of size and composition. For example, for many economies that are in the WCO and DG TAXUD datasets, the WCO dataset contains a significantly lower number of observations than the DG TAXUD dataset. In addition, the industry composition of seizures is different across these two datasets.

The industry composition is also significantly different between the US data in the WCO dataset and the CBP-ICE dataset (see section one of Annex A for more details). There are two main reasons for this: first, the DG TAXUD and CBP-ICE datasets contain information about all seizures made

in the EU and in the United States, whereas the WCO dataset only reports seizures above a certain number of items detained or seizures of high value. Consequently, the WCO database does not contain a large number of small scale seizures, such as many postal shipments. Second, the WCO database sometimes also reports internal detentions, i.e. those made within the reporting economy.

To address this issue, the DG TAXUD and CBP-ICE datasets are used instead of the WCO data for the United States and for EU countries. This is because the DG TAXUD and CBP-ICE datasets are more complete and consistent compared to the WCO dataset. Moreover, all the observations related to internal detentions were removed as they do not reflect international trade flows.

Product classification methods

Although all three datasets report product categories of seized goods, they differ with respect to the taxonomies used. The DG TAXUD database uses its own classification scheme with 35 product categories. The WCO database uses a different classification scheme, with 18 main categories. The CBP-ICE database uses a very detailed Harmonised Tariff Schedule (HTS) classification scheme at a seven digit product level. These differences are due to the fact that although they cover the same issues, they were created and are run independently.

In order to enable the use of the seizure database with the trade database, all observations were assigned a code according to the Harmonised Systems or Combined Nomenclature (CN) taxonomy.[15] This was based on an algorithm that assigned all product infringement an HS classification (see section two of Annex A for more details).

Concerning the aggregation level, this report takes a global approach and therefore a two-digit level was chosen for seizure data and trade data. While this does not allow for a detailed analysis at the product level, it enables the global scope of the analysis to be maintained.[16]

Outliers in terms of seized goods or provenance economies

There are several issues related to seizure techniques that result in outliers for seized goods or provenance economies. These issues refer to incidental reported seizures of a given product (e.g. fresh fruits) or incidental seizures from a given economy.

Outliers are due to a number of factors, including:[17]

- Certain synergy of risk profiling techniques and their relatively moderate sensitivity for "non-standard" counterfeit goods and provenance economies. For example, customs officers may focus their checks on certain products that are more likely to suffer from counterfeiting and piracy, or on shipments coming from those economies that are more likely to be provenances of counterfeit and pirated products.
- The dynamic adoption of strategies by counterfeiters, including frequent changes of trade routes, with "seasonal" transit points.
- Different attitudes towards counterfeiting across industries and, consequently, different intensities of co-operation between industry and enforcement authorities. For example, some companies actively engage in co-operation with customs and provide detailed information about the situation of counterfeiting and piracy in their industry. Such information is likely to improve the efficiency of customs checks of these particular products.

In order to address the problem of outliers, this report uses the same solution as the 2008 study: a low, "base line" counterfeiting score is given to all products and provenance economies observed in the seizures data. It should be noted that this also reduces the overall precision of this exercise.

Seizures of patent-infringing goods

The share of seizures of patent-infringing goods in the total set of seizures appears relatively small.[18] While this may be surprising given the importance of patents in modern economies, and the easily tradable nature of patent-infringing goods, some differences in terms of legal procedures between patent-infringing goods and other tangible goods that infringe trademarks, copyrights or design rights may explain this under-representation in the data. In particular, patent infringements are generally identified for products that are already in a given economy, and thus seized within economies, so that only a small fraction is seized by customs at borders (see section four of Annex A for more details).

Given that there is no robust and sound way of extrapolating the existing information on customs seizures of patent-infringing products into domestic seizures, this study conservatively and exclusively relies on customs seizures. By doing so, this analysis recognises that a large volume of traded patent-infringing products seized domestically remains outside the scope of the analysis.

Values of seized goods

Regarding the values of seized goods, one of the main purposes of this study is to put counterfeit and pirated trade into the perspective of total trade. To do so, the values of counterfeit and pirated goods should be reported in terms that are similar to those used for legitimate imports, which primarily relies on the transaction value of the goods.

In general, there are two principles of reporting the value of counterfeit and pirated goods: 1) declared value (value indicated on customs declarations), which corresponds to values reported in the general trade statistics; and 2) replacement value (price of original goods). However, it is often unclear *ex ante* whether the reported value relates to transaction or replacement.

This problem occurs mostly for goods that are knowingly bought by customers as counterfeits on the secondary market (mostly luxury goods). For goods that are offered by counterfeiters on the primary market, and that are supposed to deceive consumers, the transaction value is usually close to the replacement value.[19]

The structured interviews with customs officials and the descriptive analysis of values of selected products (see section two of Chapter Four) provide some insights into the valuation issues in the DG TAXUD and WCO. For most cases, the declared values are reported, and consequently all the values in the DG TAXUD and WCO datasets will be considered as declared.

For the CBP-ICE data, the quantitative analysis indicates that the prices of genuine goods were reported (see section five of Annex A for more details). Consequently, for the purpose of quantitative analysis in this study, data for the United States are assumed to represent replacement value. Two factors should be kept in mind in this context: first, this issue primarily applies to industries that produce luxury goods that are knowingly bought by customers as counterfeits on the secondary market. For goods that deceive consumers, the transaction value is usually close to the replacement value. Second, such interpretation of values of US seizures affects only the relative positioning of the impacted industries, not the total value of counterfeit trade. This is because the information is used to calculate the relative (not absolute) indices of counterfeiting (GTRIC-p and GTRIC-e, explained below). These indices are used in the second step to calculate the total value of counterfeit and pirated trade.

The statistical analysis of values of counterfeit and pirated products in the dataset highlighted two more issues. First, some observations have

unreasonably low values that are way below even the hypothetical transaction values. For example, unit values of a watch equalling one cent or less. Second, some observations do not have any values, mostly in the WCO database. This is mainly due to the voluntary nature of reporting that, together with "survey fatigue", could lead to some inadequacies.

To address this issue, very low values were assigned "no price" in the dataset. For observations with no value, valuations were imputed from the existing observations. This imputation was carried out at the most detailed level possible, i.e. based on distributions of values of product groups presenting similar characteristics, such as product type, right holder and provenance economy (see section five of Annex A for more details).

Methodological and statistical aspects: The GTRIC methodology

The methodology used in this exercise relies primarily on the methodology developed in OECD (2008). The core idea underlying the methodological framework is as follows: if the propensity to which different types of infringing goods are imported from different provenance economies can be established, then these propensities can be applied to existing statistics on international trade to estimate both the relative intensities of counterfeiting and the overall magnitude of counterfeiting and piracy. In this context, propensities therefore refer to the likelihood that a particular type of counterfeit or pirated goods is imported from a particular trading partner.

This methodology relies on three key econometric components:

- The General Trade-Related Index of Counterfeiting for products (GTRIC-p): an index of industry sectors (HS) according to their relative propensity of containing counterfeit products.
- The General Trade-Related Index of Counterfeiting for economies (GTRIC-e): an index of economies according to their relative propensity to be an economy of provenance for counterfeit products.
- The general matrix that assigns relative likelihood of containing counterfeit products to each pair: "product category" and "provenance economy" (GTRIC).

All of these key components are briefly presented below. More detailed methodological notes can be found in the Annex B at the end of this report.

It should be noted that given the overall improvement of seizure data, the OECD (2008) methodology was enhanced in order to take advantage of these data improvements. The key methodological amendments are outlined in Table 3.2.

Table 3.2. Improvements compared to the 2008 methodology

	2008	2015
Time dimension	No (pooled dataset)	Yes (2011, 2012 and 2013)
Construction of GTRIC-p and GTRIC-e	Based on values of seized goods, numbers of seizures and numbers of seized goods. Strong assumptions on: • Conversions from numbers of seizures and numbers of seized goods to values. • Minimal levels of counterfeiting in each provenance economy and in each product category.	Based only on values of seized goods. No strong assumptions made on conversions and on minimal levels of counterfeiting.
Estimation of total value (fixed point)	Chosen following informal interviews with customs and industry representatives.	Refined after structured interviews and focus groups with customs and other enforcement officials.

Industry overview (GTRIC-p)

The identification of sensitive goods relies on customs data presented in the previous sections. Because of some data compatibility issues discussed above, a sensitive good is broadly defined as a (sensitive) category of goods. This study uses the 96 two-digit product modules included in the Harmonised System (HS). In particular, this means that if any of the reporting customs authorities registered an infringing item as belonging to a given HS category, the whole category is treated as "sensitive".

To obtain a meaningful measure of the seizure intensity of a given product category, which would allow a rightful estimate of the propensity to import this infringing product, the average of its seizure percentages is weighted by the respective share of each reporting economy into total imports of the corresponding two-digit HS sensitive product. The product-specific counterfeiting factors are then obtained by relating these seizure intensities to the import share of the corresponding product category into total trade. In other words, the counterfeiting factors calculated here reflect the sensitivity of product infringements occurring in a particular product category, relative to its share in international trade.

GTRIC-p is constructed from a transformation of the general propensity factor while addressing a number of known related biases. It is meant to

capture the propensity to which products in international trade are counterfeit and/or pirated, relative to the total trade in these products. Formed on a two-digit HS basis, GTRIC-p establishes the relative likelihood for products in one HS chapter to be counterfeit relative to another. Within any one chapter there could be considerable variation among products, and the relative counterfeiting propensities must therefore be seen as averages for the hundreds of goods covered by each HS chapter.

Provenance economies (GTRIC-e)

Following the OECD (2008) methodology, a provenance economy is an economy detected and registered by any reporting customs agency as a source of any item that has been intercepted in violation of an IP right, whatever the amount or value concerned. In this study, a provenance economy refers to those economies of origin where the actual production of infringing goods is taking place, as well as those economies that function as ports of transit through which infringing goods pass prior to the economy of destination.[20]

Similar to GTRIC-p, the propensity for a given provenance economy is obtained by relating the weighted average of its seizure percentages to its respective import share of its total imports. From this, a GTRIC-e is established along the same lines as GTRIC-p, and indicates the relative propensity of importing infringing goods from different provenance economies.

Given the overall good quality of data, GTRIC-e is also calculated separately for each year for which seizure data are available (2011, 2012 and 2013).

Total counterfeit trade (GTRIC)

The general propensity framework (GTRIC) assigns the relative likelihood of containing counterfeit products to each pair: "product category" and "provenance economy".

The GTRIC index itself can be represented as a matrix table where provenance economies are listed across the rows and where the two-digit HS Modules are listed in columns. Each element of the matrix, i.e. the value of GTRIC, denotes the relative propensity of a given provenance economy to export infringing products covered by a given HS Module. It is emphasised that these propensities can only be interpreted relative to each other and that GTRIC itself does not provide any information about the absolute magnitude of counterfeiting and piracy in world trade. Instead, the index

should be considered as a tool to aid a better appraisal of the problem of counterfeit and pirated trade.

Estimating GTRIC is a difficult undertaking as both indices, GTRIC-e and GTRIC-p, are combined. The product- and economy-wise application of the relative propensity indices (GTRIC-p and GTRIC-e, respectively) serves as a foundation for indicating the magnitude of counterfeiting and piracy in world trade. However, they have limitations and more precise information about the international trade in counterfeit and pirated goods can be gained by establishing a detailed indicator at a "product-economy" level.

The absolute number of counterfeit and pirated goods

GTRIC is a matrix of relative propensities that assigns a relative probability of containing counterfeit or pirated products to provenance economy and product category, with the top category ranked as 1 and the bottom ranked with $\varepsilon_c > 0$.

To calculate the absolute value of counterfeit and pirated products in international trade it is important to identify at least one probability of containing counterfeit and pirated products in a given product category from at least one provenance economy. This was established in a set of confidential and structured interviews with customs officials. The detailed quantitative and qualitative set of inputs on customs operations that were collected during these confidential interviews have allowed this report to determine the upper limit of the absolute number of imported counterfeit and pirated goods in a given product category for at least some EU member countries. This result could then be extrapolated onto the yearly trade flows, which will give a basis to be applied onto GTRIC.

Section 4.

Mapping counterfeit and pirated products patterns: Preliminary analysis of seizure data

This chapter presents a set of relevant results based on the analysis of seizures of counterfeit and pirated products.

Overview of counterfeit seizures

In each analysed year (2011, 2012 and 2013) the total number of customs seizures of counterfeit and pirated goods worldwide consistently exceeded 100 000. These data provide a wealth of information about the provenance economies, industry scope of counterfeit trade, and the economies of registration of right holders whose IP rights are infringed.

It should be noted that regarding provenance economies[21] for trade in counterfeit and pirated products, most economies were indicated as provenance for these goods in international trade. However, some economies tend to dominate. The highest number of counterfeit shipments being seized originates from East Asia, with the People's Republic of China (hereafter "China") being on top (See Figure 4.1).

The unified dataset can be used to draw quantitative illustrations regarding infringed product categories (See Figure 4.2). The scope of products being counterfeited and pirated is very broad, ranging from luxury to common products (see Box 4). The most frequently seized counterfeit goods include some luxurious products, such as watches, perfumes or leather goods, but also common products, such as toys or machinery. Some categories of seized counterfeit products contain goods that can pose significant health and safety threats. These include toys, pharmaceuticals and spare parts.

Box 4. The wide scope of counterfeiting and piracy.

As long as a given product is protected with a trademark, patent, design right or copyright that adds an economic value to its rights holder, it is likely that this product suffers from counterfeiting and piracy. The scope of counterfeiting and piracy is broad and covers almost all products that are protected by the four IP rights mentioned above. Existing statistics report on seizures of counterfeit (trademark infringing) fresh strawberries, cinnamon and coconut oil.

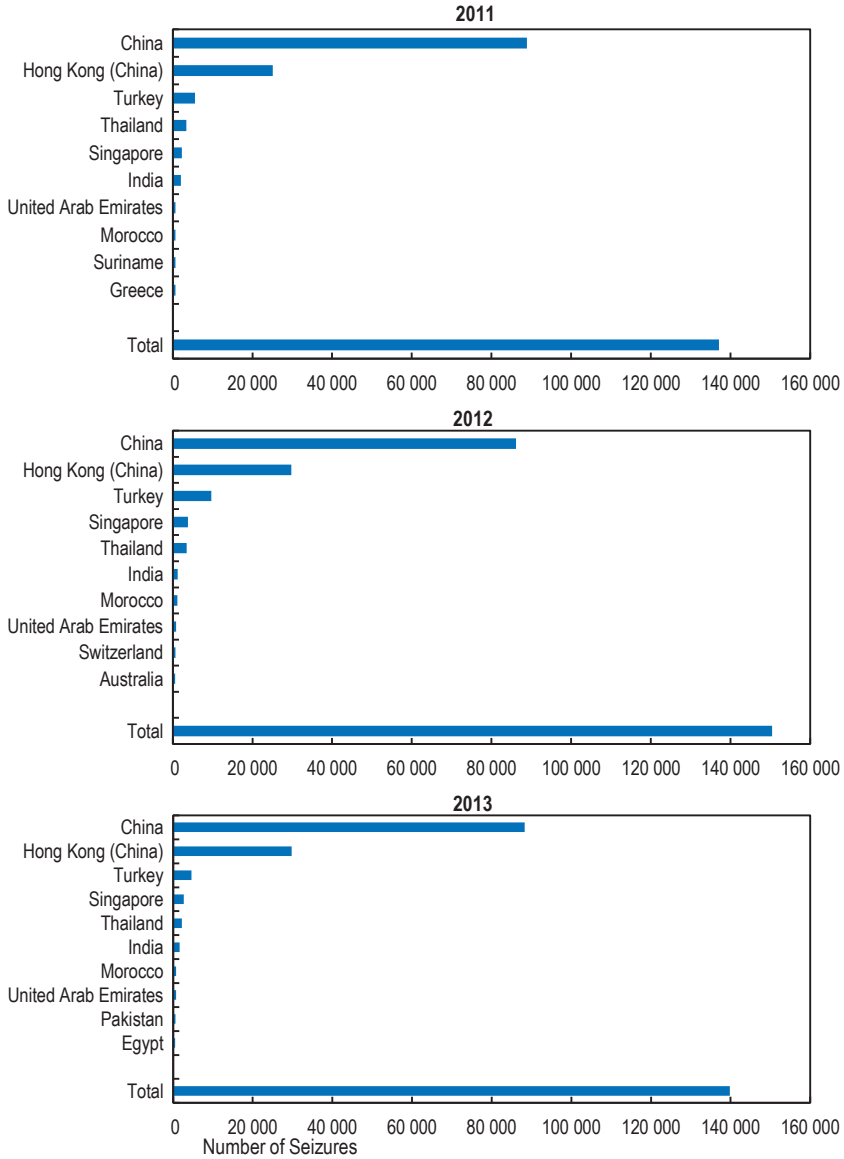
It should be noted that some counterfeit products can pose significant threats to the environment or to consumers' health and safety. For example, counterfeit pesticides or fungicides that do not correspond to safety norms often pose serious environmental hazards. Personal health and safety risks are often generated by substandard counterfeit products such as pharmaceuticals, car spare parts, baby formulas, toys, food and drink, and medical equipment.

The available dataset enables the economies in which the right holders are located to be checked in order to determine whose IP rights are infringed. Location refers to the place where the headquarters of a right holder is registered. This is done only based on WCO and DG TAXUD data as the CBP-ICE data does not report the brand owners, hence it is impossible to establish the economy of registration of the right holder. In the combined WCO – DG TAXUD dataset, such information is available for 68% of all the seizures in terms of value.

Almost 20% of the total value of seized products refers to IP rights of holders registered in the United States; followed by Italy (14.6%), France (12.1%), Switzerland (11.7%), Japan (8.2%) and Germany (7.5%) (See Figure 4.3).

Rights holders in China also frequently have their IP rights infringed: about 1.3% of seizures of counterfeit and pirated goods concerns violations of the IP rights of Chinese companies. This contrasts sharply with China being at the top of economies of provenance in counterfeit and pirated products. It also indicates a very strong threat of counterfeiting and piracy that undermines the innovative efforts of Chinese companies relying on knowledge-based capital and using IP rights in their business strategies.

Figure 4.1. Seizures of counterfeit and pirated goods: Top provenance economies (2011, 2012 and 2013)



Statlink: http://dx.doi.org/10.1787/888933345908

Figure 4.2. Seizures of counterfeit and pirated goods: Top industries by Harmonised System (HS) codes (2011, 2012 and 2013)

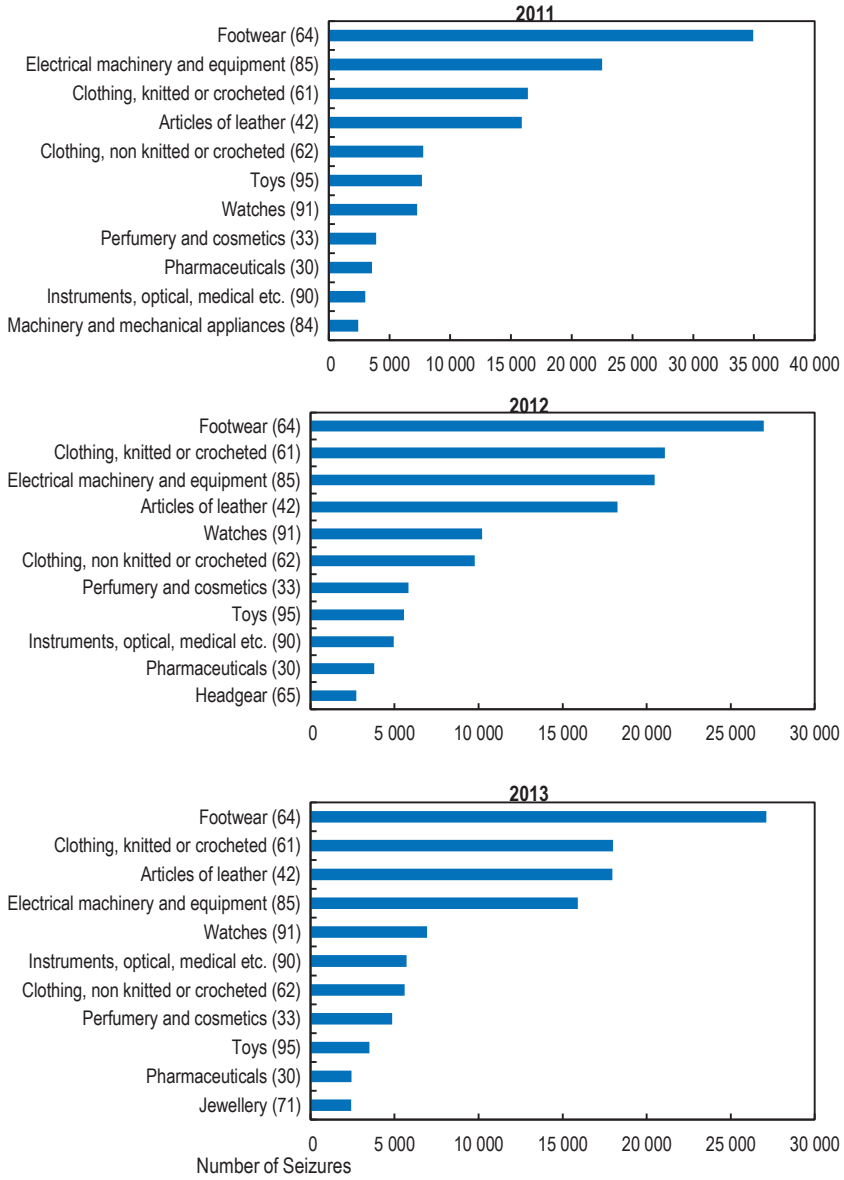


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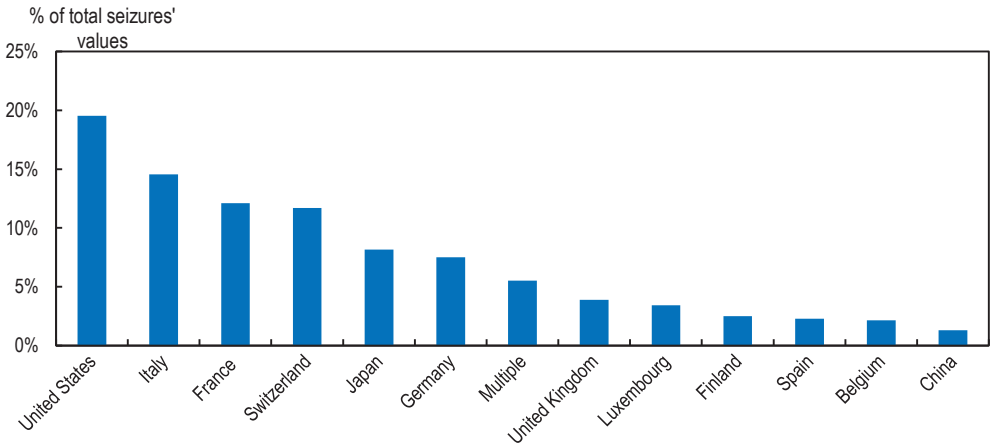
Figure 4.3. Seizures of counterfeit and pirated goods: Top economies of origin of right holders whose IP rights are infringed (pooled dataset)



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Multiple segments of targeted markets

The WCO and DG TAXUD databases report on infringed trademarks, meaning that they can be used to draw some quantitative illustrations about the market segments being targeted by counterfeit products.

In principle, there are two market segments that counterfeiters target: primary markets and secondary markets. In primary markets, prices are expected to be close to those of legitimate products, whereas larger price dispersions are expected in secondary markets. Consumers that knowingly purchase an IP infringing product may expect to pay a lower price for it than for a genuine product.

Several submarkets can be observed, especially for products that are intensely targeted by counterfeiters (and hence for which large data samples are available). These submarkets correspond to primary and secondary submarkets and are characterised with different price ranges of IP infringing products.

Specific brands among the diverse selection of infringed trademarks, such as Rolex, Nike, Ray Ban and Louis Vuitton, seem to be more intensely targeted by counterfeiters. This observation corroborates the results of a previous report published by the WCO, which identified Nike as the most frequently counterfeited brand in 2013 (WCO, 2014).

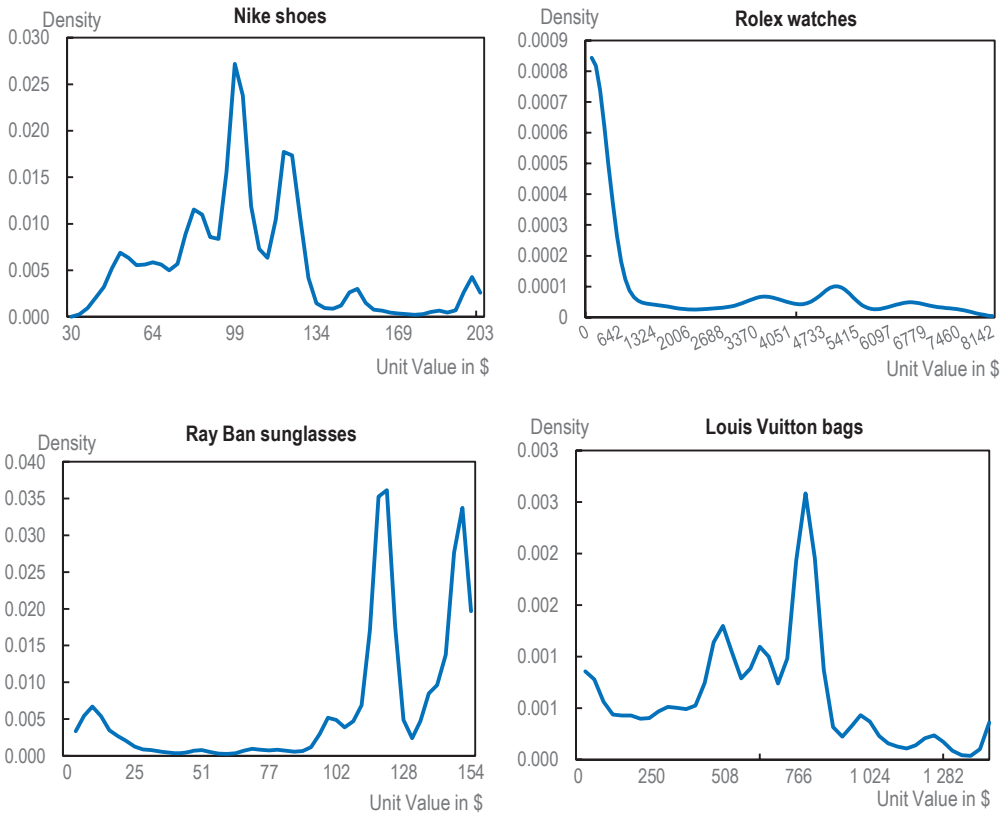
The relatively high frequency of these trademarks allows this report to perform some basic statistical checks on the type of markets that may be targeted by IP infringing Rolex watches, Nike shoes, Ray Ban sunglasses and Louis Vuitton bags. For this purpose, it is relevant to explore whether the declared values of these infringing goods can illustrate the emergence of primary and secondary submarkets.

A basic frequency value analysis of these IP infringing product reports a wide range of item values: between 5 and 200 USD for a pair of counterfeit Nike shoes, 5 and 150 USD for counterfeit Ray Ban sunglasses, between 5 and 1500 USD for a counterfeit Louis Vuitton bag, and between 5 and 20 000 USD for a counterfeit Rolex watch (see Figure 4.4).

As can be seen in Figure 4.4, some of these infringing products with higher values were going to be offered in a primary sub-market, where a consumer is deceived and prices are equal or close to those of genuine footwear. These counterfeits can report values that approach the prices of genuine goods. This value can sometimes be slightly lower if, for example, a counterfeit deceiving watch is offered as a "special deal".

It is likely that counterfeit Ray Ban sunglasses, Louis Vuitton bags, Nike shoes or Rolex watches with very low prices target the secondary sub-market, where prices are much lower and consumers intentionally demand and purchase IP infringing goods. Some may be advertised as "replicas", which refers to watches that do not pretend to be genuine but attempt to convince a buyer that it is of a high quality that is identical to the original good.

Figure 4.4. Frequencies of values of counterfeit Nike shoes, Ray Ban sunglasses, Louis Vuitton bags and Rolex watches



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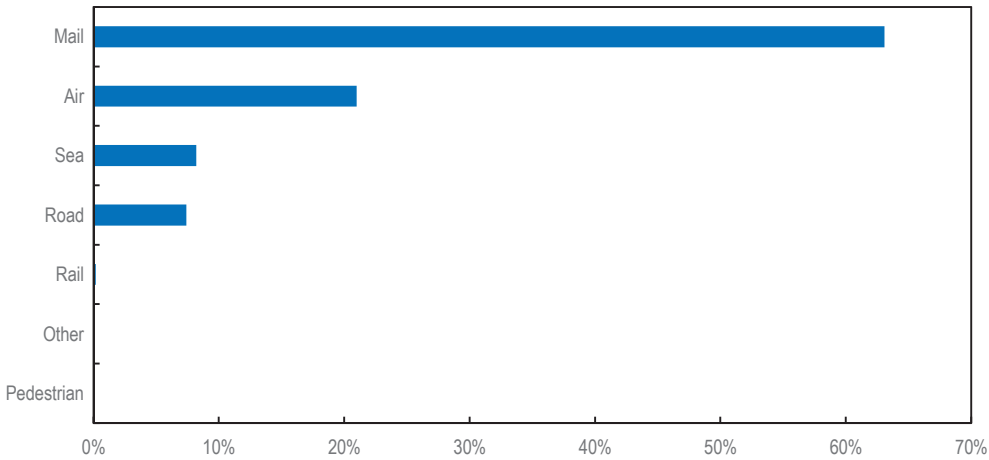
Conveyance methods and shipment sizes: A trend towards small shipment

A review of data highlighted that postal parcels are the most popular way of shipping counterfeit and pirated product (Figure 4.5).[22] Between 2011 and 2013, an average of almost 62% of seizures worldwide concerned postal shipments. Air transport and sea transport followed, with slightly more than: 20% and 9% of seizures respectively. Finally, seizures concerning vehicle transport amounted to about 7%. Other conveyance modes of counterfeit product, such as products carried by pedestrians or by rail, reported negligible shares.

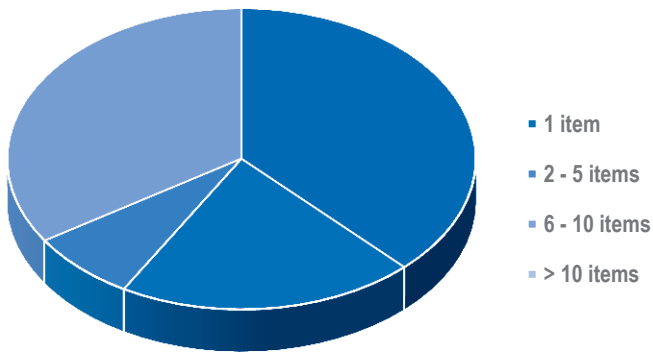
Figure 4.5. Conveyance methods (2011-2013, average)



Statlink: http://dx.doi.org/10.1787/888933345940

The sizes of seized shipments tend to be small: shipments with fewer than ten items accounted for about 43% of the total number of shipments, on average (Figure 4.6). This corresponds to the fact that postal parcels are the most popular conveyance method of counterfeit and pirated products.

Figure 4.6. Small seizures, up to 10 items seized (2011-2013, average)
As a percentage of total seizures



Statlink: http://dx.doi.org/10.1787/888933345952

The large volume of small shipments sent by mail or express seems to be related to the recent fast growth of the Internet, and particularly e-commerce solutions. Even though e-commerce offers businesses great productivity-enhancing tools, it also provides a powerful platform for counterfeiters and pirates to cost effectively engage large numbers of potential consumers

For enforcement authorities, postal and express shipments containing counterfeit products tend to be more difficult to detect and to detain. Consequently, the misuse of e-commerce for counterfeiting purposes imposes an additional significant burden onto enforcement authorities.

It should be highlighted that the roles of the online environment and e-commerce in the context of counterfeiting of physical goods is nuanced. On the one hand, the online environment has, for long time, been very attractive to counterfeiters/pirates for reasons such as anonymity, flexibility or market scope (OECD, 2008; OHIM-Europol, 2015). On the other hand, for rights holders, e-commerce has become an additional channel of distribution for genuine products, which to some consumers may reduce the relative attractiveness of infringing goods. The online environment is very dynamic and industry-specific, more research is needed in this area to fully understand the issues involved.

Packaging and labels

The descriptive analysis of the seizures database shows a large number of seized IP-infringing packaging and labels. This confirms findings about the domestic assembly of counterfeit and pirated products from imported materials, formulated in a study by OHIM and Europol (2015). This finding merits further attention, as packaging and labels have a significantly lower value than the final products. According to GTRIC methodology, all counterfeit packaging and labels are treated as "packaging", and represent the value of packaging. The results could vary significantly depending on the approach taken towards the product classification of these categories, and hence are difficult to fully confirm. This calls for a more detailed analysis of trademark infringing packages and labels.

Counterfeit credit cards and other methods of payments

The dataset reports a number of seizures of counterfeit credit cards (infringing trademarks of, for example, Visa, MasterCard or American Express), counterfeit card holograms, mobile credit card readers etc. Even

though the nominal value of a plastic card or a label is very low, these cases should be seen in a larger context of credit card fraud.

According to a study by Brody et al (2014), credit card fraud is increasing throughout the world and has become a global problem. Credit card fraud has proven to be an effective and often easy crime to commit, with new modes of operation for committing fraud constantly being introduced. Counterfeit credit cards are produced using original credit card details, which can be obtained by criminals through: 1) skimming the data contained on magnetic strips; 2) using cards stolen from the cardholder; 3) taking from potential victims while promoting the sale of non-existent goods and services. These counterfeit credit cards can be used for many types of transaction, both online and in stores.

Within this study, counterfeit credit cards and related goods are not comparable to other goods, since the nominal market value of counterfeit credit cards is very low and the main economic damage follows from their future misuse.

Section 5.

Counterfeit and pirated trade: Provenance economies and impacted industries

The key objective of this study is to employ the existing methodologies and techniques to gauge our understanding of the magnitude of counterfeit and pirated trade, both worldwide and in specific economies. The information presented in this chapter is based on the econometric methodology presented in Chapter Three, together with the unified dataset on counterfeit seizures. Issues covered in this chapter include:

- Identification of key economies of provenance (GTRIC-e).
- Scope of counterfeit and pirated trade (GTRIC-p).
- Estimates of total value of trade in counterfeit and pirated products.

It should be highlighted that all the results presented in this chapter rely on indices created by the econometric toolbox GTRIC. These indices are constructed to take into account the general context of international trade. Importantly, the GTRIC indices are weighted indices that assign high scores of counterfeiting to provenance economies or industries in two contexts:

- When a given economy is reported to be a source of high values of counterfeit and pirated products in absolute terms, or when a given product category can contain high values of counterfeit and pirated products in absolute terms (e.g. in USD).

or/and

- When a large share of trade from a given economy is counterfeit and pirated products, or a large share of products in a given product category is counterfeit and pirated (in percentage terms)

This is different from the descriptive statistics presented in the previous chapter, which rely only on the total volumes of seizures and do not take into account the general economic context.

Key provenance economies

Information developed during this study suggests that virtually any economy can be the provenance of counterfeit and pirated trade, either as places that produce infringing goods or as points of transit through which infringing goods pass. This is supported by a descriptive analysis of the unified dataset of customs seizures that identified 173 provenance economies of counterfeit and pirated products.

The large number of provenance economies of counterfeit and pirated products provides indications of the significance of counterfeiting and piracy in international trade. Developing an economy-specific index that follows the methodology presented in the previous chapter can provide some precision. This is undertaken for all reporting economies by taking into account seizure percentages and trade flows. From this, similar to the product categories above, a General Trade-Related Index of Counterfeiting for economies (GTRIC-e) is established, which indicates the relative propensity of importing infringing goods from different provenance economies.

Table 5.1 shows the top 15 provenance economies of counterfeit goods for 2011-2013, with Hong Kong, China and China on top (see Annex C for a complete list). A high GTRIC-e score implies either that a given economy is reported to be a provenance of high values of counterfeit and pirated products in absolute terms (e.g. USD), or that a large share of total imports from that economy are counterfeit and pirated products.

Table 5.1. Top 15 provenance economies in terms of their propensity to export counterfeit products GTRIC-e, average 2011-2013

Provenance economy	GTRIC-e
Hong Kong (China)	0.999
China	0.980
Turkey	0.975
Tokelau	0.952
Syrian Arab Republic	0.924
Greece	0.900
Nepal	0.699
Tunisia	0.697
Armenia	0.673
Yemen	0.667
Morocco	0.644

Panama	0.637

Table 5.1. Top 15 provenance economies in terms of their propensity to export counterfeit products GTRIC-e, average 2011-2013 *(continued)*

Provenance economy	GTRIC-e
Cambodia	0.636
Afghanistan	0.625
Cyprus*	0.617

Statlink: http://dx.doi.org/10.1787/888933346073

Note: A high GTRIC-e is a weighted value of two sub-components: the value of exports of counterfeit and pirated products from that economy in absolute terms, and the share of trade in counterfeit and pirated products from that economy.

* For Cyprus, see Notes.[23]

It should be noted that some of these provenance economies are more important sources of infringing goods than others. This could be because they are important producers of IP infringing goods or because they are strategic points of transit (See Box 5).

Box 5. Complex routes of counterfeit trade

GTRIC-e presents key provenance economies of counterfeit trade, i.e. economies where the actual production of infringing goods is taking place, and economies that function as a point of transit through which infringing goods pass. Counterfeiters and pirates tend to ship counterfeit products via complex trade routes, using several transit points. This is done for several reasons, including:

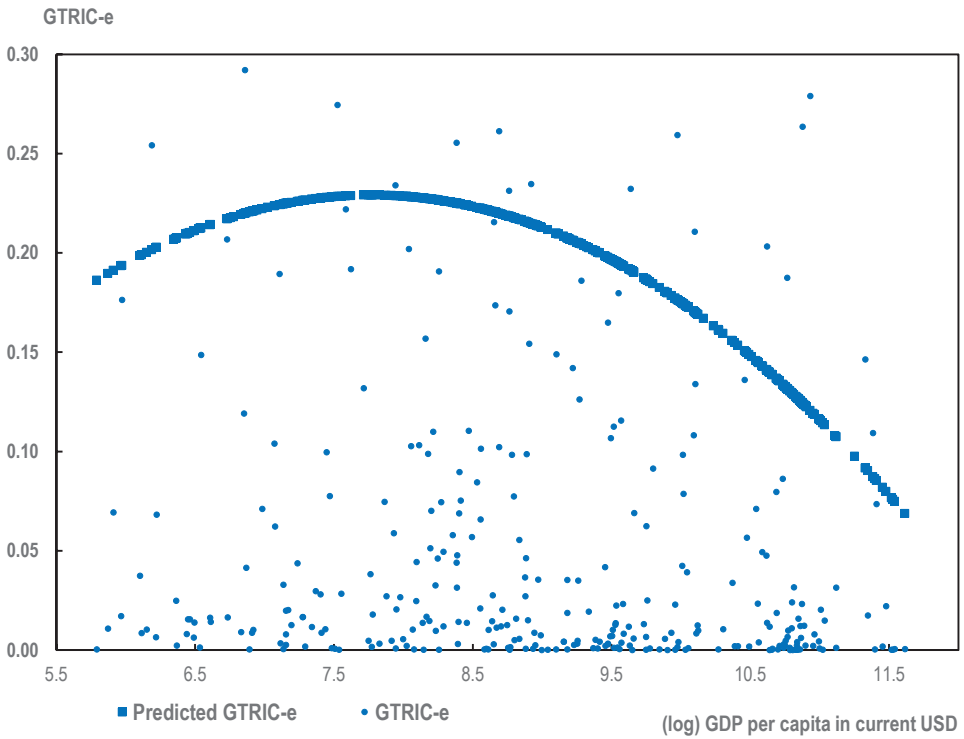
- "Cleansing" of all the documents and camouflaging the original point of production and/or departure.
- Establishing distribution centres for counterfeit and pirated goods (e.g. in free trade zones), and for transhipping them in smaller orders to their final destination points.
- Processing of products, usually in the free trade areas, often by adding counterfeit trademarks and/or repackaging or re-labelling goods.

Consequently, in most cases it is difficult for customs officers to determine the "producing economy", not only because of document cleansing, but also because the actual process of counterfeiting may not take place in the same economy as the production of a given good. A given product may be produced in one economy, however its labelling with counterfeit logos or packaging into trademark-infringing packages may take place in another economy that is closer

to destination markets and has weaker IP enforcement.

Assuming that the domestic production of infringing goods is positively correlated with being a provenance economy (large producers of counterfeit and pirated goods also tend to be large provenance economies), it would be expected that GTRIC-e is linked with the level of economic development. A simple econometric test reveals a significant relationship between GRTIC-e and GDP (see Annex D for more details of the econometric specification), presented in Figure 5.1.

Figure 5.1. The relationship between propensity to export counterfeit products (GTRIC-e) and GDP per capita, all economies



Statlink: http://dx.doi.org/10.1787/888933345969

Note: GDP per capita in current USD. Source: World Bank (2014), World Development Indicators, available at http://data.worldbank.org/data-catalog/world-development-indicators (accessed 11 February 2016).

The relationship between counterfeiting and piracy activities (expressed by GTRIC-e) and the level of economic development (expressed by GDP per capita) is illustrated by an inverted U-shape. This means that the highest values of GTRIC-e tend to be related to middle income economies, while high-income and low-income economies tend to be associated with low or zero values of GTRIC-e. This echoes the analysis in the OECD (2008) report.

Low-income economies generally lack the capital and technological capacity for producing a wide range of products, which limits the capability for producing infringing goods. As economies develop and grow richer, so do the productive and technological capabilities that affect the possibility for higher scale infringement activities. Institutional developments tend to lag behind economic development – including IP-related legislation and enforcement practices – which creates favourable conditions for infringement activities. But as economies grow even richer and become more knowledge-based, a higher emphasis is placed on the role played by IP and legislation and enforcement in these areas are tightened.

Industry scope of counterfeit and pirated trade

Based on available statistics from 103 economies between 2011 and 2013, customs detected articles in violation of intellectual property rights in 77 of the 96 HS chapters (80%).

While the scope of goods that are sensitive to infringement is broad, several sectorial studies suggest that the intensity of counterfeiting and piracy differs greatly across different types of goods, and hence HS categories. This is supported by seizure statistics that indicate the interceptions are concentrated in a relatively limited number of chapters.

To obtain a meaningful measure of the propensity for different types of infringing products to be imported, the weighted average of seizure percentages of infringing goods across importing economies is related to the respective import share, following the methodology outlined in Chapter Three. Based on these relative sensitivities, GTRIC-p establishes the relative likelihood for products in one HS chapter to be counterfeit relative to another. As a result, a general ranking of products with respect to their propensities of being counterfeit is established (see Annex C).

Similarly to GTRIC-e, the good quality of data allows a calculation of GTRIC-p for each year for which seizure data are available (2011, 2012, and 2013). Table 5.2 presents the top 15 sensitive product categories according to their general counterfeiting factor (average values over the analysed years). A high GTRIC-p score implies either that a given product category

contains high values of counterfeit and pirated products in absolute terms (e.g. USD), or that a large share of imports from that product category are counterfeit and pirated products.

Table 5.2. Top 15 industries with respect to their propensities to suffer from counterfeiting, GTRIC-p, average 2011-2013

Harmonised System (category number)	GTRIC-p
Watches (91)	0.9997
Articles of leather (42)	0.9990
Headgear (65)	0.9706
Footwear (64)	0.9633
Perfumery and cosmetics (33)	0.9145
Toys (95)	0.8986
Clothing apparel, knitted or crocheted (61)	0.8609
Miscellaneous manufactured articles (96)	0.8606
Tobacco (24)	0.8234
Other textile articles, labels (63)	0.6695
Umbrellas, walking sticks (66)	0.5902
Packaging (49)	0.5391
Clothing apparel, non-knitted or crocheted (62)	0.5032
Fabrics, labels (58)	0.4978
Tools of base metal (82)	0.4598

Statlink: http://dx.doi.org/10.1787/888933346080

Note: The GTRIC-p score is a weighted index of two sub-components: values of counterfeit and pirated products in absolute terms in a given product category, and share of trade in counterfeit and pirated products in that product category.

For full description of HS codes see Table A.7 in Annex C.

Estimating the total value of trade in counterfeit and pirated products

While the GTRIC does not give a direct measure of the overall magnitude of counterfeiting and piracy in world trade, it establishes

relationships that can be useful. Specifically, the GTRIC matrix can be used to approximate international trade in counterfeit and pirated goods.

For each good coming from a given provenance economy, GTRIC assigns a probability of it being counterfeit, relative to the most intensive combination of product-provenance economy. In theory, the absolute number of counterfeit trade for one provenance economy-product can be integrated into the corresponding cell of the GTRIC matrix to yield the total value of world trade in counterfeit and pirated products (See Annex B for more details).

However, determining this total value is currently impossible for two main reasons: first, the clandestine and dynamically changing nature of counterfeit trade makes any measurement exercise extremely difficult and highly imprecise; and second, operational data from customs offices are in most cases strictly confidential.

Nevertheless, the GTRIC matrix can be employed to gauge the "ceiling" value for international trade in counterfeit and pirated goods. Similar to OECD (2008), this approach is taken by establishing an upper limit of counterfeit trade (in percentages) from the key provenance economies in product categories that are most vulnerable to counterfeiting. Following OECD (2008), these values are called "fixed points".

The overall enhancement of seizures data since the previous OECD (2008) report allows for significant improvements to this methodology. Even though both studies attempt to quantify the "upper ceiling" of counterfeit and pirated trade, the current methodology is free from several strong assumptions and limitations. Consequently, the quantitative results presented in this study are much more reliable and robust than the results from the OECD (2008).

However, caution should be paid when comparing the results of the current study with the OECD (2008). Even though both studies quantify the same phenomenon, they rely on different methodologies; hence the results are not directly comparable. In particular, there are three key methodological improvements:

- The new refined fixed point that was chosen following a focus group meeting and sets of structured interviews with enforcement officials.
- Introduction of a time dimension.
- No strong assumptions on a minimum level of counterfeiting in each product category and in imports from each provenance economy.

The fixed point

In the 2008 study, this fixed point was determined based on ex ante assumptions that were debated with industry and enforcement representatives.[24] At the time this was the best possible methodological approach given the poor data quality.

In the current study, the fixed point has been gauged for a range of five industries, based on a focus group meeting and on interviews with customs officials from all EU members. The results were refined using a set of supplementary data on seizures in dedicated actions provided by the European Anti-Fraud Office (OLAF).

The goal of these interviews was to establish the range of "ceilings" in counterfeit and pirated trade, i.e. pairs of product category and provenance economy where shares of counterfeit products are the highest. Interviews with customs officials, a focus group meeting and analysis of OLAF data allowed for the identification of pairs with the highest shares of counterfeit products. At this stage, the identification of pairs with average or low shares of counterfeit and pirated goods is not possible. Consequently, the results presented in this study refer to the upper possible limit of trade in counterfeit and pirated goods.

In particular the new, refined fixed point refers to the consideration of the following pairs: HS33, Turkey; HS42, Hong Kong, China; HS61/62, China; HS 61/62, Turkey; HS64, China; and HS91, China (See Box 6).

Box 6. The new empirical foundation for the fixed point

To determine the potential range of "ceilings" in counterfeit and pirated trade, and to gauge the new fixed point, a focus group meeting and a set of structured, confidential interviews were conducted with experts from WCO and DG TAXUD and with the customs officials of all EU members. During these meetings and interviews a wealth of qualitative and quantitative information on counterfeit trade was collected. Investigated issues included: percentages of shipments being checked on the borders for given product categories and from given provenance economies; methods of checks (random checks, risk profiling, etc.); priority given to certain products and provenance economies; and trends in interception rates.

As a result of these meetings and interviews, a set of pairs, product-provenance economy, was determined. These pairs were analysed in depth to gauge the fixed point that could finally approximate the upper boundary of counterfeit trade in total world trade. These pairs included: HS33 (perfumes) from Turkey; HS42 (handbags and leather foods) from Hong Kong, China; HS61/62 (clothing) from China; HS 61/62 (clothing) from Turkey; HS64 (footwear) from China; and HS91 (watches) from China. A supplementary analysis of seizure data

provided by the European Anti-Fraud Office was also used to corroborate the analysis.

Box 6. The new empirical foundation for the fixed point *(continued)*

After initial evaluations, the pair HS91 (watches) from China was eliminated, given the large ambiguity regarding potential valuations of seized watches, which could lead to a significant bias in the fixed point. Other pairs were analysed quantitatively in order to determine the "ceiling" value. Eventually the fixed point was set at 27% for HS64 (footwear) from China. This means that for some EU members, the incoming flows of counterfeit footwear from China tends to reach 27% of the total incoming trade in that product category. This does not imply that on average 27% of footwear exported from China is counterfeit: it represents the upper level of potential trade in counterfeits, meaning that within the HS64 category imported from China by some EU members, the share of counterfeits was reaching 27% in some years.

The time dimension

The second important improvement compared with the 2008 methodology is the introduction of the time dimension. This was made possible due to the more precise and complete seizure data used for this study compared to data used by the OECD (2008 and 2009) studies. While there was no time indication for the data used in the OECD (2008 and 2009) studies, the current data include information on the exact date of seizure. Consequently, data used to calculate GTRIC-e and GTRIC-p were not pooled, but the calculations were repeated for each year separately. This results in much more precise estimates.

Assumptions of minimum level of counterfeiting

The third improvement refers to very strong assumptions of a minimum level of counterfeiting in each product category, and in imports from each provenance economy, which were made in OECD (2008 and 2009). These assumptions were made to address the problem of incomplete reporting of affected industries and provenance economies by customs offices. The new data is more complete and in most cases an observation on a given seizure includes information on product categories and provenance economies. This enables a more realistic and empirically based estimate of counterfeiting and pirated trade.

Conclusions

The best estimates of this study, based on the data provided by customs authorities, indicate that **counterfeit and pirated products accounted for as much as USD 461 billion in world trade in 2013**. The term "as much as" is crucial in this context as it refers to the upper boundary of counterfeit trade.

Given that total imports in world trade in 2013 amounted to USD 17 905 billion, this number implies that **as much as 2.5% of total world trade in 2013 was in counterfeit and pirated products**. World trade and its structure are very dynamic, especially in the post-crisis period, so this percentage cannot be directly applied to values for other years. In addition, this amount does not include domestically produced and consumed counterfeit and pirated products and pirated digital products that are distributed via the Internet.

Even though the current results cannot be directly compared with those from the OECD (2008) and (2009) studies, some general conclusions about the evolution of trade in counterfeit and pirated products over these years can be drawn. The current study concludes that as much as 2.5% of total world trade in 2013 was in counterfeit and pirated products. This is a significantly higher volume than the finding of the 2008 study, which concluded that counterfeit and pirated trade was up to USD 200 billion in 2005 (1.9 % of world trade) (OECD, 2008), and the 2009 update that concluded that counterfeit and pirated trade was up to USD 250 billion in 2007 (1.8 % of world trade) (OECD, 2009).

The OECD (2008) and (2009) studies represent state-of-the-art knowledge on counterfeit and pirated trade at the time and are the best that could have been assessed given the relatively poorer quality of data.

Considering the methodological improvements, the changes in volumes of counterfeit and pirated trade suggests that the problem of counterfeit and pirated trade has not diminished, but has become a major threat for modern knowledge-based economies.

Section 6.

The European Union case study

This chapter looks at the current situation of counterfeit trade in the European Union. Quantitative findings are primarily based on counterfeit seizures data received through DG TAXUD of the European Commission. In particular, this chapter:

- Recalls the economic importance of IP rights in Europe.
- Presents the quantitative assessment of counterfeit trade in the EU context.
- Charts counterfeit trade routes into the EU.

IP landscape in the EU

Historically, all modern IP rights originate from Europe. In the United Kingdom, the first legal acts on what is called today "intellectual property" were passed in the 15th and 16th centuries. In 1857, France established a trademark system that included an examination based registration.

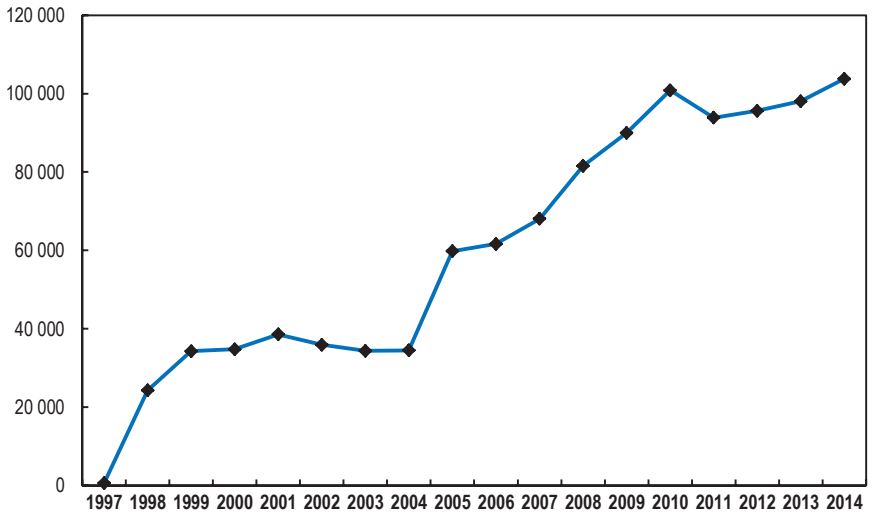
Today, all types of intellectual property rights, the infringements of which are analysed in this study, are protected in the EU according to national, European and/or international regulations. This refers to trademarks, design rights, copyrights, and patents.

For trademarks and industrial designs, rights are governed by European Union law and national laws of EU members. In the EU, trademarks can be registered within individual countries or across the whole of the EU as EU Trade Marks (EUTM) (until March 2016 these were called community trademarks). These trademarks can be registered by the European Union Intellectual Property Office (EUIPO).[25] An EU Trade Mark may consist of any signs that can be represented graphically, such as words, designs, letters, numerals, shapes of goods or of their packaging. EUTM applications are made directly to the EUIPO office in Alicante, Spain.

EUTM have become very popular among European and non-European registering parties. Over the past ten years there has been a growth rate of over 5% each year in registrations (Figure 6.1). The number of trademarks registered in 2015 reached more than one hundred thousand, compared to around five hundred in 1997.

In recent years the number of registrations of EUTM designs has been growing steadily: by 1% per year. E-filings are particularly popular; more than 90% of filings are carried out online.

Figure 6.1. Total community trademark registrations in the European Union
In thousands, 1997 - 2014



Statlink: http://dx.doi.org/10.1787/888933345976

Source: EUIPO (European Union Intellectual Property Office) (2016), Community trade mark applications, https://oami.europa.eu/ohimportal/en/the-office (accessed 18 February 2016).

Patents can be declared in the EU either nationally, through national patent offices, or through a centralised patent examination process at the European Patent Office (EPO). The EPO grants European patents on the basis of a single application; applicants can choose to protect their rights in up to 36 European countries.

The copyright holders have an exclusive right in the EU to: reproduce their work in forms such as printed publications or sound recordings; distribute copies and translations; broadcast the work or make it available; license and/or lend it; adapt it (e.g. to turn a book into a screenplay); or give

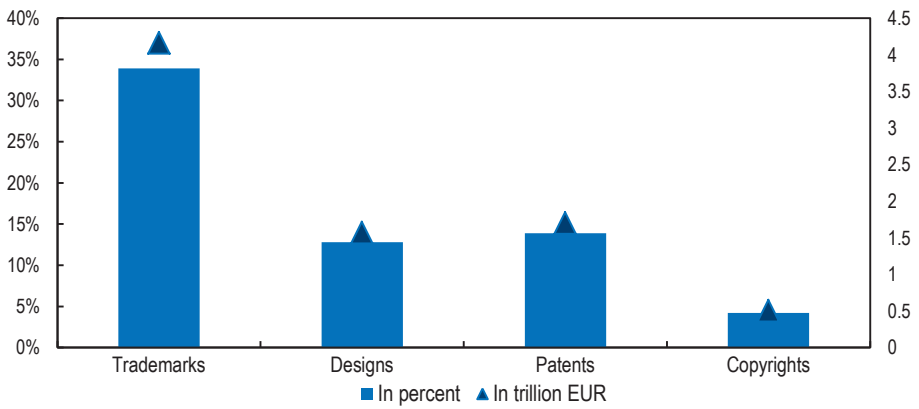
performances based on the work. Copyright in the EU is granted automatically upon creation and does not require any official registration.

In the EU, copyright law consists of a number of directives that aim to harmonise the differing copyright laws of the EU members, who are obliged to include these directives in their national legal frameworks. Examples of relevant directives include those of the European Parliament and the Council on collective management of copyright and related rights and multi-territorial licensing of rights in musical works for online use in the internal market (Directive, 2014/26/EU), certain permitted uses of orphan works (Directive, 2012/28/EU), and enforcement of intellectual property rights (Enforcement Directive, 2004/48/EC).

In the economic context, all these intellectual property rights are of fundamental importance for the EU economy as a whole. At the macroeconomic level, the IP-intensive industries have generated on average 39% of EU GDP between 2008 and 2010, which corresponded to over EUR 4.7 trillion annually (see Figure 6.2). In addition, IP-intensive industries contributed directly to 25.9% of employment in the EU over the same period, out of which the trademark-intensive industries contributed 20.8% (OHIM-EPO, 2013).

Figure 6.2. Average contribution of IP intense industries to economic activity (GDP) in the EU

Industries by IP category (2008-2010)



Statlink: http://dx.doi.org/10.1787/888933345988

Source: EUIPO (European Union Intellectual Property Office) (2013), "Intellectual property rights intensive industries: contribution to economic performance and employment in the European Union", *Industry-level Analysis Report,* Alicante, Spain, http://ec.europa.eu/internal_market/intellectual-property/docs/joint-report-epo-ohim-final-version_en.pdf.

At the firm level, IP rights in the EU also demonstrate high economic importance. Empirical studies have found that, on average, companies that employ their own IP rights also tend to employ at least 5.8 times the number of people than companies that are less IP intense. In addition, IP-intensive firms have, on average, 29% higher revenue per employee and pay on average 20% higher wages than firms that do not employ IP rights in their activities.

Counterfeit trade in the EU: The current picture

The quality of seizure statistics for the European Union allows for a thorough quantitative assessment of counterfeit trade in the EU context. This is done using the EU-specific GTRIC indices. In the EU context these indices illustrate:

- Relative propensity of industry sectors to contain counterfeit products in the trade flows to the European Union (GTRIC-p).
- Relative propensity of economies to be the provenance of trade in counterfeit and pirated goods to the European Union (GTRIC-e).

Concerning the relative propensity for products traded to the EU to include counterfeit or pirated goods, the range of sectors prone to counterfeiting is not narrower for the EU than for world trade. This implies that the problem of counterfeit imports to the EU is not narrower in industry scope and is not focused on only some industries (see Table 6.1).

The importation of infringing goods to the European Union appears to be most intensive for luxury products such as watches (chapter 91), articles of leather, […], travel goods, handbags (42), footwear (64), perfumes (33) and jewellery (71). However, consumer products imported into the EU also tend to be often targeted by counterfeiters. This includes apparel (61 and 62), tobacco (24) or toys (95). Lastly, counterfeit or pirated intermediary products, such as machinery (85) or instruments (95), also appear to be frequently traded with the European Union.

For certain types of counterfeit goods imported to the EU, the health and safety of consumers may be put at significant risk. This refers to a large range of products, such as: cosmetics, pharmaceuticals, spare parts, tools and machinery, chemicals and household products. These infringing products are often substandard and health and safety risks to consumers may range from mild inconveniences to life-threatening situations.

Table 6.1. Top 15 industries likely to suffer from counterfeit EU imports, GTRIC-p, average 2011-2013

Harmonised System (category code)	GTRIC-p
Watches (91)	1.000
Articles of leather (42)	0.999
Footwear (64)	0.958
Tobacco (24)	0.927
Perfumery and cosmetics (33)	0.919
Headgear (65)	0.893
Clothing apparel, knitted or crocheted (61)	0.882
Toys (95)	0.877
Miscellaneous manufactured articles (96)	0.718
Clothing apparel, not knitted or crocheted (62)	0.536
Jewellery (71)	0.479
Optical, photographic, medical instruments (90)	0.426
Electrical machinery, equipment and parts (85)	0.395
Other textile articles (63)	0.383
Tools of base metal (82)	0.379

Statlink: http://dx.doi.org/10.1787/888933346090

Note: The GTRIC-p score is a weighted index of two sub-components: *values* of counterfeit and pirated products in absolute terms in a given product category, and *share* of trade in counterfeit and pirated products in that product category. For a full description of HS codes see Table A.7 in Annex C.

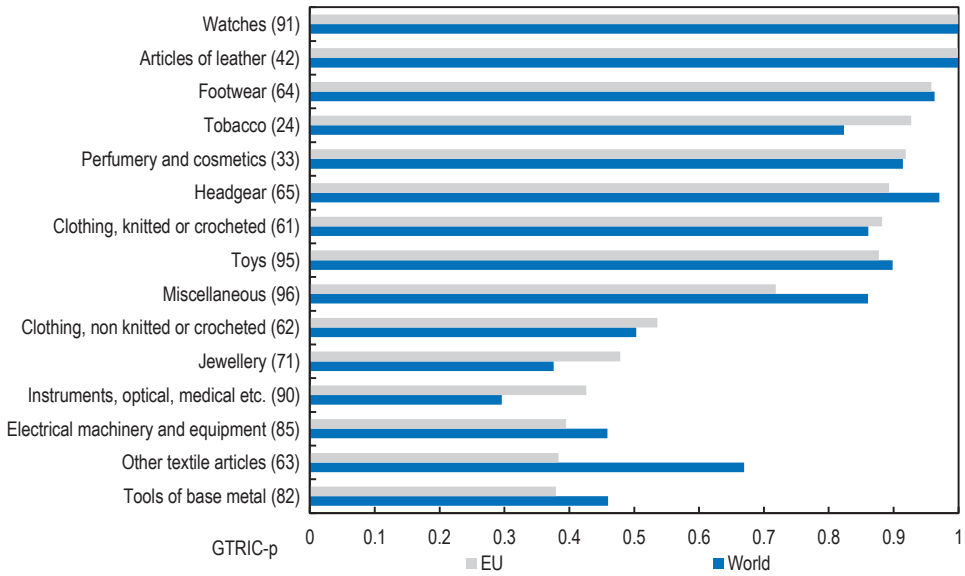
Comparing the GTRIC-p indices calculated for world trade and EU imports it appears that the scope of goods sensitive to infringement in the EU is as broad as the scope of infringed products in world trade. However, differences do exist and are highlighted in Figure 6.3, which compares the top most counterfeit product categories in EU trade with those in world trade.

Two main sectors are less targeted in EU trade than in world trade, these are: other made up textile articles (63); and tools, […] of base metal, parts thereof of base metal (82). There are three main industry sectors in which

counterfeit trade is more intense in EU trade than in world trade, these are: tobacco and manufactured tobacco substitutes (24); optical, photographic, […] medical or surgical instruments (90); and jewellery (71).

The relatively larger share of counterfeit instruments in EU imports suggests that counterfeiters have, to some extent, successfully managed to infiltrate the production processes of EU industries. Given the large complexity of global value chains, this is likely to lead to great risks when low quality counterfeit products enter production as intermediary inputs. Moreover, these risks may then emerge in other industry sectors that rely on the production processes that use these counterfeit intermediary inputs.

Figure 6.3. Differences in industrial composition of counterfeit trade between world trade and EU Imports, GTRIC-p for world trade and EU imports



Statlink: http://dx.doi.org/10.1787/888933345992

Regarding the provenance economies for counterfeit and pirated goods imported to the EU, information captured in the EU-specific GTRIC-e index shows that, as with world trade, their scope is wide and global. Table 6.2 shows the top 15 provenance economies of counterfeit goods entering the EU for 2011-2013, with Hong Kong, China at the top (see Annex C for a complete list).

Table 6.2. Top 15 provenance economies of counterfeit goods entering the EU, GTRIC-e, average 2011-2013

Provenance economy	GTRIC-e
Hong Kong (China)	0.9999
China (People's Republic of)	0.8788
United Arab Emirates	0.9414
Turkey	0.9127
Greece	0.8806
Syrian Arab Republic	0.8657
Suriname	0.8461
Lebanon	0.8295
Singapore	0.7601
Senegal	0.7201
Panama	0.7051
Tokelau	0.6930
Afghanistan	0.6632
Pakistan	0.6361
Thailand	0.6335
Morocco	0.6293
Tunisia	0.5873
Latvia	0.5260
India	0.5039
Togo	0.4770

Statlink: http://dx.doi.org/10.1787/888933346101

Note: A high GTRIC-e is a weighted value of two sub-components: the value of exports of counterfeit and pirated products from that economy in absolute terms, and the share of trade in counterfeit and pirated products from that economy.

Some provenance economies are more significant sources of infringing goods than others. This could be because they are large producers (origins) of IP infringing goods, or because they are strategic points of transit. This issue is explored in the next section.

Before undertaking these checks, the upper boundary of the total value of counterfeit imports to the European Union should be calculated. These calculations rely on GTRIC indices for the EU (based on DG TAXUD data), and follow the same methodological principles as the calculation of total counterfeit world trade presented in the previous section. In particular, the fixed point remains identical to that used for the global calculation, which was established during structured interviews with WCO, DG TAXUD and EU customs officials.

Through applying the GTRIC methodology, the global estimates show that **total trade in counterfeit and pirated products to the European Union amounted to as much as USD 116 billion (EUR 85 billion) in 2013**, compared to total imports of USD 2 243 billion (EUR 1 624 billion) (UN Comtrade). This number implies **that as much as 5.1% of EU imports in 2013 was in counterfeit and pirated products**. As with global imports, this percentage should not be directly applied onto the values of total trade in other years as the structure of trade tends to be dynamic.

Two important factors should be considered when calculating these figures:

1. As with OECD (2008), this number represents an upper limit of counterfeit imports to the EU. In terms of the model, the number used in this exercise is much more robust than the fixed point used in the OECD (2008), yet both numbers refer to the maximum possible amount of imports of counterfeit goods.
2. The above-presented amount does not include domestically produced and consumed counterfeit and pirated products, and pirated digital products being distributed via the Internet.

Charting counterfeit trade routes to the EU

The application of the GTRIC methodology onto EU trade data and EU seizures data leads to the identification of key provenance economies of counterfeit trade to the European Union. However, it does not indicate the nature of these provenance economies. In particular, among significant provenance economies some are source (producing) and some are major transit economies.

Parties engaging in the trade of counterfeit/pirated products tend to ship infringing products via complex trade routes, often using transit points in jurisdictions with little or no risk of IP-related enforcement actions. This is done for reasons including camouflaging the original point of departure, establishing distribution centres for counterfeit and pirated goods, and repackaging or re-labelling goods (see Box 5).

While imports of counterfeit goods are, in most cases, targeted by local enforcement authorities, goods in transit are not within their scope, which means they are less likely to be intercepted.

Given the overall very good quality of DG TAXUD data, a quantitative exercise can shed light on which provenance economies are more likely to

be producers of infringing goods, and which are more likely to be the transit points.

To do this exercise, data on the industrial activity of top provenance economies are compared with the GTRIC-p index that captures the propensity to counterfeit in various industry sectors. The logic behind this exercise is as follows: if a given economy has been indicated as an important provenance economy in terms of counterfeit trade to the EU, and at the same time this economy is an important producer of sensitive goods, it can be concluded that this economy is likely to be a provenance economy (producer) of counterfeit goods, rather than just a point of transit. Conversely, an economy that is a significant provenance according to the GTRIC-e score, but that also reports low industrial production in sensitive industry sectors, is more likely to be a transit point.

This exercise is carried out in four steps:

1. Industry data (output) is extracted from the industrial statistics database of the United Nations Industrial Development Organisation (UNIDO). These data are classified according to the categories of industrial activity (ISIC-Rev3) at a two-digit level.
2. ISIC-Rev3 are matched with relevant HS codes that refer to the GTRIC-p tables; this is done following the concordance tables proposed by the United Nations Statistics Division26 (see Table A.5 in Annex C). As a result, each industrial category (ISIC-Rev3) gets assigned an index of propensity to counterfeiting that comes from the corresponding GTRIC-p table.
3. A set of significant provenance economies for the EU is identified. It is assumed that for a significant provenance economy, GTRIC-e is larger than 0.5. For each provenance economy, data on sectorial industrial outputs are weighted with indices of propensity to counterfeiting, as calculated in step two. The results for each economy are summarised into total industrial output, controlled for propensity to counterfeiting.
4. These results are then normalised for each year (2011, 2012 and 2013)
   (Table A.6).

According to the results presented in Table A.6 in Annex C, China emerges as the only clear economy of origin of counterfeit trade to the European Union. Consequently, for calculation purposes, excluding China from the sample could shed some more light on the relationship between the remaining economies.

This exercise results in an index that assigns a number between 1 and 0 to each important provenance economy of counterfeit trade to the EU. Large values of this index indicate a high probability that an economy is a provenance economy (producer) of counterfeit goods. Low values indicate a high probability that an economy is an important transit point for the trade in counterfeit goods.

As the general economic potential of China is so huge, only after it was excluded did the sample provided some additional signals about other potential source (producing) economies. In particular, economies whose score grew significantly after excluding China may be both transit points and provenance economies.[27] Economies with scores close to zero tend to be transit points only.

These results are presented in Table 6.3 below.

Table 6.3. Imports of counterfeit and pirated products to the EU

Preliminary identification of potential producers and transit points

	2011	2012	2013
Potential producers (and exporters to the EU) of counterfeit goods	China (People's Republic of)	China (People's Republic of)	China (People's Republic of)
Potential producers and/or transit points in trade with counterfeit goods to the EU	Afghanistan	Afghanistan	Greece
	Greece	Greece	Hong Kong (China)
	Hong Kong (China)	Hong Kong (China)	Lebanon
	Latvia	Lebanon	Morocco
	Lebanon	Mauritius	Panama
	Malaysia	Morocco	Senegal
	Pakistan	Pakistan	Serbia
	Romania	Panama	Singapore
	Singapore	Senegal	Syrian Arab Republic
	Suriname	Singapore	Thailand
	Syrian Arab Republic	Suriname	Turkey
	Thailand	Syrian Arab Republic	
	Tunisia	Thailand	

	Turkey	Tunisia
		Turkey

Table 6.3. Imports of counterfeit and pirated products to the EU *(continued)*

	2011	2012	2013
No data available	Cabo Verde	Djibouti	Bosnia and Herzegovina
	India	Maldives	Christmas Island
	Seychelles	Democratic People's Republic of Korea	Fiji
	Togo	United Arab Emirates	Jamaica
	Tokelau	Vanuatu	Mongolia
	United Arab Emirates		Togo
			Tokelau
			United Arab Emirates

The role of some economies is unclear. They may be provenance economies (e.g. for some sensitive goods), transit economies (e.g. for other sensitive goods), or both. Some of these economies, such as Hong Kong, China; or Singapore, are important hubs of international trade. However, some of the economies identified have very weak governance and strong a presence of organised criminal networks (e.g. Afghanistan or Syria). The situation of each industry and in each economy is unique; therefore more in-depth studies are needed to analyse this issue at a sectorial- and economy-level.

Because of different reporting schemes and data quality, all of these results should be considered as general indications. More research is still needed in the area of charting counterfeit trade to the EU.

The schemes used for data on industrial production (ISIC) and for propensities to counterfeit (HS) are different. Moreover, the counterfeiting propensities are reported at a two-digit level, which reduces the precision of match between both datasets.

The data on industrial production are relatively old and incomplete for many sectors and economies. Only about 80% of all sensitive sectors

identified by GTRIC-p have a corresponding category in the industrial dataset. Available data is also lacking at the economy level, where there is still no credible data on their industrial output for many important provenance economies.

Section 7.

Conclusion

This study quantitatively assesses the value, scope and trends of trade in counterfeit and pirated products.[28] It relies primarily on a unique international set of customs seizure data that includes 500 000 seizure observations received from the DG TAXUD, CBP-ICE and WCO, as well as structured interviews with trade and customs experts.

Infringed products are found in numerous industries, such as: luxury items (e.g. fashion apparel or deluxe watches), intermediary products (such as machines, spare parts or chemicals), and consumer goods that have an impact on personal health and safety (such as pharmaceuticals, food and drink, medical equipment, or toys).

Detailed results show that counterfeit and pirated products can originate from virtually all economies in all continents, with China appearing as the single largest producing economy, when using detailed data from the EU. On average, middle-income economies tend to be the key provenances of counterfeit and pirated goods.

Using the G-TRIC Methodology, originally developed for the OECD (2008) study, this new report estimates that in 2013, international trade in counterfeit and pirated products could be as much as USD 461 billion. This represents up to 2.5 % of world trade. This amount does not include domestically produced and consumed counterfeit and pirated products, and pirated digital products being distributed via the Internet. The 2008 OECD study, which relied on a more limited dataset, estimated that 1.9 % of world trade at the time was in counterfeit and pirated goods, equivalent to up to USD 200 billion. This shows that in the context of a revival of international trade, with many opportunities for counterfeiters and criminals in the open globalised world economy, the magnitude of counterfeit and pirated trade seems to be on the rise,

This study performs an in depth assessment of the situation in the European Union, drawing on detailed DG TAXUD data for the EU. The results show that in 2013, imports of counterfeit and pirated products into

the EU amounted to as much as USD 116 billion (EUR 85 billion), which represents up to 5 % of EU imports. Therefore, the magnitude of the phenomenon for a group of developed countries, such as the EU, could be twice as high as on a world scale.

A detailed analysis of the data on infringed IP rights, coupled with registration of their rights holders, shows that the companies suffering from counterfeiting and piracy are primarily registered in OECD countries: the United States, Italy, France, Switzerland, Japan, Germany, the United Kingdom, and Luxembourg. However, a significant volume of rights holders that suffer from counterfeiting and piracy are also registered in emerging economies, for example, China. Counterfeiting and piracy is therefore a critical risk for all innovative companies that rely on IP to support their business strategies

The share of small shipments, mostly by post or express services, keeps growing due to the shrinking costs of such modes of transport and the increasing importance of Internet and e-commerce in international trade. Small shipments are also a way to avoid detection and minimise the risk of sanctions. This raises the cost of checks and detention for customs and, consequently, introduces additional significant challenges for enforcement authorities.

More detailed data available for the EU show that counterfeit and pirated products follow complex trading routes, including a set of intermediary transit points. Some of them, such as Hong Kong, China; or Singapore, are important hubs of international trade. Other transit points include economies with very weak governance and a strong presence of organised criminal networks (e.g. Afghanistan or Syria). This reflects the ability of counterfeiters and criminal networks to quickly identify weak points, gaps, and leverage opportunities for arbitrage.

Next steps

The current study presents a state of the art quantitative analysis of global trends in counterfeit and pirated goods based on the largest available dataset to date, with an accompanying comprehensive factual analysis. Given the magnitude of the issue, policy makers in OECD member countries and other governments, as well as the private sector, should be concerned about the scope of the phenomenon and its implications for the future, including the world's highest added value activities and innovation potential, both of which are sources of long term economic growth.

The unique dataset that has been built can lend itself to a number of more detailed analyses. These could include further in-depth quantitative exercises, such as mapping the trade routes of counterfeit products and the potential impacts of free trade zones; analysis of the customs seizure patterns that could help to strengthen risk-based enforcement practices; and economy- or industry-specific case studies to shed light on the situation in certain economies or sectors.

The potential for case studies is particularly fruitful where the data are abundant and where there is evidence of a significant impact in terms of infringements. More detailed analysis here can be very relevant for producing a more complete picture of trade in counterfeit and pirated goods, and its negative impact on right holders, governments and consumers.

The current mapping of trade in counterfeit and pirated products provides a foundation to formulate and propose a set of issues for OECD member countries and other policy makers to consider. This policy analysis could rely on quantitative results that could be complemented with an analysis of the drivers that underlie trade in counterfeit and pirated goods. The analysis could include analysing the supply- and demand-shaping factors in order to address the reasons why trade in counterfeit and pirated products tends to emerge. It could also address other potential issues such as a lack of deterrent penalties, trade-based money laundering, and other factors related to transnational crime. This analysis will inform policy discussions that governments can take individually or in co-ordination to prevent, reduce or deter trade in counterfeit and pirated goods.

The analysis carried out in this study has also highlighted some data-related issues. Even though available information on counterfeit and pirated trade has significantly improved over recent years, more could be done to improve and expand information on this phenomenon. Further research on measurement techniques and data collection methods could help to further refine the analysis. Observing further differences at the economy level through expanding the dataset over time could allow for a more granular analysis that focuses on rights holders. This could highlight the microeconomic impact of counterfeiting and piracy on selected cases and potentially allow forecasts or estimates of future counterfeiting and piracy trends.

Annex A.

Data issues

Following the descriptive analysis of the DG TAXUD, CBP-ICE and WCO datasets, five main data-related issues were identified.

- Discrepancies between DG TAXUD, CBP-ICE and WCO data.
- Classification levels.
- Outliers in terms of seized goods or provenance economies.
- Seizures of patent-infringing products.
- Valuations of detained goods.

Discrepancies between DG TAXUD, CBP-ICE and WCO data

Even though the DG TAXUD, CBP-ICE and WCO datasets have different geographical focuses, some commonalities can be found. First, some reporting economies are present in the WCO and DG TAXUD datasets (hereafter "overlapping countries"), including: Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Malta, the Netherlands, Poland, Portugal, Spain, Slovak Republic and Sweden. Second, the WCO dataset also contains US data.

WCO and DG TAXUD dataset discrepancies

Descriptive statistics of data from overlapping countries show a number of discrepancies between WCO and DG TAXUD. These discrepancies are observed at two levels. First, the absolute number of observations in the WCO dataset is much lower than in DG TAXUD dataset: second, countries' shares of seizures differ significantly.

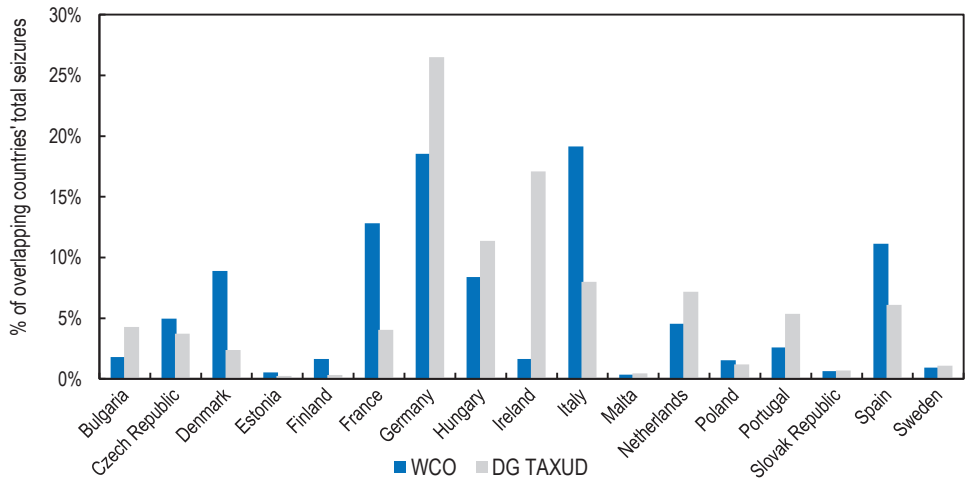
Concerning the absolute number of observations, the WCO dataset contains a significantly lower number of observations than DG TAXUD. For example, for the first quarter (Q1) 2011, the WCO dataset reports 2 947

observations for overlapping countries, whereas DG TAXUD dataset has 11 073 observations, which is 3.76 times more.

For almost all overlapping countries, the DG TAXUD database contains more observations than the WCO database. For some countries, these differences are dramatic. For example for Q1 2011, Germany reports 2 390 more seizures in the DG TAXUD database than in the WCO database; for Ireland this difference amounts to 1 845. There are only two exceptions for Q1 2011: Denmark reports only one more seizure in the DG TAXUD than in the WCO dataset, and Finland reports 11 more seizures in the WCO than in the DG TAXUD database.

Regarding the composition of observations, in Q1 2011 the relative share of overlapping countries in the total number of seizures of all overlapping countries also differ dramatically between the DG TAXUD and WCO datasets (see Figure A.1). For example, in the DG TAXUD datasets, seizures made in Ireland account for approximately 17% of seizures, compared to 1.6% in the WCO dataset; seizures made in France account for 4.03% of seizures in the DG TAXUD dataset and 12.83% in the WCO dataset.

Figure A.1. Shares of seizures
Overlapping countries, Q1 2011

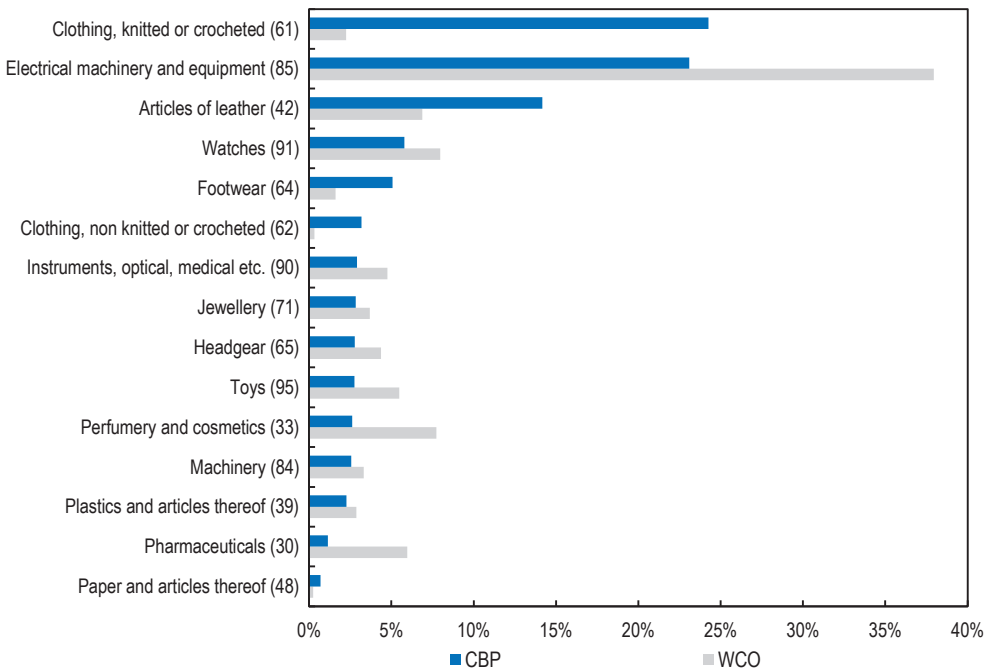


Statlink: http://dx.doi.org/10.1787/888933346003

Discrepancies in the WCO and CBP-ICE datasets

The WCO dataset contains a certain number of US seizures. Apart from the total number of seizures, there are significant differences in the industrial composition of US seizures between CBP-ICE and WCO databases (see Figure A.2). For example, according to the CBP-ICE data the highest number of seizures relates to product category 61 (knitted or crocheted fabrics), followed by 85 (machinery and mechanical appliances) and 42 (leather articles). The sample of US data in the WCO database reports that the most frequent counterfeit products are the 85 category (machinery and mechanical appliances). Contrary to the CBP-ICE data, the WCO database shows a significant share of US seizures of counterfeit and pirated products in category 91 (optical, photographic, cinematographic appliances), 33 (perfumery and cosmetic) and 30 (pharmaceuticals).

Figure A.2. Main differences in the industrial composition of US seizures between the CBP-ICE and WCO databases



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Origins of the issue

Following several discussions with customs officials as part of this study, two main origins of the discrepancies between the databases were identified.

First, in the WCO dataset, only seizures above a certain number of items detained or seizures of high value products are reported. Consequently, the WCO database does not contain a large number of small-scale seizures (e.g. postal shipments). DG TAXUD and CBP-ICE, however, do not apply these thresholds. Moreover, customs reporting to the DG TAXUD and CBP-ICE databases is mandatory, which is not the case for the WCO database.

Second, the CBP-ICE dataset only contains detentions made by US customs at US borders. The DG TAXUD databases only contain observations related to detentions made under Regulation (EU) No 608/2013 of 12 June 2013, which concerns customs enforcement of IPR and covers non-EU goods. However, the WCO database, in some instances, also reports internal detentions made within the reporting economy. This explains why the number of corresponding seizures in the WCO database is sometimes larger than in the DG TAXUD database.

The way forward

Given that the DG TAXUD and CBP-ICE databases are much more complete and consistent than the WCO database, for the purpose of this exercise, and whenever possible (i.e. for all the overlapping countries in the EU and for the United States), the DG TAXUD and CBP-ICE databases are used instead of the WCO database. All observations related to internal detentions have been removed as they do not reflect international trade flows.

Classification levels

Even though all three datasets report product categories of seized goods, they differ with respect to the taxonomies used.

The DG TAXUD database uses its own classification scheme with 35 product categories. This is complemented with manually entered descriptions of a detained product.

The WCO database has 15 main categories: accessories, cigarettes, clothing, computers and accessories, electronic appliances, foodstuff, footwear, games and toys, mobile phone and accessories, pharmaceuticals, phonographic products, textiles other than clothing, toiletries/cosmetics,

transportation and spare parts, and watches. Each category is divided into numerous sub-categories. The WCO database also includes an "other" category with detailed product description.

The CBP-ICE database relies on the Harmonised Tariff Schedule (HTS) at a very detailed seven digit level.[29] The HTS is based on HS taxonomy.

Origins of the issue

Despite the fact that both datasets cover the same issues, they were created and are run independently. In particular, EU customs officers need to enter data into both datasets, and there is no co-ordination of data reporting.

The way forward

HS/CN taxonomy is the common denominator for both datasets. Therefore, for this study HS taxonomy was used to achieve a global scope.

For CBP-ICE data, the HTS classification scheme is directly based on HS taxonomy, and the mapping process was straightforward.

For the DG TAXUD and WCO databases, mapping product infringement onto HS classification was a complex process that was structured along the following steps:

- First, DG TAXUD and WCO seizure categories were mapped with the HS 2 digit chapters (HS2). In some cases, a one-to-one match was established, e.g. the DG TAXUD category 5C (watches) corresponded strictly to the HS 91 chapter.
- Second, whenever there were more than two HS chapter matches that corresponded with one DG TAXUD or WCO category, the algorithm matched the general seizures categories with detailed descriptions of HS chapters, headings and subheadings (up to an eight digit HS code). Since the detailed description in the DG TAXUD and WCO datasets is not limited to English, matches were made based on detailed descriptions in three languages: English, German and French. All descriptions of items in individual seizures and HS classification were then normalised (i.e. set to upper case, special characters and stop words removed). For each description of a seized item, each word was checked against the detailed HS code description. The HS chapter with the highest degree of similarity with the description of the seized good was then matched with a given seizure.

- Third, the results of this automatised assignment were also checked manually. Regular expression lists were manually created for multiple matches, for no exact matches, and for certain popular categories of products. These lists matched certain expressions used for describing seized products with corresponding HS codes.

Although HS chapters are quite broad, for certain cases they are not broad enough to accommodate a general description of seized items. For example, a counterfeit jacket can be classified into several HS chapters depending of the material it was made of. For those ambiguous cases, where no exact information on the fabric was given, the corresponding values were distributed across multiple HS chapters, based on the distribution of non-ambiguous matches.

Outliers of seized goods or provenance economies

Outliers of seized goods or provenance economies refers to incidental seizures of a given product (e.g. coconuts) or incidental seizures from a given economy.

Origins of the issue

During a set of structured interviews with customs officials, several origins of this issue were identified, including:

- Certain synergy of risk profiling techniques, which makes seizing, for example, less commonly counterfeit products much more difficult.
- Relatively moderate sensitivity of risk profiling techniques for "non-standard" counterfeit goods and provenance economies, especially in customs offices that lack modern ICT equipment.
- Dynamic adoption of strategies by counterfeiters, which sometimes involves complex transit routes through several "clean" economies and the misuse of free trade zones.
- Different attitudes towards counterfeiting across industries and, consequently, different intensities of co-operation between industry and enforcement authorities.

The way forward

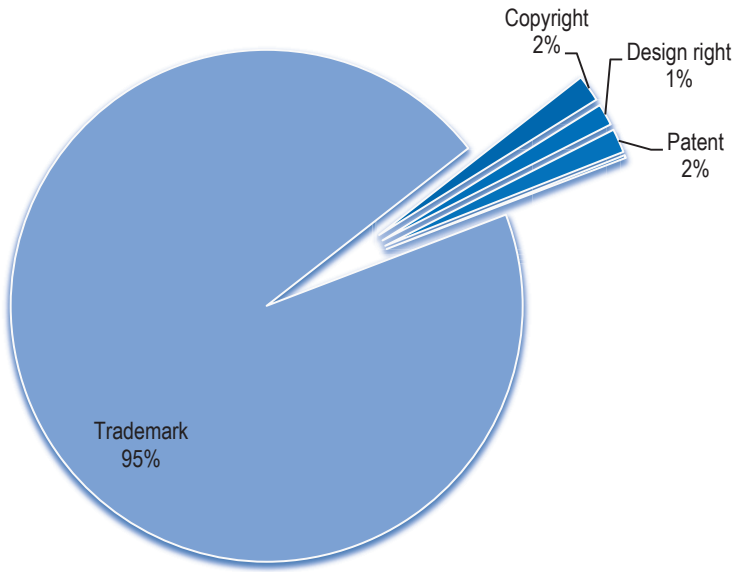
The solution proposed in the 2008 OECD study deals with the issue of outliers in terms of seized goods and provenance economies. Transformation

of the counterfeiting factor assigns a low, "base line" counterfeiting score to all products and provenance economies observed in the seizures data. This solution is also used for this study.

Seizures of patent infringing products

Regarding seizures of patent-infringing goods, it should be noted that these seizures represent only a small fraction of total seizures (see Figure A.3).[30] At a first glance, this may appear counterintuitive, given that patents play an important role in modern economies (see, for example, ESA-USPTO, 2012; OHIM-EPO, 2013), and that patent-protected goods are often easily tradable.[31]

Figure A.3. Shares of seizures by IP-infringing category
In terms of number of seizures



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However, the dataset that the analysis relies on covers information about only a fraction of patent infringing goods. This is because in most economies, legal procedures relating to infringements and seizures of patent-

infringing products are different from procedures relating to tangible goods that infringe trademarks, copyrights or design rights.

In most economies the law states that patent infringement is determined by a judge, who is assisted by an expert. In addition, infringement seizures are often used to collect evidence of the infringement. Consequently, patent-infringing goods are usually seized within the economies, and only a small fraction are seized by customs at borders.

The way forward

There seems to be no operational dataset that provides insight into domestic seizures of patent-infringing products. In addition, there is no workable way of mapping the existing information of seizures by customs at borders onto domestic seizures. This is because the product composition and scale of domestic seizures are largely unknown; hence any extrapolation exercise would introduce a substantial bias to the final results.

Consequently, this study takes a conservative approach and relies only on seizures of patent-infringing products by customs at borders. By doing so, it recognises that a large volume of traded, patent-infringing products are seized domestically but remain outside of the scope of the analysis.

Valuation issues

One of the main goals of this study is to estimate the share of counterfeit and pirated products in the total volume of international trade. Consequently, the value of counterfeit and pirated goods should be reported in terms that are similar to those used for legitimate imports, which primarily relies on the transaction value of goods.[32]

There are two main value types for seized counterfeit and pirated goods:

- Declared value (value indicated on customs declarations).
- Replacement value (the retail price the goods would have had if they had been genuine).

The WCO does not issue any recommendations on valuation methods. Moreover, numerous economies in the WCO dataset do not report any value of their seizures. A descriptive analysis of the WCO dataset suggests that these values tend to be declared; see examples of Rolex watches, Nike shoes, RayBan sunglasses and Louis Vuitton bags in the "Multiple segments of targeted brand markets" section of Chapter Four.

The descriptive analysis of the WCO dataset indicates that in some economies, reported values are unreasonably low and do not even represent declared values. For example, in many cases the reported values of Rolex watches were below one euro. These unreasonably low values do not seem to be correlated with any product category or provenance economy.

DG TAXUD recommends that valuations should reflect the replacement value. However, a descriptive analysis of their data suggests that this recommendation is not always taken into account. Taking again from the Rolex example in Chapter 4, it can be seen that reported values of seized counterfeit and pirated watches are distributed well below the market value of genuine articles. Hence, this dataset also appears to contain declared value rather than replacement value.

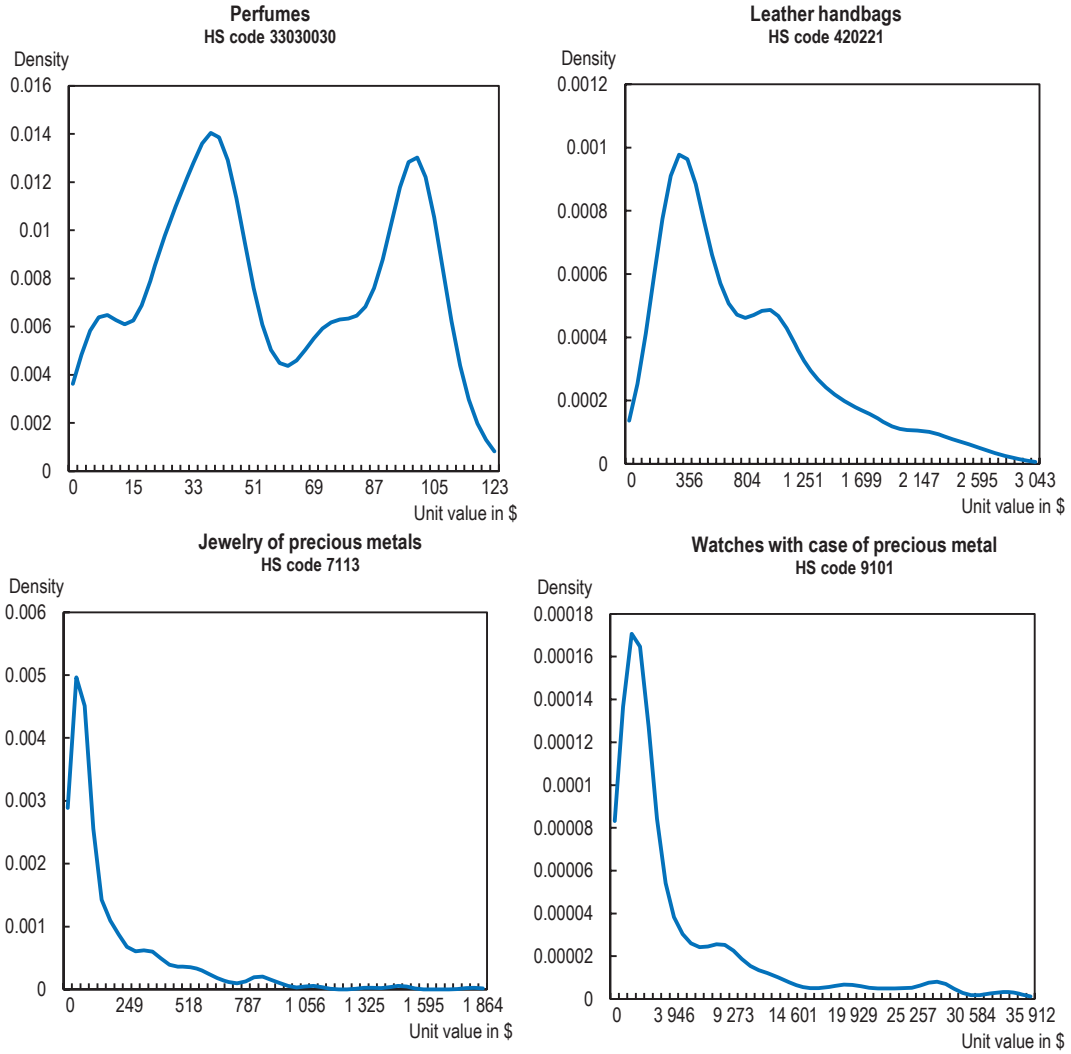
CBP-ICE recommends that valuations should reflect the manufacturer's suggested price for merchandise sold at retail to the consumer (MSRP), i.e. the replacement value. The quantitative analysis of seizures of selected product categories indicated that the prices of genuine goods were reported. The check was done for products where counterfeit items are relatively likely to be purchased knowingly by consumers on secondary markets. This is likely for luxury products, such as: leather handbags (HS code 420221), perfumes (HS code 33030030), jewellery of precious metals (HS code 7113) and watches with a precious metal case (HS code 9101). For all cases reported, values seem to correspond to the replacement value rather than declared value. This was particularly striking for watches with a precious metal case, where most seizures reported values above 1 000 USD (see Figure A.4).

For the purpose of this exercise, the CBP-ICE data are assumed to represent to replacement values. Two important issues should be considered in this context:

First, the valuation issue applies only to infringing products that are knowingly bought by customers as counterfeits on the secondary market, which in most cases are luxury goods. For goods that deceive consumers, the transaction value is usually close to the replacement value.

Second, interpretation of values of CBP-ICE data as replacement values affects only the relative positioning of the impacted industries, not the total value of counterfeit trade. This is because information on relative values of seizures is used to calculate the relative (not absolute) indices of counterfeiting (GTRIC-p and GTRIC-e), not to calculate the total value of counterfeit and pirated trade.

Figure A.4. Distribution of luxury goods' unit value in the CBP-ICE database



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Similar to the WCO dataset, the DG TAXUD data also contains some observations with unreasonably low values. For example, it reports many seized luxury apparel products of value below three euros. Moreover, a tiny fraction of observations in the DG TAXUD database (about 0.2%) does not

report any values. These unreasonably low values also do not seem to be correlated to any product category or provenance economy.

To reiterate, three main problems were identified:

1. Some observations have unreasonably low values; way below even the hypothetical transaction values (both databases).
2. It is often unclear whether the reported value is the transaction, or replacement one. This seems to be predominantly the case for goods that tend to be knowingly bought by customers as counterfeits (mostly luxury goods). For goods that are supposed to deceive consumers the transaction value is usually close to the replacement value.
3. Some observations do not have any values (mostly in the WCO database).

Origins of the issues

Following a set of structured interviews with customs officials as part of this study, some origins of these issues were identified.

Concerning the WCO dataset, these include a lack of direction on how to report values and the voluntary nature of reporting that, together with "survey fatigue", could lead to inadequacies. For the DG TAXUD dataset, "survey fatigue" could also result in a limited accuracy of the reported values.

The way forward

To manage the problem of too low valuations, observations with too low values were assigned "no price" in the dataset. For the problem of a lack of clarity of whether the value is declared or replacement, the entire dataset will be considered as reporting declared value. For the last problem of observations with no values, these values were imputed from existing observations. This imputation was done at the most detailed level possible, i.e., based on distributions of values from sample products with similar characteristics (product type, right holder, provenance economy, etc.)

Data imputations

There are several parametric and non-parametric imputation methods that can be used to impute the missing value of seizures. Non-parametric methods may be less prone to bias under a variety of situations because they do not make any assumptions regarding the distribution of variables in the dataset. The best-known approach to non-parametric imputation is the "hot

deck" method, which is frequently used by the US Census Bureau to produce imputed values for public-use data sets. A major strength of non-parametric imputations is that outcome values are observed values. Consequently, there are no "impossible" or out-of-range values and the shape of distribution tends to be preserved (Allison, 2001).

This study uses the predictive mean matching method proposed by Long (1997). This is a partially parametric method that relies on the following imputation steps:

- The variable to be imputed (item value) is regressed on a set of predictors for cases with complete data.
- This regression is then used to generate predicted values for both the missing and non-missing cases.
- For each case with missing data, a set of cases with complete data that have predicted values of Y that are "close" to the predicted value for the case with missing data is found. From this set of cases, one case whose Y value is donated to the missing case is randomly chosen.

In the context of this study, the predicted value of the missing observation is compared with five closest values in the non-missing value observations. Among these observations, one "donor" is randomly chosen based on factors such as provenance economy, brand name, transport mode, and transport mode.

Annex B.

Methodological notes

Construction of GTRIC-p

GTRIC-p is constructed of four steps:

1. For each reporting economy, the seizure percentages for sensitive goods are formed.
2. For each product category, aggregate seizure percentages are formed, taking the reporting economies' share of total sensitive imports as weights.
3. From these, a counterfeit a source factor is established for each industry, based on the industries' weight in terms of total trade.
4. Based on these factors, the GTRIC-p is formed.

Step 1: Measuring reporter-specific product seizure intensities

$\widetilde{v}_i^k$ and $\widetilde{m}_i^k$ are, respectively, the seizure and import values of product type *k* (as registered according to the HS on the two-digit level) in economy *i* from *any* provenance economy in a given year. Economy i's relative seizure intensity (seizure percentages) of good *k,* denoted below as γ_i^k, is then defined as:

$$\gamma_i^k = \frac{\widetilde{v}_i^k}{\sum_{k=1}^{\overline{K}} \widetilde{v}_i^k}, \text{ such that } \sum_{k=1}^{\overline{K}} \gamma_i^k = 1 \quad \forall i \in \{1,...,\overline{N}\}$$

$k = \{1,...,\overline{K}\}$ is the range of sensitive goods (the total number of goods is given by *K*) and $i = \{1,...,\overline{N}\}$ is the range of reporting economies (the total number of economies is given by *N*).

Step 2: Measuring general product seizure intensities

The general seizure intensity for product *k*, denoted Γ^k, is then determined by averaging seizure intensities, γ_i^k, weighted by the reporting economies' share of total sensitive imports in a given product category: *k*. Hence:

$$\Gamma^k = \sum_{i=1}^{\bar{N}} \omega_i \gamma_i^k \ , \quad \forall k \in \{1,...,\bar{K}\}$$

The weight of reporting economy *i* is given by:

$$\omega_i = \frac{\tilde{m}_i^k}{\sum_{i=1}^{\bar{N}} \tilde{m}_i^k}$$, where $\tilde{m}_i$ is *i*'s total registered import value of sensitive goods is ($\sum_{i=1}^{\bar{n}} \omega_i = 1$)

Step 3: Measuring product-specific counterfeiting factors

$\tilde{M}^k = \sum_{i=1}^{N} \tilde{m}_i^k$ is defined as the total registered imports of sensitive good *k* for *all* economies, and $\tilde{M} = \sum_{k=1}^{\bar{K}} \tilde{M}^k$ is defined as the total registered world imports of *all* sensitive goods.

The world import share of good *k,* denoted s^k, is therefore given by:

$$s^k = \frac{\tilde{M}^k}{\tilde{M}}$$, such that $\sum_{k=1}^{\bar{K}} s^k = 1$

The general counterfeiting factor of product category *k*, denoted CP^k, is then determined as the following.

$$CP^k = \frac{\Gamma^k}{s^k}$$

The counterfeiting factor reflects the sensitivity of product infringements occurring in a particular product category, relative to its share in international trade. These are based on the seizure percentages calculated for each reporting economy and constitute the foundation of the formation of GTRIC-p.

Step 4: Establishing GTRIC-p

GTRIC-p is constructed from a transformation of the general counterfeiting factor and measures the relative propensity to which different types of product categories are subject to counterfeiting and piracy in international trade. The transformation of the counterfeiting factor is based on two main assumptions:

- The first assumption (A1) is that the counterfeiting factor of a particular product category is positively correlated with the actual intensity of international trade in counterfeit and pirated goods covered by that chapter. The counterfeiting factors must thus reflect the real intensity of actual counterfeit trade in the given product categories.
- The second assumption (A2) acknowledges that the assumption may not be entirely correct. For instance, the fact that infringing goods are detected more frequently in certain categories could imply that differences in counterfeiting factors across products merely reflect that some goods are easier to detect than others, or that some goods, for one reason or another, have been specially targeted for inspection. The counterfeiting factors of product categories with lower counterfeiting factors could therefore underestimate actual counterfeiting and piracy intensities in these cases.

In accordance with assumption A1 (positive correlation between counterfeiting factors and actual infringement activities) and assumption A2 (lower counterfeiting factors may underestimate actual activities), GTRIC-p is established by applying a positive monotonic transformation of the counterfeiting factor index using natural logarithms. This standard technique of linearisation of a non-linear relationship (in the case of this study between counterfeiting factors and actual infringement activities) allows the index to be flattened and gives a higher relative weight to lower counterfeiting factors (see Verbeek, 2000)

In order to address the possibility of outliers in both ends of the counterfeiting factor index; i.e. some categories may be measured as particularly susceptible to infringement even though they are not, whereas others may be measured as insusceptible although they are; it is assumed

that GTRIC-p follows a left-truncated normal distribution, with GTRIC-p only taking values of zero or above.

The transformed counterfeiting factor is defined as

$$cp^k = \ln(CP^k + 1)$$

Assuming that the transformed counterfeiting factor can be described by a left-truncated normal distribution with $cp^k \geq 0$; then, following Hald (1952)33, the density function of GTRIC-p is given by:

$$f_{LTN}(cp^k) = \begin{cases} 0 & if\ cp^k \leq 0 \\ \dfrac{f(cp^k)}{\int_0^\infty f(cp^k)dcp^k} & if\ cp^k \geq 0 \end{cases}$$

Where $f(cp^k)$ is the non-truncated normal distribution for cp^k specified as:

$$f(cp^k) = \frac{1}{\sqrt{2\pi\sigma_{cp}^2}} \exp\left(-\frac{1}{2}\left(\frac{cp^k - \mu_{cp}}{\sigma_{cp}} \right)^2 \right)$$

The mean and variance of the normal distribution, here denoted μ_{cp} and σ_{cp}^2, are estimated over the transformed counterfeiting factor index, cp^k, and given by $\widehat{\mu}_{cp}$ and $\widehat{\sigma}_{cp}^2$. This enables the calculation of the counterfeit import propensity index (GTRIC-p) across HS chapters, corresponding to the cumulative distribution function of cp^k.

Construction of GTRIC-e

GTRIC-e is also constructed in four steps:

1. For each reporting economy, the seizure percentages for provenance economies are calculated.
2. For each provenance economy, aggregate seizure percentages are formed, taking the reporting economies' share of total sensitive imports as weights.
3. From these, each economy's counterfeit source factor is established, based on the provenance economies' weight in terms of total trade.
4. Based on these factors, the GTRIC-e is formed.

Step 1: Measuring reporter-specific seizure intensities from each provenance economy

$\widetilde{v}_i^j$ is economy *i*'s registered seizures of all types of infringing goods (i.e. all *k*) originating from economy *j* at a given year in terms of their value. γ_i^j is economy *i*'s relative seizure intensity (seizure percentage) of all infringing items that originate from economy *j*, in a given year:

$$\gamma_i^j = \frac{\widetilde{v}_i^j}{\sum_{j=1}^{\bar{J}} \widetilde{v}_i^j} \text{ such that } \sum_{j=1}^{\bar{J}} \gamma_i^j = 1 \quad \forall i \in \{1,...,\bar{N}\}$$

Where $j = \{1,...,\bar{J}\}$ is the range of identified provenance economies (the total number of exporters is given by *J*), and $i = \{1,...,\bar{N}\}$ is the range of reporting economies (the total number of economies is given by *N*).

Step 2: Measuring general seizure intensities of each provenance economy

The general seizure intensity for economy *j*, denoted Γ^j, is then determined by averaging seizure intensities, γ_i^j, weighted by the reporting economy's share of total imports from known counterfeit and pirate origins.[34] Hence:

$$\Gamma^j = \sum_{i=1}^{\bar{N}} \varpi_i \gamma_i^j \quad , \quad \forall j \in \{1,...,\bar{J}\}$$

The weight of reporting economy *i* is given by:

$$\varpi_i = \frac{\tilde{m}_i^j}{\sum_{i=1}^{\bar{N}} \tilde{m}_i^j} \text{, such that } \sum_{i=1}^{\bar{N}} \varpi_i = 1$$

Step 3: Measuring partner-specific counterfeiting factors

$\overline{M}^j = \sum_{i=1}^{N} \tilde{m}_i^j$ is defined as the total registered world imports of all sensitive products from *j*, and $\overline{M} = \sum_{j=1}^{\bar{J}} \overline{M}^j$ is the total world import of sensitive goods from all provenance economies.

The share of imports from provenance economy *j* in total world imports of sensitive goods, denoted s^j, is then given by:

$$s^j = \frac{\overline{M}^j}{\overline{M}} \text{, such that } \sum_{j=1}^{J} s^j = 1$$

From this, the economy-specific counterfeiting factor is established by dividing the general seizure intensity for economy *j* with the share of total imports of sensitive goods from *j*.

$$CE^j = \frac{\Gamma^j}{s^j},$$

Step 4: Establishing GTRIC-e

Gauging the magnitude of counterfeiting and piracy from a provenance economy perspective can be undertaken in a similar fashion as for sensitive goods. Hence, a general trade-related index of counterfeiting for economies (GTRIC-e) is established along similar lines and assumptions:

- The first assumption (A3) is that the intensity by which any counterfeit or pirated article from a particular economy is detected and seized by customs is positively correlated with the actual amount of counterfeit and pirate articles imported from that location.
- The second assumption (A4) acknowledges that assumption A3 may not be entirely correct. For instance, a high seizure intensity of counterfeit or pirated articles from a particular provenance economy could be an indication that the provenance economy is part of a customs profiling scheme, or that it is specially targeted for investigation by customs. The importance that provenance economies with low seizure intensities play regarding actual counterfeiting and piracy activity could therefore be under-represented by the index and lead to an underestimation of the scale of counterfeiting and piracy.

As with the product-specific index, GTRIC-e is established by applying a positive monotonic transformation of the counterfeiting factor index for provenance economies using natural logarithms. This follows from assumption A3 (positive correlation between seizure intensities and actual infringement activities) and assumption A4 (lower intensities tend to underestimate actual activities). Considering the possibilities of outliers at both ends of the GTRIC-e distribution; i.e. some economies may be wrongly measured as being particularly susceptible sources of counterfeit and pirated imports, and vice versa; GTRIC-e is approximated by a left-truncated normal distribution as it does not take values below zero.

The transformed general counterfeiting factor across provenance economies on which GTRIC-e is based is therefore given by applying logarithms onto economy-specific general counterfeit factors (see, for example, Verbeek, 2000):

$$ce^j = \ln(CE^j + 1)$$

In addition, following GTRIC-p it is assumed that GTRIC-e follows a truncated normal distribution with $ce^j \geq 0$ for all j. Following Hald (1952), the density function of the left-truncated normal distribution for ce^j is given by

$$g_{LTN}(ce^j) = \begin{cases} 0 & if\ ce^j \leq 0 \\ \dfrac{g(ce^j)}{\int_0^\infty g(ce^j)dce} & if\ ce^j \geq 0 \end{cases}$$

Where $g(ce^j)$ is the non-truncated normal distribution for ce^j specified as:

$$g(ce^j) = \frac{1}{\sqrt{2\pi\sigma_{ce}^2}} \exp\left(-\frac{1}{2}\left(\frac{ce^j - \mu_{ce}}{\sigma_{ce}} \right)^2 \right)$$

The mean and variance of the normal distribution, here denoted μ_{ce} and σ_{ce}^2, are estimated over the transformed counterfeiting factor index, ce^j, and given by $\widehat{\mu}_{ce}$ and $\widehat{\sigma}_{ce}^2$. This enables the calculation of the counterfeit import propensity index (GTRIC-e) across provenance economies, corresponding to the cumulative distribution function of ce^j.

Construction of GTRIC

In the OECD (2008) study, propensities to import infringing goods from different trading partners were developed using seizure data as a basis. The usage of data is maximised by applying a generalised approach in which the propensities for products to be counterfeit and for economies to be sources of counterfeit goods were analysed separately. This increased the data coverage of both products and provenance economies significantly, which increases the robustness of the overall estimation results. Unfortunately, it also reduced the detail of the analysis, meaning that counterfeit trade patterns specific to individual reporting economies, for both product types and trading partners, were not simultaneously accounted for; this introduced bias into the results. On balance, given the large scope of the analysis, the advantages of increasing data coverage can be viewed as outweighing the biases.

This approach combines the two indices: GTRIC-p and GTRIC-e. In this regard, it is important to emphasise that the index resulting from this combination does not account for differences in infringement intensities

across different types of goods that may exist between economies. For instance, imports of certain counterfeit and pirated goods could be particularly large from some trading partners and small from others. An index taking such "infringement specialisation", or concentration, into account is desirable and possible to construct; but it would require detailed seizure data. The combined index, denoted GTRIC, is therefore a generalised index that approximates the relative propensities to which particular product types, imported from specific trading partners, are counterfeit and/or pirated.

Step 1: Establishing propensities for product and provenance economy

In this step the propensities to contain counterfeit and pirated products will be established for each trade flow from a given provenance economy and in a given product category.

The general propensity of importing infringed items of HS category *k*, from any economy, is denoted P^k, and be given by GTRIC-p so that:

$$P^k = F_{LTN}(cp^k)$$

Where $F_{LTN}(cp^k)$ is the cumulative probability function of $f_{LTN}(cp^k)$.

Furthermore, the general propensity of importing any type of infringing goods from economy *j* is denoted P^j, and given by GTRIC-e, so that:

$$P^j = G_{LTN}(ce^j)$$

Where $G_{LTN}(ce^j)$ is the cumulative probability function of $f_{LTN}(ce^j)$

The general propensity of importing counterfeit or pirated items of type *k* originating from economy *j* is then denoted P^{jk} and approximated by:

$$P^{jk} = P^k P^j$$

Therefore, $P^{jk} \in [\varepsilon_p \varepsilon_e; 1)$, $\forall j,k$, with $\varepsilon_p \varepsilon_e$ denoting the minimum average counterfeit export rate for each sensitive product category and each provenance economy.[35] It is assumed that $\varepsilon_p = \varepsilon_e = 0.05$.

Calculating the absolute value

α is the fixed point, i.e. the maximum average counterfeit import rate of a given type of infringing good, *k*, originating from a given trading partner, *j*.

α can be applied onto propensities of importing infringing goods of type *j* from trading partner *k* (αP^{jk}). As a result, a matrix of counterfeit import propensities **C** is obtained**.**

$$\mathbf{C} = \begin{pmatrix} \alpha P^{11} & \alpha P^{21} & & & \alpha P^{1K} \\ \alpha P^{12} & \ddots & & & \\ & & \alpha P^{jk} & & \\ & & & \ddots & \\ \alpha P^{J1} & & & & \alpha P^{JK} \end{pmatrix} \text{ with dimension } J \, x \, K$$

The matrix of world imports is denoted by **M.** Applying **C** on **M** yields the absolute volume of trade in counterfeit and pirated goods.

In particular, the import matrix **M** is given by:

$$\mathbf{M} = \begin{pmatrix} \mathbf{M_1} \\ \vdots \\ \mathbf{M}_i \\ \vdots \\ \mathbf{M}_n \end{pmatrix} \text{ with dimension } n \text{ x } J \text{ x } K$$

Each element is defined by economy *i*'s unique import matrix of good *k* from trading partner *j*.

$$\mathbf{M}_i = \begin{pmatrix} m_{i1}^1 & m_{i1}^2 & & & m_{i1}^K \\ m_{i2}^1 & \ddots & & & \\ & & m_{ij}^k & & \\ & & & \ddots & \\ m_{iJ}^1 & & & & m_{iJ}^K \end{pmatrix} \text{ with dimension } J \text{ x } K$$

Hence, the element m_{ij}^{k} denotes *i*'s imports of product category *k* from trading partner *j*, where $i = \{1,...,n\}$, $j = \{1,...,J\}$, and $k = \{1,...,K\}$.

Denoted by Ψ, the product-by-economy percentage of counterfeit and pirated imports can be determined as the following:

$$\Psi = \mathbf{C}'\mathbf{M} \div \mathbf{M}$$

Total trade in counterfeit and pirated goods, denoted by the scalar **TC**, is then given by:

$$\mathbf{TC} = \mathbf{i}_1'\Psi\mathbf{i}_2$$

Where $\mathbf{i}_1$ is a vector of one with dimension *nJ* x 1, and $\mathbf{i}_2$ is a vector of one with dimension *K* x 1. Then, by denoting total world trade by the scalar $\mathbf{TM} = \mathbf{i}_1'\mathbf{M}\mathbf{i}_2$, the value of counterfeiting and piracy in world trade, s_{TC}, is determined by:

$$s_{\mathbf{TC}} = \frac{\mathbf{TC}}{\mathbf{TM}}$$

Annex C.

Tables and figures

Table C.1. Propensity of economies to export counterfeit products
GTRIC-e for world trade, based on the unified seizure dataset

Economy	2011	2012	2013	Economy	2011	2012	2013
Afghanistan	0.938	0.925	0.014	Canada	0.012	0.023	0.006
Albania	0.014	0.058	0.069	Cabo Verde	0.848	0.157	
Algeria	0.001		0.000	Central African Republic			0.000
Angola	0.000	0.000		Chad			0.000
Argentina	0.007	0.676	0.319	Chile	0.008	0.002	0.069
Armenia	0.992	0.103	0.922	China (People's Republic of)	0.995	0.999	0.946
Australia	0.015	0.031	0.001	Christmas Island			0.424
Austria	0.000	0.001	0.000	Colombia	0.046	0.035	0.007
Azerbaijan	0.027	0.154	0.455	Congo	0.000	0.010	
Bahamas	0.259			Democratic Republic of the Congo		0.017	
Bahrain	0.042	0.039	0.211	Costa Rica	0.000	0.000	0.005
Bangladesh	0.207	0.334	0.292	Côte d'Ivoire	0.003	0.002	0.017
Barbados	0.000		0.012	Croatia	0.023	0.007	0.112
Belarus	0.012	0.016	0.002	Cuba	0.020	0.001	
Belgium	0.010	0.002	0.005	Cyprus*	1.000	0.000	0.853
Belize	0.075			Czech Republic	0.004	0.006	0.534
Bolivia	0.001	0.027		Denmark	0.000	0.008	0.001
Bosnia and Herzegovina	0.110	0.003	0.769	Djibouti	0.002	0.922	0.444
Brazil	0.003	0.005	0.001	Dominica			0.036
British Virgin Islands		0.479		Dominican Republic	0.174	0.261	0.102
Brunei Darussalam		0.000		Ecuador	0.101	0.027	0.012
Bulgaria	0.460	0.344	0.235	Egypt	0.234	0.447	0.202
Cambodia	0.829	0.119	0.962	El Salvador	0.046	0.074	0.049
Cameroon	0.000	0.189	0.013	Eritrea		0.015	0.001

Table C.1. Propensity of economies to export counterfeit products *(continued)*

Economy	2011	2012	2013	Economy	2011	2012	2013
Estonia	0.062	0.007	0.000	Democratic People's Republic of Korea	0.139	0.93	0.186
Ethiopia	0.011	0.010	0.006	Kuwait	0.006	0.004	0.011
Faroe Islands		0.002		Kyrgyzstan	0.868	0.104	0.020
Fiji		0.048	0.255	Lao People's Democratic Republic	0.020	0.016	0.010
Finland	0.358	0.187	0.000	Latvia	0.942	0.521	0.232
France	0.080	0.047	0.001	Lebanon	0.409	0.493	0.670
Former Yugoslav Republic of Macedonia	0.084	0.014	0.021	Liberia			0.008
Gambia		0.068		Libya	0.010	0.003	0.003
Georgia	0.000	0.017	0.015	Lithuania	0.004	0.116	0.006
Germany	0.086	0.019	0.003	Luxembourg			0.000
Ghana	0.030	0.028	0.274	Macao (China)	0.481	0.928	0.073
Greece	0.983	0.790	0.930	Malawi	0.069		
Guatemala	0.446	0.025	0.014	Malaysia	0.142	0.035	0.126
Guinea	0.037	0.254		Maldives		0.554	
Guinea-Bissau	0.006			Mali		0.015	
Guyana		0.032		Malta	0.098	0.023	0.000
Haiti	0.016			Mauritania	0.044		
Honduras	0.005	0.018	0.038	Mauritius	0.149	0.763	0.004
Hong Kong (China)	1.000	1.000	1.000	Mexico	0.019	0.035	0.002
Hungary	0.001	0.002	0.010	Moldova	0.222	0.192	0.132
Iceland		0.000		Mongolia	0.010	0.044	0.031
India	0.483	0.321	0.505	Montenegro	0.099	0.098	
Indonesia	0.070	0.110	0.051	Morocco	0.367	0.937	0.629
Iran, Islamic Rep.	0.009	0.015	0.170	Mozambique			0.002
Iraq	0.011	0.005	0.006	Myanmar	0.000		
Ireland	0.000	0.000	0.000	Nauru			0.030
Israel	0.002	0.002	0.002	Nepal	0.149	1.000	0.951
Italy	0.023	0.136	0.057	Netherlands	0.012	0.024	0.002
Jamaica	0.000		0.369	New Caledonia	0.019	0.103	
Japan	0.001	0.002	0.004	New Zealand	0.071	0.049	0.000
Jordan	0.430	0.057	0.066	Nicaragua		0.001	0.001
Kazakhstan	0.019	0.001	0.001	Niger		0.176	
Kenya	0.010	0.062	0.033	Nigeria	0.003	0.005	0.005
Kiribati		0.458		Northern Mariana Islands	0.879		
Korea	0.108	0.134	0.425	Norway	0.000	0.000	0.000

Table C.1. Propensity of economies to export counterfeit products *(continued)*

Economy	2011	2012	2013	Economy	2011	2012	2013
Oman	0.000		0.000	Togo	0.207	0.025	0.409
Pakistan	0.841	0.564	0.442	Tokelau	0.998	0.860	1.000
Palau	0.647			Trinidad and Tobago	0.001	0.025	
Panama	0.454	0.470	0.989	Tunisia	0.847	0.750	0.493
Paraguay	0.012	0.000	0.090	Turkey	0.961	0.985	0.978
Peru	0.699	0.231	0.077	Turkmenistan	0.003		
Philippines	0.341	0.075	0.059	Ukraine	0.099	0.191	0.686
Poland	0.013	0.165	0.022	United Arab Emirates	0.357	0.698	0.317
Portugal		0.009	0.001	United Kingdom	0.014	0.203	0.012
Qatar	0.000	0.002	0.022	United States	0.032	0.016	0.263
Romania	0.545	0.000	0.004	Uruguay	0.000	0.786	0.013
Russia	0.107	0.180	0.320	Uzbekistan	0.012	0.100	0.000
Saint Helena		0.994		Vanuatu		0.103	
Saint Kitts and Nevis	0.013			Venezuela	0.186	0.042	0.004
Saint Lucia	0.001			Viet Nam	0.940	0.077	0.028
Saudi Arabia	0.001	0.012	0.008	Western Sahara	0.097		
Senegal	**0.071**	0.750	1.000	Yemen	0.008	1.000	0.996
Serbia	0.000	0.014	0.001	Zambia	0.009		
Seychelles	**0.747**	0.435					
Sierra Leone	0.008						
Singapore	0.519	0.539	0.279				
Slovak Republic	0.000	0.091					
Slovenia	0.010	0.079	0.332				
Somalia			0.002				
South Africa	0.000	0.001	0.055				
Spain	0.034	0.524	0.010				
Sri Lanka	0.020	0.027	0.044				
Suriname	0.509	0.776	0.538				
Swaziland		0.002	0.001				
Sweden	0.004	0.002	0.020				
Switzerland	0.109	0.146	0.017				
Syrian Arab Republic	1.000	0.776	0.997				
Tajikistan	0.016	0.041					
Tanzania	0.014	0.408	0.009				
Thailand	0.505	0.875	0.215				
Timor-Leste	0.009						

Note: *For Cyprus see Notes.[23]

Table C.2. Propensity of commodities to suffer from counterfeiting GTRIC-p for world trade, based on the unified seizure dataset

Harmonised System	2011	2012	2013	Harmonised System	2011	2012	2013
2		0.014	0.001	48	0.074	0.125	0.258
3	0.015	0.015	0.000	49	0.572	0.956	0.090
4	0.080	0.005	0.001	52	0.000	0.000	0.000
6	0.032	0.002	0.000	54	0.006	0.000	0.000
7		0.003	0.080	55		0.002	
8	0.024	0.891	0.091	56	0.001	0.002	
9	0.021	0.009	0.030	57	0.001	0.000	0.025
10	0.105	0.003		58	1.000	0.402	0.092
12		0.004	0.000	59	0.000	0.000	0.000
13			0.090	60	0.051	0.047	0.060
15		0.000		61	0.861	0.845	0.877
16	0.004	0.018	0.001	62	0.492	0.688	0.330
17	0.113	0.028	0.063	63	0.501	0.530	0.977
18	0.165	0.007	0.000	64	0.978	0.954	0.958
19	0.020	0.060	0.000	65	0.956	0.999	0.956
20	0.001	0.016		66	0.327	0.492	0.952
21	0.012	0.014	0.008	67	0.007		0.003
22	0.003	0.245	0.029	68	0.001	0.000	0.000
24	0.913	0.874	0.683	69	0.002	0.011	0.004
25	0.001			70	0.017	0.018	0.045
27	0.000	0.000	0.000	71	0.404	0.266	0.458
29	0.004	0.002	0.001	72		0.000	
30	0.374	0.399	0.410	73	0.065	0.026	0.012
32	0.009	0.001	0.000	74	0.000		0.000
33	0.857	0.935	0.952	76	0.008	0.001	0.001
34	0.012	0.088	0.034	79	0.019	0.002	
35	0.049	0.026	0.335	82	0.472	0.352	0.555
36	0.003	0.007	0.052	83	0.096	0.086	0.079
37		0.000		84	0.063	0.279	0.075
38	0.006	0.009	0.060	85	0.471	0.459	0.448
39	0.175	0.476	0.227	87	0.060	0.055	0.070
40	0.016	0.018	0.290	88	0.000	0.004	0.000
41	0.000	0.001		89	0.000	0.001	0.001
42	0.997	1.000	1.000	90	0.280	0.295	0.312
44	0.408	0.007	0.051	91	1.000	1.000	1.000
46	0.002			92	0.011	0.276	0.325

Table C.2. Propensity of commodities to suffer from counterfeiting *(continued)*

Harmonised System	2011	2012	2013	Harmonised System	2011	2012	2013
93	0.066	0.042	0.017	**96**	0.943	0.919	0.720
94	0.085	0.070	0.062	**99**			0.000
95	0.818	0.933	0.945				

Note: For description of HS codes see Table A.7.

Table C.3. Propensity of economies to export counterfeit products to the EU

GTRIC-e based on DG TAXUD data

Economy	2011	2012	2013	Economy	2011	2012	2013
Afghanistan	1.000	0.989	0.001	Czech Republic	0.001	0.004	0.046
Albania	0.010	0.047	0.061	Denmark		0.007	
Algeria	0.001		0.000	Djibouti		0.624	
Angola	0.000	0.001		Dominican Republic	0.025	0.284	0.015
Argentina	0.006	0.002	0.005	Ecuador	0.015	0.074	0.044
Armenia	0.025	0.216	0.295	Egypt	0.334	0.435	0.240
Australia	0.069	0.250	0.011	El Salvador			0.027
Azerbaijan		0.006	0.001	Estonia	0.066		
Bahrain	0.209	0.125	0.001	Ethiopia			0.005
Bangladesh	0.139	0.237	0.219	Faroe Islands		0.002	
Belarus	0.001	0.048	0.008	Fiji		0.353	0.667
Belgium	0.007	0.001	0.004	Finland		0.375	
Bolivia	0.015	0.000		France	0.000	0.009	0.000
Bosnia and Herzegovina	0.004	0.003	0.616	Gambia		0.305	
Brazil	0.003	0.005	0.000	Georgia	0.001	0.015	
Bulgaria	0.477	0.216	0.221	Germany	0.102	0.002	0.002
Cambodia	0.013	0.038	0.009	Ghana	0.046	0.027	0.347
Cameroon	0.001	0.135	0.013	Greece	0.980	0.768	0.894
Canada	0.002	0.002	0.002	Guatemala		0.024	
Cabo Verde	0.772	0.123		Guinea	0.088	0.347	
Chad			0.006	Guinea-Bissau	0.266		
Chile	0.017	0.006	0.004	Haiti	0.326		
China (People's Republic of)	0.994	0.996	0.947	Honduras	0.000	0.007	0.032
Christmas Island		1.000		Hong Kong, China	1.000	1.000	1.000
Colombia	0.001	0.003	0.001	Hungary	0.000	0.002	0.008
Congo	0.000	0.027		India	0.658	0.438	0.416
Democratic Republic of the Congo	0.083			Indonesia	0.126	0.124	0.120
Costa Rica		0.000	0.013	Iran, Islamic Rep.	0.021	0.099	0.267
Cote d'Ivoire	0.005	0.003		Iraq	0.048	0.017	0.023
Croatia	0.003	0.007	0.000	Ireland	0.000	0.000	
Cuba	0.003	0.003		Israel	0.004	0.001	0.005
Cyprus*		0.001		Italy	0.006	0.005	0.032

Table C.3. Propensity of economies to export counterfeit products to the EU *(continued)*

Economy	2011	2012	2013	Economy	2011	2012	2013
Jamaica			0.550	Nigeria	0.005	0.004	0.006
Japan	0.001	0.003	0.001	Norway	0.000		0.000
Jordan	0.147	0.134	0.003	Oman	0.005		
Kazakhstan	0.000	0.001	0.001	Pakistan	0.868	0.566	0.475
Kenya	0.023	0.122	0.019	Panama	0.307	0.814	0.994
Korea	0.015	0.024	0.130	Paraguay			0.059
Democratic People's Republic of Korea	0.118	1.000	0.002	Peru	0.372	0.056	0.025
Kuwait	0.024	0.032	0.084	Philippines	0.284	0.118	0.153
Kyrgyzstan		0.012	0.053	Poland	0.000	0.106	0.019
Latvia	0.917	0.454	0.208	Portugal		0.001	0.001
Lebanon	0.888	0.692	0.909	Qatar	0.001	0.001	0.140
Libya	0.010	0.003	0.003	Romania	0.537	0.000	0.004
Lithuania	0.001	0.006	0.006	Russia	0.004	0.030	0.003
Luxembourg		0.000		Saudi Arabia	0.004	0.012	0.006
Macao (China)	0.254	0.181	0.031	Senegal	0.214	0.947	1.000
Former Yugoslav Republic of Macedonia	0.017	0.000		Serbia		0.002	
Malaysia	0.646	0.147	0.476	Seychelles	0.681	0.405	
Maldives		0.582		Sierra Leone	0.011		
Mali		0.122		Singapore	0.678	0.871	0.732
Malta	0.002	0.046		Slovak Republic	0.000	0.074	
Mauritius	0.185	0.623		Slovenia	0.006	0.062	0.268
Mexico	0.001	0.001	0.001	South Africa	0.000	0.002	0.012
Moldova	0.289	0.218	0.156	Spain	0.025	0.025	0.036
Mongolia	0.249	0.015	0.517	Sri Lanka	0.022	0.023	0.045
Montenegro	0.125	0.093		Suriname	0.926	0.890	0.723
Morocco	0.408	0.897	0.583	Sweden	0.005	0.002	0.002
Nepal		0.212	0.394	Switzerland	0.052	0.095	0.029
Netherlands	0.011	0.020	0.001	Syrian Arab Republic	0.620	0.977	1.000
New Caledonia	0.042			Tajikistan		0.185	
New Zealand	0.344	0.201	0.001	Tanzania	0.053		0.029

Nicaragua	0.008		Thailand	0.645	0.681	0.574

Table C.3. Propensity of economies to export counterfeit products to the EU *(continued)*

Economy	2011	2012	2013	Economy	2011	2012	2013
Togo	0.513	0.100	0.818	Uruguay	0.002	0.121	
Tokelau	1.000	0.080	0.999	Uzbekistan		0.002	0.002
Tunisia	0.778	0.587	0.400	Vanuatu		0.998	
Turkey	0.879	0.948	0.912	Venezuela	0.084	0.000	0.030
Ukraine	0.011	0.012	0.379	Vietnam	0.401	0.110	0.038
United Arab Emirates	0.979	0.994	0.852	Yemen			0.199
United Kingdom	0.004	0.000	0.004	Zambia	0.067		
United States	0.021	0.017	0.024				

Note: *For Cyprus see Notes.[23]

Table C.4. Propensity of industries to suffer from counterfeiting

GTRIC-p for the EU, based on DG TAXUD data

Harmonised System codes	2011	2012	2013	Harmonised System codes	2011	2012	2013
2		0.0003	0.0000	57	0.0020	0.0000	0.0455
3	0.0011	0.0004	0.0000	58	0.4502	0.4015	0.1648
4	0.0043	0.0001	0.0000	60	0.0060	0.0252	0.0072
7		0.0001	0.0001	61	0.8831	0.8538	0.9094
8	0.0013	0.0177	0.0066	62	0.4437	0.7712	0.3925
9	0.0014	0.0002	0.0337	63	0.4145	0.1369	0.5986
10	0.0147	0.0001		64	0.9844	0.9526	0.9380
12		0.0001	0.0000	65	0.7954	0.9561	0.9274
13			0.0014	66	0.3672	0.1019	0.4156
15		0.0000		69	0.0029	0.0002	0.0008
17	0.0111	0.0003	0.0003	70	0.0217	0.0204	0.0905
18	0.0025	0.0001	0.0000	71	0.5413	0.2747	0.6199
19	0.0085	0.0022	0.0006	73	0.1224	0.0158	0.0079
20	0.0000	0.0001		76	0.0042	0.0000	0.0000
21	0.0008	0.0001	0.0002	82	0.2308	0.4713	0.4354
22	0.0060	0.1182	0.0397	83	0.0156	0.0218	0.0972
24	0.9683	0.9589	0.8538	84	0.1039	0.2231	0.0584
27	0.0000	0.0006	0.0001	85	0.3695	0.3418	0.4734
30	0.2642	0.2357	0.1609	87	0.0322	0.0289	0.0961
32	0.0185		0.0000	88	0.0003	0.0037	
33	0.7958	0.9775	0.9824	90	0.4079	0.3483	0.5222
34	0.0027	0.0171	0.0599	91	1.0000	0.9999	0.9998
35	0.0200	0.0406	0.5201	92	0.0275	0.2486	0.5473
36	0.0080	0.0203	0.1274	93		0.0145	0.0049
37		0.0004		94	0.0011	0.0024	0.0017
38	0.0139	0.0202	0.1188	95	0.8277	0.8662	0.9373
39	0.1142	0.0970	0.0869	96	0.6463	0.8097	0.6987
40	0.0356	0.0002	0.0000				
42	0.9988	0.9994	0.9986				
44	0.0012	0.0045	0.0001				
48	0.0552	0.0610	0.2168				
49	0.4749	0.1011	0.0287				
54	0.0178	0.0012					

Note: For description of HS codes see Table A.7.

Table C.5. Adjustment factors for ISIC codes based on GTRIC-p (based on DG TAXUD data)

	GTRIC-p related factors		
ISIC	2011	2012	2013
1	0.0680	0.0354	0.0285
2	0.0360	0.0020	0.0000
5	0.0337	0.0100	0.0198
10	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000
14	0.0168	0.0100	0.0198
15	0.0022	0.0065	0.0192
16	0.0301	0.3470	0.0272
17	0.0558	0.0522	0.0580
18	0.0970	0.1295	0.1030
19	0.1128	0.1360	0.1160
20	0.0000	0.0002	0.0000
21	0.0017	0.0022	0.0069
22	0.0312	0.0081	0.0019
24	0.0684	0.0735	0.1001
25	0.0409	0.0505	0.0179
26	0.0127	0.0139	0.0219
27	0.0207	0.0105	0.0200
28	0.0148	0.0271	0.0193
29	0.0324	0.0275	0.0395
30	0.0159	0.0207	0.0185
31	0.0274	0.0331	0.0337
32	0.0115	0.0124	0.0151
33	0.0585	0.0693	0.0705
34	0.0042	0.0091	0.0049
35	0.0042	0.0092	0.0049
36	0.1199	0.1344	0.1604
40	0.0000	0.0000	0.0000
74	0.0148	0.0037	0.0009
92	0.0000	0.0000	0.0000
93	0.0000	0.0000	0.0000
99	0.0651	0.0540	0.0465

Note: For description of HS codes see Table A.7.

Table C.6. Estimated "production probabilities" for provenance economies to the EU with GTRIC-e > 0.5

2011			2012			2013		
China (People's Republic of)	0.854	--	China (People's Republic of)	0.874	--	China (People's Republic of)	0.868	--
Greece	0.069	0.473	Greece	0.055	0.439	Greece	0.067	0.509
Turkey	0.025	0.172	Turkey	0.028	0.220	Turkey	0.028	0.210
Singapore	0.012	0.085	Singapore	0.016	0.129	Singapore	0.014	0.108
Malaysia	0.011	0.078	Thailand	0.011	0.088	Thailand	0.010	0.074
Thailand	0.010	0.070	Lebanon	0.004	0.029	Lebanon	0.005	0.038
Lebanon	0.005	0.032	Morocco	0.003	0.025	Hong Kong (China)	0.002	0.019
Pakistan	0.005	0.031	Pakistan	0.003	0.024	Morocco	0.002	0.016
Romania	0.003	0.021	Hong Kong (China)	0.002	0.019	Syrian Arab Republic	0.002	0.014
Hong Kong (China)	0.002	0.016	Syrian Arab Republic	0.002	0.013	Serbia	0.001	0.009
Tunisia	0.002	0.011	Tunisia	0.001	0.010	Senegal	0.000	0.002
Syrian Arab Republic	0.001	0.007	Mauritius	0.000	0.002	Panama	0.000	0.001
Latvia	0.000	0.003	Panama	0.000	0.001			
Afghanistan	0.000	0.000	Afghanistan	0.000	0.000			
Suriname	0.000	0.000	Senegal	0.000	0.000			
			Suriname	0.000	0.000			
Cabo Verde			*Djibouti*			*Bosnia and Herzegovina*		
India			*Maldives*			*Christmas Island*		
Seychelles			*Democratic People's Republic of Korea*			*Fiji*		
Togo			*United Arab Emirates*			*Jamaica*		
Tokelau			*Vanuatu*			*Mongolia*		
United Arab Emirates						*Togo*		
						Tokelau		
						United Arab Emirates		

Note: Large values indicate a high probability for an economy to be a producer of counterfeit goods. Low values indicate a high probability for an economy to be a transit point for trade in counterfeit goods. The second column for each year presents the index, with China excluded from the sample. No data are currently available for economies in italics.

Table C.7. Industries by Harmonised System (HS) codes

HS code	Description
01	Live animals.
02	Meat and edible meat offal.
03	Fish and crustaceans, molluscs and other aquatic invertebrates.
04	Dairy produce; birds' eggs; natural honey; edible products of animal origin, not elsewhere specified or included.
05	Products of animal origin, not elsewhere specified or included.
06	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage.
07	Edible vegetables and certain roots and tubers.
08	Edible fruit and nuts; peel of citrus fruit or melons.
09	Coffee, tea, mate and spices.
10	Cereals.
11	Products of the milling industry; malt; starches; inulin; wheat gluten.
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruit; industrial or medicinal plants; straw and fodder.
13	Lac; gums, resins and other vegetable saps and extracts.
14	Vegetable plaiting materials; vegetable products not elsewhere specified or included.
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes.
16	Preparations of meat, of fish or of crustaceans, molluscs or other aquatic invertebrates.
17	Sugars and sugar confectionery.
18	Cocoa and cocoa preparations.
19	Preparations of cereals, flour, starch or milk; pastry cooks' products.
20	Preparations of vegetables, fruit, nuts or other parts of plants.
21	Miscellaneous edible preparations.
22	Beverages, spirits and vinegar.
23	Residues and waste from the food industries; prepared animal fodder.
24	Tobacco and manufactured tobacco substitutes.
25	Salt; sulphur; earths and stone; plastering materials, lime and cement.
26	Ores, slag and ash.
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes.
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes.
29	Organic chemicals.
30	Pharmaceutical products.
31	Fertilisers.
32	Tanning or dyeing extracts; tannins and their derivatives; dyes, pigments and other colouring matter; paints and varnishes; putty and other mastics; inks.
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations.

Table C.7. Industries by Harmonised System (HS) codes *(continued)*

HS code	Description
34	Soap, organic surface-active agents, washing preparations, lubricating preparations, artificial waxes, prepared waxes, polishing or scouring preparations, candles and similar articles, modelling pastes, "dental waxes" and dental preparations
35	Albuminoidal substances; modified starches; glues; enzymes.
36	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations.
37	Photographic or cinematographic goods.
38	Miscellaneous chemical products.
39	Plastics and articles thereof.
40	Rubber and articles thereof.
41	Raw hides and skins (other than furskins) and leather.
42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of animal gut (other than silk-worm gut).
43	Furskins and artificial fur; manufactures thereof.
44	Wood and articles of wood; wood charcoal.
45	Cork and articles of cork.
46	Manufactures of straw, of esparto or of other plaiting materials; basketware and wickerwork.
47	Pulp of wood or of other fibrous cellulosic material; recovered (waste and scrap) paper or paperboard.
48	Paper and paperboard; articles of paper pulp, of paper or of paperboard.
49	Printed books, newspapers, pictures and other products of the printing industry; manuscripts, typescripts and plans.
50	Silk.
51	Wool, fine or coarse animal hair; horsehair yarn and woven fabric.
52	Cotton.
53	Other vegetable textile fibres; paper yarn and woven fabrics of paper yarn.
54	Man-made filaments.
55	Man-made staple fibres.
56	Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof.
57	Carpets and other textile floor coverings.
58	Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery.
59	Impregnated, coated, covered or laminated textile fabrics; textile articles of a kind suitable for industrial use.
60	Knitted or crocheted fabrics.
61	Articles of apparel and clothing accessories, knitted or crocheted.
62	Articles of apparel and clothing accessories, not knitted or crocheted.
63	Other made up textile articles; sets; worn clothing and worn textile articles; rags.
64	Footwear, gaiters and the like; parts of such articles.
65	Headgear and parts thereof.
66	Umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops and parts thereof.

Table C.7. Industries by Harmonised System (HS) codes *(continued)*

HS code	Description
67	Prepared feathers and down and articles made of feathers or of down; artificial flowers; articles of human hair.
68	Articles of stone, plaster, cement, asbestos, mica or similar materials.
69	Ceramic products.
70	Glass and glassware.
71	Natural or cultured pearls, precious or semi-precious stones, precious metals, metals clad with precious metal and articles thereof; imitation, jewellery; coin.
72	Iron and steel.
73	Articles of iron or steel.
74	Copper and articles thereof.
75	Nickel and articles thereof.
76	Aluminium and articles thereof.
77	(Reserved for possible future use in the Harmonised System)
78	Lead and articles thereof.
79	Zinc and articles thereof.
80	Tin and articles thereof.
81	Other base metals; cermets; articles thereof.
82	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal.
83	Miscellaneous articles of base metal.
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof.
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television image and sound recorders and reproducers, and parts and accessories of such articles
86	Railway or tramway locomotives, rolling-stock and parts thereat railway or tramway track fixtures and fittings and parts thereof; mechanical (including electro-mechanical) traffic signalling equipment of all kinds.
87	Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof.
88	Aircraft, spacecraft, and parts thereof.
89	Ships, boats and floating structures.
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof.
91	Clocks and watches and parts thereof.
92	Musical instruments; parts and accessories of such articles.
93	Arms and ammunition; parts and accessories thereof.
94	Furniture; bedding, mattresses, mattress supports, cushions and similar stuffed furnishings; lamps and lighting fittings, not elsewhere specified or included; illuminated signs, illuminated nameplates and the like; prefabricated buildings.
95	Toys, games and sports requisites; parts and accessories thereof.
96	Miscellaneous manufactured articles.
97	Works of art, collectors' pieces and antiques.
98	(Reserved for special uses by Contracting Parties).

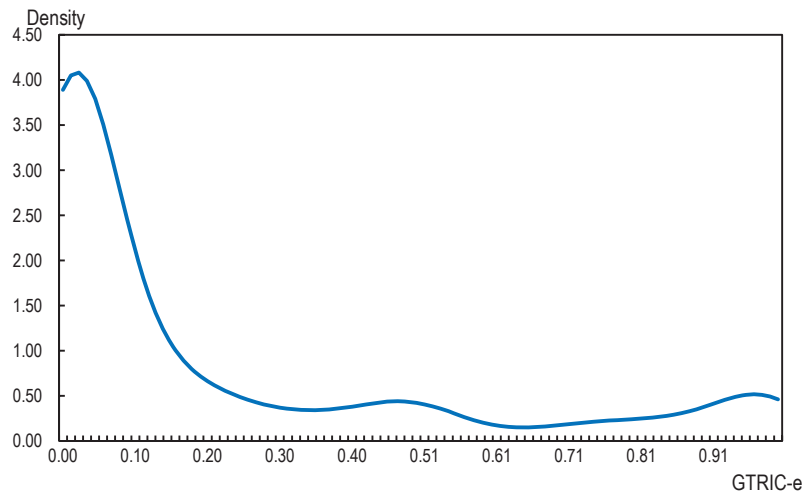
Annex D.

The quantitative relationship between GTRIC-e and GDP

The goal of this exercise is to shed light on the quantitative relationship between the propensity of an economy to be a provenance of counterfeit and pirated goods in international trade, and its level of income. For this purpose, the relationship between GTRIC-e, as a proxy for the propensity of provenance, and GDP per capita, as a measure of income level, is analysed using an econometric approach.

The nature of GTRIC-e does not allow this relationship to be tested with an ordinary least square regression for two main reasons: first, GTRIC-e is a truncated index that ranges from zero to one; second, whereas only few observations fall within the [0.8, 1] interval, a significant number are lower than 0.1. The peak of observations with low values is clearly seen on Figure A.5, which plots the distribution of GTRIC-e within the whole sample.

Figure D.1. Distribution of GTRIC-e



Statlink: http://dx.doi.org/10.1787/888933346048

The estimation strategy for non-negative restriction, right-censoring and the peak of low values is to consider GTRIC-e as a censored continuous variable within the [0, 1] interval, and use a two-limit Tobit model in order to estimate the relationship between GTRIC-e and GDP per capita[36]. The result of this specification is presented in column one of Table A.8 below.

This estimation clearly emphasises a significant relationship between GTRIC-e and the GDP per capita of a given economy. In addition, the relationship seems to follow an inverted U shape. This means that the highest values of GTRIC-e tend to be related to middle-income economies, while high-income and low-income economies tend to be associated with low or zero values.

Table D.1. Quantitative relationship between GTRIC-e and GDP

	Dependant variable: GTRIC-e		
	[1]	[2]	[3]
(log) GDP per capita	0.254*		
	(0.13)		
(log) GDP per capita square	-0.016*		
	(0.01)		
Share of manufacturing value added		-0.023***	-0.024***
		(0.01)	(0.01)
Share of manufacturing value added square		0.001***	0.001***
		(0.00)	(0.00)
Intellectual Property Protection Index			-0.057***
			(0.01)
_cons	-0.783	0.346***	0.551***
	(0.55)	(0.06)	(0.09)
N° of observation	398	343	308
R square	0.052	0.084	0.205

Note: *** indicates a significance level at 0.1%, ** a significance level at 1% and * a significance level at 5%. GDP per capita is measured in log values of GDP per capita in current USD for 2011

Source: Author's own calculations based on DG TAXUD, WCO and CBP-ICE data; World Bank (2014), World Development Indicators, available at http://data.worldbank.org/data-catalog/world-development-indicators (accessed 11 February 2016); World Economic Forum (2015), "The Global Competitiveness Report 2014-2015", http://reports.weforum.org/global-competitiveness-report-2014-2015 .

Low-income economies generally lack the capital and technological capacity to produce a wide range of products, which also limits their

capability to produce infringing goods. As economies develop and grow richer, so do their productive and technological capabilities, which affects the possibility for higher scale infringement activities. Institutional developments tend to lag behind economic development – including IP-related legislation and enforcement practices – which creates favourable conditions for infringement activities. As economies grow richer and become more knowledge-based, higher emphasis is placed on the role played by IP, and legislation and enforcement in these areas are tightened.

To test whether this hypothesis explains the inverted U-shape relationship between GTRIC-e and GDP per capita, the censored Tobit model is implemented using three alternative explanative variables. The first two are the share of the manufacturing value added in total GDP of a given economy and its square. If productive capabilities offer greater possibility for higher scale infringement activities, it could be expected that GTRIC-e increases with the size of the manufacturing sector. The third explanative variable is a perception-based indicator, provided by the World Economic Forum, which rates the quality of intellectual property protection, including anti-counterfeiting measures, within each economy.[37] This index ranges from 1 to 7, with 1 being very weak and 7 indicating very strong intellectual property protection. Therefore, if poor IP-related legislation and enforcement practices do create favourable conditions for infringement activities, it could be expected that GTRIC-e is a decreasing function of this intellectual property protection index.

Column two of Table A.8 displays the results of this econometric regression using the share of the manufacturing value added in total GDP and its square as the only explanative variables. Column three adds the intellectual property protection index to this specification.

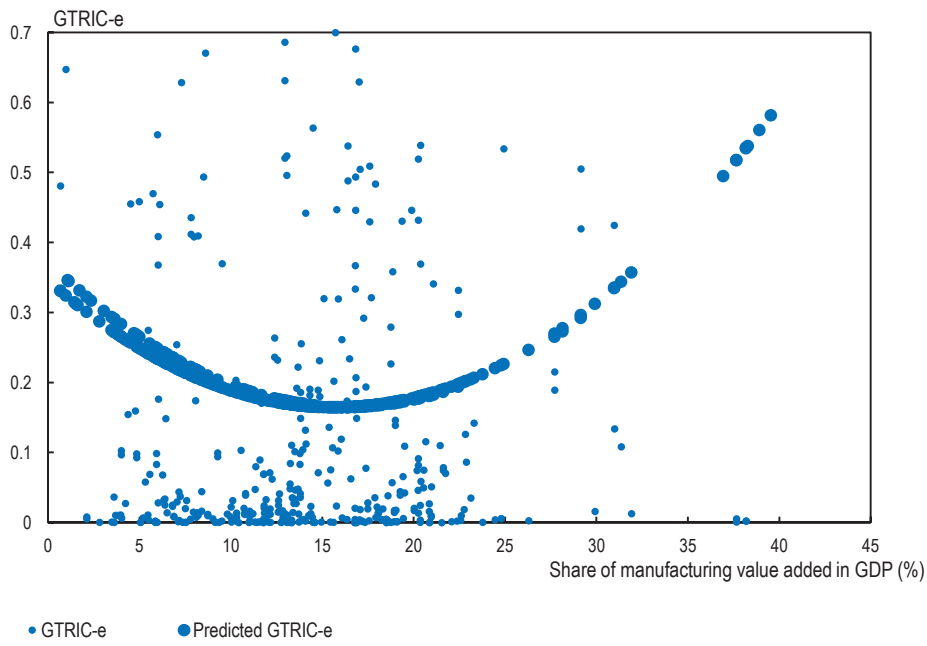
The relationship between the size of the manufacturing sector of a given economy and its propensity to export counterfeit products follows a U-shape relationship. This is illustrated by Figure A.6 below, which plots the predicted value of GTRIC-e for each economy, according to the size of the manufacturing sector in its total economic activity.

The poorest economies are invariably the least industrialised ones, and the most successful developing economies tend to exhibit the highest degree of industrialisation. However, the services sector is predominant in high-income economies, meaning that the manufacturing sector accounts for a smaller proportion of total economic activity, compared to upper-middle income economies. This backs up the findings above, according to which some scarcely industrialised economies, notably those associated with weak governance and a strong presence of organised criminal works, are important transit points for the trade in counterfeit goods. These economies

therefore exhibit high GTRIC-e values. Some of the most successful developing economies, notably those associated with a highly competitive manufacturing sector coupled with weak governance, tend to be provenance economies (producers) of counterfeit goods, and thus also exhibit high GTRIC-e values.

Column three of Table A.8 provides additional support to this statement. First, the incorporation of the intellectual property protection index significantly increases the overall quality of the econometric regression (higher R square values). Second, alongside the size of the manufacturing sector, poor quality of IP-related legislation and enforcement practices significantly increases the propensity of a given economy to export counterfeit and pirated products. The quality of legislation and law enforcement related to intellectual property, even/especially in the economy of provenance of counterfeit products, thus appears to be an important weapon for countering counterfeit and pirated trade.

Figure D.2. Quantitative relationship between GTRIC-e and the manufacturing sector



Statlink: http://dx.doi.org/10.1787/888933346056

Source: Author's own calculations based on DG TAXUD, WCO and CBP-ICE data; World Bank (2014), World Development Indicators, available at http://data.worldbank.org/data-catalog/world-development-indicators (accessed 11 February 2016).

Notes

1 Substandard, adulterated or mislabelled pharmaceutical products that do not violate a trademark, patent or design right are thus beyond the scope of the study, as are, for example, replacement automotive oil filters and head lamps that are made by firms other than the original equipment manufacturer (provided the replacement parts do not violate a patent, trademark or design right).

2 Article 18 TRIPS Agreement.

3 Article 33 TRIPS Agreement.

4 See Section 3 of this study for more discussion on data related to patent-infringing products.

5 The Hague System was introduced in 1925. It allows industrial designs to be protected in multiple jurisdictions with minimal formalities.

6 Article 26.3 TRIPS Agreement.

7 For example, France.

8 The Group of Seven (G7) is a group of seven major advanced economies consisting of: Canada, France, Germany, Italy, Japan, the United Kingdom and the United States.

9 A value chain can be defined as the "full range of activities that firms undertake to bring a product or a service from its conception to its end use by final consumers" (Gereffi and Fernandez-Stark, 2011).

10 The Harmonised System (HS) is an international commodity classification system, developed and maintained by the WCO.

11 Including: Albania; Algeria; Angola; Argentina; Australia; Bahrain; Benin; Bosnia and Herzegovina; Brazil; Bulgaria; Cameroon; Chile; Colombia; Costa Rica; Côte d'Ivoire; Croatia; Czech Republic; Democratic Republic the of Congo; Denmark; Djibouti; Dominican Republic; Ecuador; El Salvador; Estonia; Finland; Former Yugoslav Republic of Macedonia; France; French Guiana; Gabon; Georgia; Germany; Ghana; Guadeloupe; Guatemala; Guinea; Honduras; Hong Kong, China; Hungary; Iceland; India; Ireland; Israel; Italy; Japan; Jordan; Kenya; Democratic People's Republic of Korea; Kuwait; Latvia; Lebanon; Madagascar; Malta; Mauritius; Mexico; Montenegro; Morocco; Mozambique; Namibia; Netherlands; New Zealand; Nicaragua; Nigeria;

Norway; Panama; Paraguay; Peru; Poland; Portugal; Qatar; Réunion; Romania; Russia; Saudi Arabia; Senegal; Serbia; Slovak Republic; Slovenia; South Africa; Spain; Sudan; Sweden; Switzerland; Tanzania; Togo; Uganda; Ukraine; United Arab Emirates; United States; Uruguay; Venezuela; Yemen. For the analysis the DG TAXUD and CBP databases are used instead of the WCO data for the United States and for the EU countries

12 In total, there are 11 RILO offices in the WCO network around the world, covering all six WCO regions.

13 For instance "RILO Eastern and Central Europe" recommends keying in to the CEN database only seizures above 100 pieces or with values above 10 000 Euro.

14 All EU members, i.e.: Austria, Belgium, Bulgaria, Cyprus, Croatia (from 01 July 2013) Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, =Netherlands, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden and the United Kingdom.

15 The Combined Nomenclature (CN) is comprised of the Harmonized System (HS) nomenclature with further subdivisions.

16 Subject to data availability, more detailed, product-level checks can be done in the future for specific product- or economy-specific case studies.

17 See section three of Annex A for more details.

18 This information is available only for DG TAXUD and WCO datasets.

19 See chapter two for more discussion on primary and secondary markets.

20 Such definition of “provenance economies” is done only for the purpose of this study. It should not be confused with the definition introduced by the World Customs Organization that uses the term “provenance” for the last economy that the goods passed through. See, e.g., www.wcoomd.org/en/topics/origin/overview/challenges.aspx

21 The term provenance economy refers to: economies where actual production of infringing goods is taking place; and economies that function as ports of transit, through which infringing goods pass.

22 This analysis of conveyance methods is based on DG TAXUD and WCO datasets. The CBP dataset does not contain this type of information.

23 Note by Turkey:

The information in this document with reference to “Cyprus” relates to the southern part of the Island. There is no single authority representing

both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

Note by all the European Union Member States of the OECD and the European Union:

The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

24 For a detailed discussion see chapter four of OECD (2008).

25 Detailed rules for the community trade mark are contained in Council Regulation EC No 207/2009 of 26 February 2009 on the community trademarks. The industrial design protection throughout the European Union can be claimed under Council Regulation (EC) No 6/2002 of 12 December 2001 on Community designs. As of 23 March 2016, the community trade mark was renamed to EU Trade Mark (EUTM).

26 Available at: http://unstats.un.org/unsd/cr/registry/regot.asp?Lg=1.

27 For the purpose of tractability, the threshold was arbitrarily set to 0.1.

28 This study looked only at tangible products that infringe trademarks, designs, patents or copyrights; it does not investigate intangible infringements, such as online piracy, nor infringements of other intellectual property rights.

29 See https://hts.usitc.gov/.

30 This analysis is based on WCO and DG TAXUD data as the CBP-ICE data does not report the type of IP infringed.

31 Comparably small shares of copyright- and design-rights-infringing products can be explained by dominations of Internet piracy that is not captured for this study (for copyrights) and by relatively limited economic importance of design rights.

32 See Chapter XIV of the *International Merchandise Trade Statistics: Compilers Manual, Revision 1 (IMTS 2010-CM)*, available at http://unstats.un.org/unsd/trade/EG-IMTS.

33 Hald, A. (1952), Statistical Theory with Engineering Applications, New York: John Wiley and Sons.

34 This is different than the economy's share of total imports of sensitive goods used to calculate GTRIC-p.

35 According to the OECD (2008) methodology, these factors were applied to all provenance economies and all HS Modules in order to account for counterfeit and pirated exports of products and/or from provenance economies that were not identified. This assumption is relaxed in this study, given the overall good data quality.

36 As in other limited dependent variable models, the estimated coefficients do not have a direct interpretation.

37 This indicator is a perception-based indicator derived from responses to the WEF executive opinion survey. An average of 94 Chief Executive Officers or top-level managers were polled in each economy from a sample of companies, which includes domestic firms that sell in foreign markets, units of foreign firms that operate in the domestic market and enterprises with significant government ownership (where applicable). See: http://reports.weforum.org/global-competitiveness-report-2014-2015/.

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