OFFICE FOR HARMONIZATION
IN THE INTERNAL MARKET
(TRADE MARKS AND DESIGNS)

The Economic Cost of IPR Infringement in the Clothing, Footwear and Accessories Sector

Quantification of infringement in Manufacture of outerwear (NACE 14.13); Manufacture of underwear (NACE 14.14); Manufacture of other wearing apparel and accessories (NACE 14.19); and Manufacture of footwear (NACE 15.20)

06 | 2015

www.oami.europa.eu

The Economic Cost of IPR Infringement in the Clothing, Footwear and Accessories Sector

Project Team

Nathan Wajsman, Chief Economist
Carolina Arias Burgos, Economist
Christopher Davies, Economist

Acknowledgements

The authors would like to thank EURATEX (The European Apparel and Textile Organisation) and companies from the sector for input received during the preparation of this report. Members of the Economics & Statistics Working Group of the Observatory provided useful comments on the reports in this series and on the methodology used.

Contents

Executive Summary

The European Observatory on infringements of Intellectual Property Rights (the Observatory) was created to improve the understanding of the role of Intellectual Property and of the negative consequences of IPR infringements.

In a study carried out with the European Patent Office[1], the Office for Harmonization in the Internal Market (OHIM), acting through the Observatory, estimated that approximately 39% of total economic activity in the EU is generated by IPR-intensive industries, and around 26% of all employment in the EU is provided directly by these industries, with a further 9% of jobs in the EU arising from purchases of goods and services from other industries by IPR-intensive industries.

Perceptions and behaviours of European citizens regarding Intellectual Property and counterfeiting and piracy[2] were also assessed as part of an EU-wide survey. This survey revealed that although citizens recognise the value of IP in principle, they tend to justify their infringements as a consequence of individual circumstances as opposed to the recognition of the principle.

The Observatory has now embarked on an effort to complete the picture by assessing the economic impact of counterfeiting and piracy.

This exercise is challenging from a methodological perspective, since we are attempting to quantify a phenomenon that by its very nature is not directly observable. To pave the way towards quantification of the scope, scale and impact of IPR infringements in the European Union, as identified in its mandate, the Observatory has developed a step by step approach to evaluate the negative impact of counterfeiting and its consequences for legitimate businesses, governments and consumers, and ultimately society as a whole.

Several sectors whose products are known or thought to be subject of counterfeiting have been selected. This report presents the results of the second sectorial study, covering the clothing, footwear and accessories sector[3]. The products of this sector include all types of

1 - “Intellectual Property Rights intensive industries ; contribution to economic performance and employment in the European Union”, September 2013

2 - European citizens and intellectual property: perception, awareness and behaviour, November 2013

3 - The Clothing, Footwear and Accessories sector analysed here, comprises the four-digit NACE codes 1413, 1414, 1419, 1520, 4616, 4642, 4771 and 4772. Further details are provided in Appendix C. NACE is the official classification of economic activity used by Eurostat, the statistical office of the EU.

clothing (including sports clothing), shoes, accessories such as ties, scarves, belts, in short, products that most consumers purchase on a regular basis and that form a significant part of the economy of several EU Member States.

It is estimated that legitimate industry loses approximately €26.3 billion of revenue annually due to the presence of counterfeit clothing, footwear and accessories in the EU marketplace, corresponding to 9.7% of the sector's sales.

These lost sales translate into direct employment losses of approximately 363,000 jobs. This figure does not take account of the effect of imports, since in those cases the associated employment impacts occur outside of the EU. Estimated employment losses in the EU therefore relate to goods produced and consumed within the EU.

If we add the knock-on effects on other industries and on government revenue, when both direct and indirect effects are considered, counterfeiting in this sector causes approximately €43.3 billion of lost sales to the EU economy, which in turn leads to employment losses of 518,281 and a loss of €8.1 billion in government revenue.

Introduction

A major issue which has hampered the enforcement of Intellectual Property Rights (IPR) in the EU has been the effective quantitative scoping and scaling of IPR infringement. Numerous attempts to scale the impact of counterfeiting upon businesses, consumers and society have suffered from the absence of a consistent methodology for collecting and analysing data on counterfeiting and piracy across various sectors. Different approaches have been used, such as surveys, mystery shopping, monitoring of online activities, making it difficult to aggregate these different sources and structure of information for the whole economy. The nature of the phenomenon under investigation makes it extremely challenging to quantify reliably, as obtaining comprehensive data for a hidden, secretive and undeclared activity is by necessity difficult.

These challenges have consequently hindered the tasks of those involved in enforcing IP rights and in charge of establishing precise priorities, programmes and targets for enforcement, as they limit the possibilities to design more focused as well as evidence-based public awareness campaigns.

To help overcome these challenges while taking full account of methodological constraints, the Observatory developed a specific approach and piloted it in the cosmetics and personal care sector. Following the successful analysis of that sector, in the present report the Observatory focuses its attention on the clothing, footwear and accessory sector. The sector covers various products and services, including (further detail can be found in Appendix C):

- 1413 Manufacture of other outerwear
- 1414 Manufacture of underwear
- 1419 Manufacture of other wearing apparel and accessories
- 1520 Manufacture of footwear
- 4616 Agents involved in the sale of textiles, clothing, fur, footwear and leather goods
- 4642 Wholesale of clothing and footwear
- 4771 Retail sale of clothing in specialised stores
- 4772 Retail sale of footwear and leather goods in specialised stores

The approach in this study aims to estimate the scale of two major impacts of counterfeiting which cover the direct and indirect costs to industry and the wider costs to government and society.

1) Direct costs to industry

The costs to industry are mainly comprised of lost sales due to counterfeiting. Estimation of lost sales due to infringement is therefore a necessary first step, both because it bears a major economic consequence in itself and because it drives other consequences, for example loss of public fiscal revenue.

The methodology builds on an adaptation of an approach developed for the European Commission[4] so that it can be used on a sectorial level rather than on a firm level which proved very difficult to apply in practice.

Variation in a sector's sales are analysed using statistical techniques which allow the researcher to relate them to economic and social factors and thereby estimate the amount of sales lost by rights holders due to counterfeiting.

Loss of sales also leads to loss of employment in the affected sector, which can be derived from European statistical data on employment for the sector in question.

2) Indirect effects of counterfeiting

In addition to the direct loss of sales in the identified sector, there are also impacts on other sectors of the EU economy. These indirect effects are a result of the fact that the different sectors of the economy buy goods and services from each other for use in their production processes. If one sector's sales are reduced because of counterfeiting, then this sector will also buy fewer goods and services from its suppliers, causing sales declines and corresponding employment effects in other sectors.

3) Impacts on Public Finances

Since the activity in question is illegal, it is likely that those engaged in manufacture and distribution of counterfeit goods do not pay taxes on the resulting revenues and incomes. Therefore, an additional impact of counterfeiting are the resulting losses of tax revenue by government, specifically income taxes and social contributions, corporate taxes, and indirect taxes such as excise taxes or VAT.

In order to approximate these costs, several relationships are estimated. The methodology is fully explained in Appendices A and B and is briefly outlined below.

Step 1: Estimation of lost sales due to counterfeiting

Predicted sales of the sector are generated and compared with actual sales in each country, as reported in official statistics. The difference can then be explained by socio-economic factors such as the evolution in the per capita consumption expenditure on clothing and footwear, growth in gross disposable income and clothing and footwear prices. In addition, factors related to counterfeiting are considered, such as the behaviour of consumers[5], and the characteristics of the country's markets and its legal and regulatory environments[6]. The difference between forecast and actual sales is analysed in order to extract the effect of counterfeited consumption on legitimate sales.

4 - RAND (2012): Measuring IPR infringements in the internal market. Report prepared for the European Commission

5 - Results from the IP perception study published by OHIM in November 2013 are used, such as propensity of EU citizens to intentionally buy counterfeit goods.

6 - The Tolerance Index of Corruption from Eurobarometer is used in this study.

Step 2: Translation of lost sales into lost jobs and lost public revenue

Since the legitimate industry sells less than it would have sold in the absence of counterfeiting, it also employs fewer workers. As losses are incurred in manufacturing, wholesale and retail trade sectors, data from Eurostat on employment in these sectors is used to estimate the employment lost related to the reduction of legitimate business as a result of lost sales due to counterfeiting.

In addition to the direct loss of sales in the sector being analysed, there are also indirect impacts on other sectors as this sector will also buy fewer goods and services from its suppliers, causing sales declines and corresponding employment effects in other sectors.

Furthermore, the reduced economic activity in the private sector has an impact on government revenue as well, essentially tax revenue such as VAT, household income tax and tax on company profits, but also social security contributions.

It should be noted that the indirect effects of sales lost due to counterfeiting only include losses in sectors that provide inputs to manufacture and distribution of legal products in the EU. Possible positive effects of inputs provided for production or distribution of illicit goods that could be manufactured inside or outside the EU, are ignored in this study. In other words, the indirect effect calculated is a gross effect that does not take into account the long-term effect of sales displacement from legal to illegal producers, or the fact that some portion of sales of counterfeit products happens through the legitimate sales channels. The net employment effect could therefore be smaller than the gross effect calculated here.

Similarly, while illicit activities do not generate the same levels of tax revenue as legal activities, to the extent that distribution and sales of counterfeits happen in the legitimate sales channels, some amount of direct and indirect taxes are levied on these products, and so the net reduction in government revenue may be smaller than the gross effect calculated here.

Unfortunately, data currently available do not allow for calculation of these net effects with any degree of accuracy.

The next section presents the main findings of the study.

Impact of counterfeiting in the Clothing, Footwear and Accessories Sector

Our analysis begins by collating data on the consumption of these products in each of the constituent EU member countries. Based on official data on production, intra and extra EU trade and trade margins, total consumption of clothing, footwear and accessories for the EU 28 countries totalled €275 billion or €542 per capita in 2012.

The total EU consumption of €275 billion was comprised of €76.2 billion of production in the EU, €72.7 billion of imports, €26.4 billion of exports and €152 billion of wholesale and retail trade margins. Trade margins are dominated by the retail trade, which accounts for approximately 72% of this total, or €110 billion.

In the same year, there were around 3.8 million people employed in the clothing and footwear sector, with approximately 2.3 million employed in retail activities.

The activities of wholesale and retail trade of clothing and footwear are important across the EU, whilst a large proportion (approximately 50%) of manufacture is located in Italy. Of the 647 thousand enterprises in this sector, 64% are engaged in retailing.

Measured by employment, the size of companies involved in all activities related to the sector, including wholesale and retail trade, varies significantly across Member States, with on average 24 employees per business in the UK, 12 in Germany, and 4 in France, Italy and Spain. The average for all 28 EU Member States is 6 employees[7].

On average EU manufacturing companies employ 14 people, whilst this figure falls to 9 for companies in the manufacture of clothing, footwear and accessories sector.

The industrial structure of companies involved in the manufacturing of wearing apparel (NACE 141) and footwear (NACE 152) is dominated by small and medium size (SME) enterprises (less than 250 people employed), including many micro businesses (less than 10 people employed). Across the EU 28, 87% (100 thousand businesses, employing 200

7 - In this report, the expression “employee” is used to indicate all persons employed in the firm, including, for example, the proprietor.

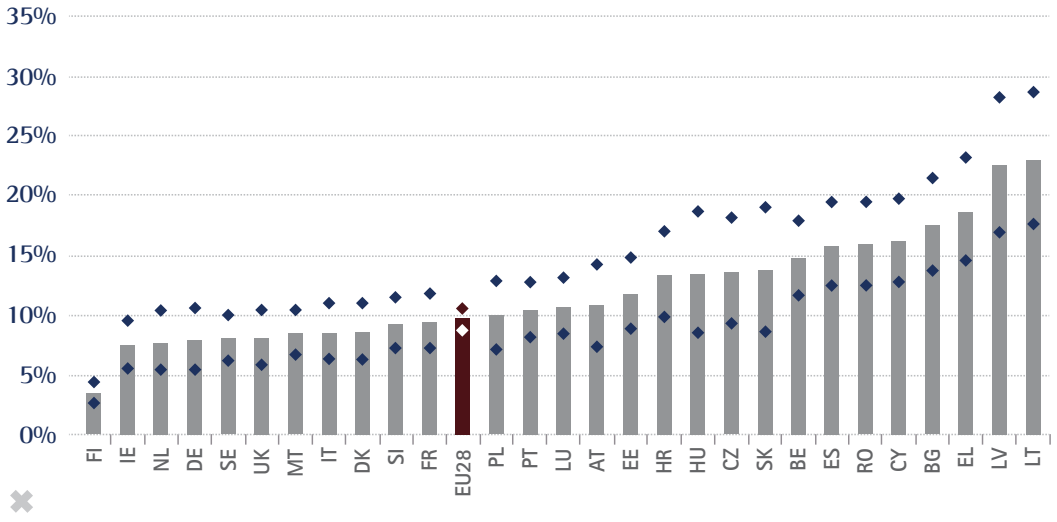
thousand workers) of all companies involved in the manufacture of apparel have fewer than 10 people employed, whilst the corresponding figure for the manufacture of footwear is 72% (15 thousand businesses, employing 42 thousand workers). Average employment amongst micro businesses stands at 2 workers, whilst for SMEs as a whole the figure stands at 6.3. These statistics underline the pre-dominance of small companies in the manufacture of clothing and footwear across the EU.

Based on these data, the difference between forecast sales and actual sales has been estimated for each country (Appendix A), and analysed using statistical methods (Appendix B), relating the sales shortfall to factors (called variables in economic parlance) such as:

- **the prices of clothing and footwear, the Euro exchange rate and the per capita growth of Gross Disposable Income** (socio-economic variables);
- **the percentage of the population reporting having bought counterfeit products in the past 12 months, and the country's position on the corruption perceptions index**[8] (variables related to counterfeiting).

The resulting estimates of lost sales due to counterfeiting for all Member States are shown in the figure below, while the underlying data are reproduced in Appendix E. This is the direct impact of counterfeiting discussed above.

For each country, the bar indicates the impact of counterfeiting on the sector, expressed as a percentage of sales, while the diamonds indicate the 95% confidence interval of that estimate. The 95% confidence interval is a statistical calculation designed to assess the precision of the estimate. It means that, based on certain statistical assumptions, there is a 95% probability that the true figure lies between the lower and upper bounds of that interval. For example, for the EU as a whole, the estimated percentage of lost sales is 9.7%, with a 95% probability that the true percentage lies between 8.8% and 10.5%, as shown in the table in Appendix E. The figures represent an average for the 6 years 2007-2012.



8 - According to WCO (2012), "the predominance of the informal economy is then associated with corruption and the degree of regulation..." So, to the extent that counterfeiting is part of the informal economy, a measure of corruption could be considered explanatory for counterfeiting.

For the EU as a whole, the estimated total counterfeiting effect amounts to 9.7% of consumption (€26.3 billion). This is a direct estimate of sales lost by legitimate industry in the EU each year due to counterfeiting in this sector, including losses in manufacture, wholesale and retail trade sectors.

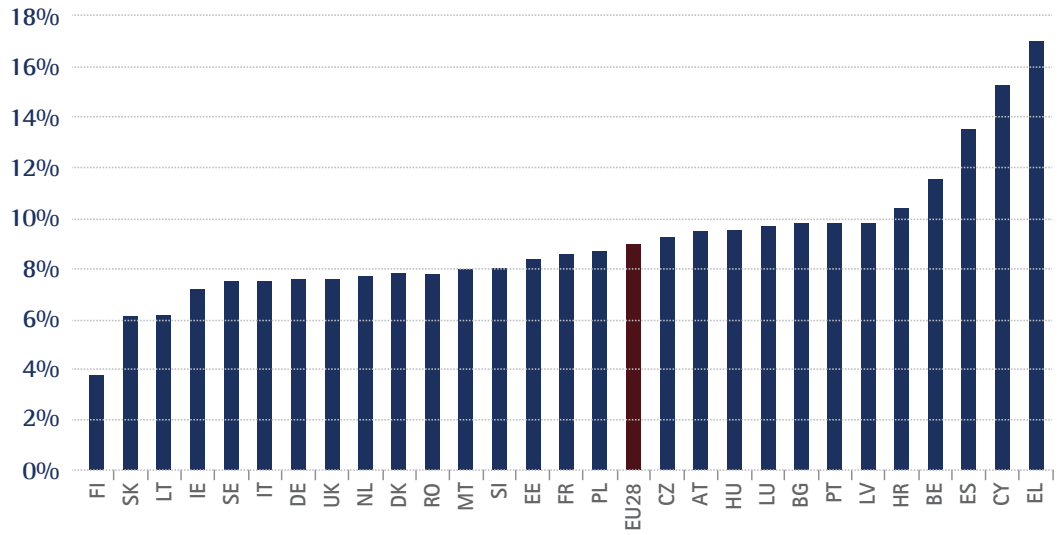
Since the legitimate industry sells less than it would have in the absence of counterfeiting, it also employs fewer workers. Eurostat employment data are used to estimate the employment lost as a result of counterfeiting. The total lost sales figure of €26.3 billion is not used to calculate employment impacts, since approximately €6.4 billion of this total is attributable to imports. Therefore, the figure used to estimate employment impacts within the EU is €19.9 billion, representing the difference between estimated total lost sales and imports.

In addition, employment to sales ratios are used to estimate the corresponding employment lost in the legitimate clothing and footwear sectors, resulting in a total of 362,625 jobs across the EU.

The distribution of lost employment by type of economic activity and the associated sales are detailed in the table below.

Lost due to counterfeiting	Sales (billion euros)	Employment (thousand persons)
Manufacture	5.0	89.5
Wholesale trade	4.4	45.5
Retail trade	10.6	227.6
Imported	6.4	-
Total sectors	26.3	362.6

Given the structure of the industry, a disproportionate loss of employment is estimated to occur in retail trade. As mentioned above, this calculation does not take account of possible infiltration of counterfeit goods into the legitimate sales channel, which would mean that the net employment loss in wholesale and retail trade would be smaller than the gross loss shown here. The employment losses as a proportion of total clothing and footwear employment in each country are shown below.



SUPPLY OF COUNTERFEIT SHOES IN ITALY

In 2012, the United Nations Interregional Crime and Justice Research Institute (UNICRI) published a report entitled Counterfeiting as an Activity Managed by Transnational Organised Crime. The following case study, described in the report, shows the industrial scale of production and distribution of counterfeit shoes.

A clear example comes from the "AB" case, in which a criminal organisation produced and sold shoes bearing counterfeit labels, obtaining its supplies from two different channels. Some of the goods and materials were imported directly from China, through a vast organisation and direct and indirect contacts with the Asian manufacturers who were mainly working in the Zhejiang region. At the same time, and in order to meet the considerable demand level, the group also used a network of collaborators working for various factories scattered around Campania. The factory owners received orders for the goods, and often the materials to be assembled (canvas, soles and uppers) in an ongoing cycle of production. To ensure that the counterfeit product looked similar to the original, the members of the gang would buy the genuine model from an authorised retailer, in order to copy the characteristics in detail before producing it in China or Italy.
The wire taps recorded during the investigations also revealed that production took place at various quality levels, and that the different quality directly influenced the prices of the products. The replicas were either approximate, or completely identical to the original, and this would influence the sale price.
Very often the products from the Far East were assembled in the same Chinese factories that worked for the legitimate brands during the day. At night, they would assemble the fake products. It is easy to see that in many cases the similarity between the genuine article and the fake can be impressive, as the counterfeiters have access to the same methods and materials that are used to make the original articles.

OHIM/Europol situation report on counterfeiting

In collaboration with Europol, in April 2015 OHIM published a situation report on counterfeiting in the European Union.

The report presents several case studies concerning clothing and shoes, considered one of the most commonly detained type of article at EU external borders, according to EU customs statistics.

Notably a joint operation carried out by the Spanish National Police and the Portuguese Food and Economic Safety Authority in 2013 demonstrated the highly organised nature of groups involved in the production and distribution of counterfeit goods and uncovered a criminal network comprised mainly of Moroccan nationals, specialised in the manufacture and distribution of counterfeit clothing and accessories and operating from the north of Portugal, where the majority of Portugal's textile industry is located. Counterfeit garments, shoes, accessories and an array of fake labels from reputed brands were produced by the group. The counterfeit goods were transported by private van from Portugal to Spain and then further distributed through delivery companies to other areas around Spain for sale in street markets, through a network of associates of African origin. Thousands of counterfeit items were seized during multiple raids; factories were dismantled; money, firearms, computer software for engraving logos, sewing machines, plastic bags with fake logos and false documents were also discovered. A financial investigation discovered that the criminal organisation involved had obtained more than EUR 5.5 million in revenue. Most of the money had been reinvested in their home country (Morocco) and further investigation also found that the organised crime groups had been using two mosques to launder money in the guise of donations.

This report also highlights the involvement of Chinese organised criminal organisations in the production and distribution of counterfeit textiles and in the provision of victims of human trafficking in textile workshops. A concentration of Chinese counterfeit businesses located in the provinces of Naples, Lombardy, Marche, and between the areas of Prato and Florence, have been identified, all areas associated with the textile and fashion industries. Parts of Madrid and its suburbs are also considered to have been infiltrated by Chinese criminal organisations.

Finally, the report also showcases the increasing use in recent years of social media such as Facebook to advertise counterfeit goods. Traders openly publish photo albums on their Facebook pages, containing images of available counterfeit merchandise, notably clothing and footwear. In most cases, the trader will post the items to consumers but some offer a collection and/or delivery service. Traders also hold 'open days' where they offer current and potential clients the opportunity to visit their home or trading location to browse and buy goods. Social networking allows consumers to recommend traders to friends and associates, resulting in some traders having in excess of 1,000 'friends' to whom they can sell items.

Indirect impact

In addition to the direct loss of sales in the clothing and footwear sector, there are also impacts on other sectors of the EU economy, as the sector suffering lost sales due to counterfeiting will also buy fewer goods and services from its suppliers such as the agriculture and chemical sectors, causing declines and corresponding employment effects in other sectors.

To assess this indirect impact, data from Eurostat[9] is used to illustrate how much the clothing and footwear sector buys in the EU from other sectors in order to produce what it delivers[10].

As final consumption of clothing and footwear, as estimated in this report, includes wholesale and retail trade margins and not only the value of production, and excludes the impact of imports, the final demand considered in the calculation of indirect effects will be €19.9 billion.

Using the Input-Output data, the estimated total direct and indirect output required to support the final demand of €19.9 billion totals €36.9billion. The total impact on sales in each sector is shown below (including the impact on sales of imported goods).

Total direct and indirect effects in the EU of lost sales due to counterfeiting as an annual average for the period 2007-2012 (million EUR)

Textiles, wearing apparel and leather	6,574
Imported goods	6,419
Wholesale trade	5,544
Retail trade	10,774
Real estate	1,356
Legal and accounting	1,019
Land transport	794
Financial services	793
Electricity, gas	778
Warehousing services	740
Construction	606
Security and investigation	567
Chemical industry	534
Other industries	6,791
TOTAL	43,288

9 - Input-Output Tables (IOT) published by Eurostat provide the structure of input requirements for the production of a certain level of final demand acknowledging whether the origin of these inputs are either domestic or imported.

10 - The input-output tables are provided by Eurostat at a 2, rather than a 4 digit NACE level. This means that for calculating the impact of the sales reduction in clothing and footwear NACE codes, it is necessary to use the structure of the textiles, wearing apparel and leather products industry (NACE 13-15) and wholesale (NACE 46) and retail trade (NACE 47) instead of detailed classes.

Thus, beyond the direct effects on the sectors involved in the production and distribution of clothing and footwear €26.3billion, a further €17 billion is lost in other sectors of the economy due to counterfeiting. This is the indirect effect of counterfeiting[11].

Turning to employment, if we add losses in the supplier sectors to the direct employment loss in the clothing and footwear sector, the total employment loss resulting from counterfeiting of clothing and footwear in the EU is estimated at 518,281.

Finally, the reduced economic activity in the legitimate private sector has an impact on government revenues as well[12]. If we accept this assumption, the lost taxes that sales of clothing and footwear valued at €26.3 billion would have generated can be calculated, as well as the tax revenues corresponding to the total (direct + indirect) loss of €43.3 billion calculated above.

The three main types of tax considered are[13]: Value Added Tax (VAT), taxes on household income, and taxes on the income or profits of companies.

1) **The lost VAT is estimated on the basis of household consumption of direct lost sales in clothing and footwear (€26.3 billion), accounting for €3.7 billion.**

2) **The lost household income tax, estimated on the basis of the share of wages generated by employment lost to total wages, considering direct and indirect effects on employment, amounts to €1.8 billion.**

3) **The lost tax on corporate profits is estimated from the share of direct and indirect costs in industry and amounts to €557 million.**

In addition, social security contributions linked to the direct and indirect employment losses are also estimated. Social security contributions data by industry are available in Eurostat, so that social security contributions per employee in each industry can be used to calculate lost contributions as a consequence of counterfeiting. These lost social security contributions amount to €2 billion.

> **The total loss of government revenue (household income taxes and social security contributions, corporate income taxes and VAT) can be roughly estimated at €8.1 billion.**

11 - As mentioned in Section 1, this calculation assumes that the counterfeit products are produced outside of the EU. If they are (partly) produced inside the EU, then the impact would be less than shown in the table since those illicit producers would presumably source some of their inputs from EU producers.

12 - According to WIPO (2010) and OECD (2008), most of the empirical work assumes that counterfeiting occurs in informal markets that usually do not generate tax revenues.

13 - National Accounts tax aggregates are published by Eurostat and provide information on total payments for these three taxes to all levels of government.

Economic losses due to counterfeiting: country-level results

The table below provides detail on both the direct and indirect impacts of counterfeiting for selected Member States.

	Direct effects				Total effects	
	Sales		Employment		Sales	Employment
	million €	%	persons	%	million €	persons
ITALY	4,548	8.5%	49,482	7.5%	8,968	80,951
SPAIN	4,127	15.8%	50,296	13.5%	*	*
UNITED KINGDOM	3,644	8.0%	40,152	7.6%	5,296	**
GERMANY	3,539	7.9%	40,281	7.6%	5,291	52,994
FRANCE	3,520	9.3%	25,763	8.6%	5,103	36,567
GREECE	953	18.7%	19,803	17.0%	1,323	24,375
PORTUGAL	452	10.4%	18,481	9.8%	992	25,659
ROMANIA	143	15.8%	20,638	7.8%	403	27,613
BULGARIA	56	17.5%	15,381	9.8%	186	20,400
EU28	26,343	9.7%	362,625	8.9%	43,288	518,281

*Harmonized input-output tables for Spain are not available in Eurostat.
**Detailed sectorial employment statistics are not available for the UK in Eurostat.

Lost sales and employment due to counterfeiting at country level are estimated based on the demand model and employment ratios as explained above. In addition, indirect impacts of lost sales are calculated at the EU level using Input-Output Tables and detailed employment data from Eurostat.

The country-level calculation of indirect effects could not be done for some Member States because harmonised statistics are not available with the required quality.

The nine Member States shown in the table include countries with high impact of counterfeiting in clothing, footwear and accessories. The indirect impact calculated reflects the effect in each country due to lost sales in the EU market. For example, the direct sales lost by Italian industry as a result of counterfeiting, are estimated by adding sales lost in Italy to sales lost in other EU countries, the latter of which is driven by the different rates of counterfeiting prevalent within each of the Member States.

In contrast, the indirect effects of the same sales losses are driven, as noted previously, by total demand minus the influence of imports, since the import employment effects are assumed to occur outside Italy.

Because domestic input-output tables are used for each country, the knock-on effects on lower input purchases from other EU Member States are not included here.

The indirect employment effects in Italy therefore are larger (relative to the direct effects) than those evidenced elsewhere in the EU, since approximately 70% of textile inputs to the clothing and footwear sector are sourced in Italy, whereas, for example, indirect employment effects in France are lower, as only 20% of textile inputs to the French sector are sourced in France.

Conclusions and Perspectives

As with the earlier pilot study on cosmetics and personal care products, OHIM has worked with Observatory stakeholders in producing these estimates, incorporating, where possible, industry perspectives and feedback on the methodology and the results produced.

The sector has a high profile in the EU, with many of the world´s top fashion houses located in Member States including France, Italy and the UK, whilst the major centres for production are in Italy, Germany, France and Spain. Our study reveals the threat that counterfeiting poses to the industry´s innovative output and the direct and indirect costs to the EU economy.

In the coming months, studies looking at other sectors which have a high profile in the EU and beyond, such as sporting goods; games and toys; jewellery; handbags and luggage, and others, will be published.

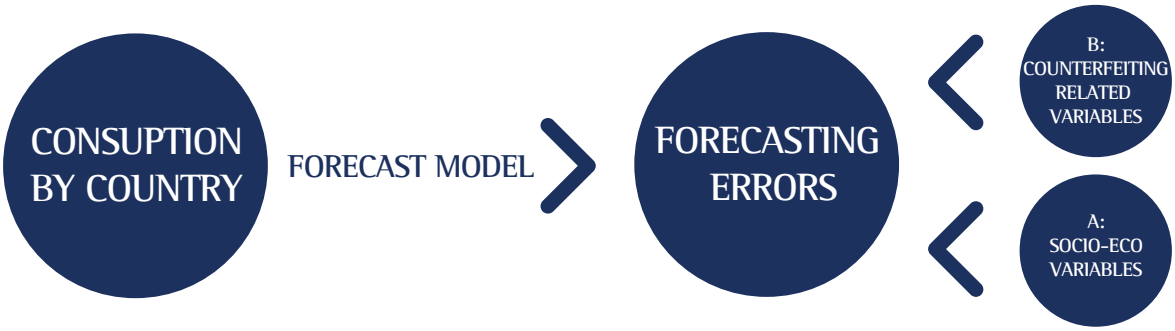
In parallel, the Observatory has embarked on a joint study with the Organization for Cooperation and Development (OECD) to estimate the value of counterfeit goods in international trade, and on studies of infringements in the music, film and e-book industries, in this case with the support of the Joint Research Centre of the European Commission.

Taken together, these studies complement each other and will provide a complete and objective picture of the impact of IPR infringements in Europe, in order to help policy makers develop effective enforcement policies.

Questions remain that could be investigated in future research, such as the degree to which counterfeit products have penetrated the various legitimate distribution channels. On one hand, such penetration would mean that the losses in the retail sector would be smaller than those estimated in the present study; but on the other hand, the impact on consumer welfare is arguably even greater, as there is a higher likelihood of the buyer being deceived when buying a seemingly genuine product from a legitimate sales outlet.

Appendix A: The first stage forecasting model

Employing the first stage of the two stage model as discussed earlier, we generate annual forecasts of consumption for each of the Member States. The process of producing the forecasts and estimating the impact of counterfeiting is presented in the diagram below.



The simplest available comparable forecasts, across all member states, are produced via the use of ARIMA modelling. These models only use the past values of consumption to produce a forecast of future consumption. The forecast error, between the ARIMA forecast and observed sales, represents an estimate of the expected lost sales, notwithstanding adjustments for the impact of socio-economic factors.

The forecasting error is the difference between predicted and actual consumption and for the purposes of comparability is expressed as a proportion of actual consumption. For instance,

$$q^*_{it} = \frac{\hat{Y}_{it} - Y_{it}}{Y_{it}}$$

where Y_{it} is the consumption of clothing and footwear in country i and year t (measured in Euros) and $\hat{Y}_{it}$ is the forecast of Y_{it} obtained from the univariate model using consumption expenditure information up to and including the period t-1.

The relative error q^*_{it} measures the extent to which the forecasting model has predicted a higher or lower value (as a share of actual consumption) versus the actual level of consumption observed from the Eurostat data.

Step-wise forecasting errors for the six years from 2007 to 2012 are constructed for 22 Member States for which sufficient data is available[14].

The forecasting errors are presented in the following table. It is evident that these errors exhibit a large degree of variability, swinging from sizeable negative errors in the initial periods to similar positive magnitudes between 2009 and 2012. Whilst it is clear that the absolute relative errors for the smaller countries tend to exceed those of larger countries, possibly as a result of data coverage issues and smaller statistical bases amongst smaller countries, some larger countries such as Poland, Spain and Italy exhibit similar variability.

14 - These 22 Member States account for 95% of total consumption of EU28. It is therefore reasonable to apply the resulting coefficients from the second stage (see below) to the six Member States for which data on the dependent variable was not available.

RELATIVE ERRORS (%)	2007	2008	2009	2010	2011	2012
AUSTRIA	-5.8	-2.4	0.2	-6.2	-8.5	9.1
BELGIUM	NA	0.2	-14.6	3.3	-4.8	-16.7
CYPRUS	-9.9	4.4	0.9	1.0	14	3.0
GERMANY	-1.2	3.4	-10.2	5.4	-14.3	11.1
DENMARK	-14.5	-1.8	3.6	-13.0	-2.6	-0.9
ESTONIA	8.4	24.1	27.7	-23.4	-10.2	26.2
GREECE	-2.4	-11.3	-1.4	5.4	54.0	98.8
SPAIN	0.5	9.8	29.5	-5.2	12.0	20.7
FINLAND	-0.4	2.9	6.9	-15.5	-11.5	13.2
FRANCE	-1.1	9.0	-4.5	-11.8	-13.3	-3.7
HUNGARY	3.7	-15.3	15.9	-18.3	-6.4	5.6
ITALY	-11.4	29.2	2.3	1.1	-9.7	3.3
LITHUANIA	-46.1	0.2	40.2	-16.4	-24.4	-14.6
LUXEMBOURG	-9.3	-10.2	NA	NA	-4.5	-4.2
LATVIA	-7.7	3.8	99.2	-42.9	12.8	-4.1
NETHERLANDS	-15.8	NA	NA	NA	NA	NA
POLAND	-46.1	-16.6	9.7	18.4	-10.6	11.0
PORTUGAL	14.6	-4.2	5.1	-7.0	-0.5	15.9
SWEDEN	1.3	-27.9	31.6	-10.4	-1.5	6.6
SLOVENIA	-32.2	-21.1	15.4	-12.5	-15.6	3.8
SLOVAKIA	-65.1	42.0	-45.4	-44.1	-24.2	11.5
UNITED KINGDOM	-1.3	12.2	7.4	7.4	-3.5	-8.7

The second part of the estimation process seeks to determine to what extent these forecast errors can be explained by economic and subsequently counterfeiting factors.

Appendix B: The second-stage econometric model

Counterfeiting might be one of a number of factors impacting on the level of legal sales of clothing and footwear, but there are, as outlined earlier, a series of other economic factors which can explain the differential, such as variables related to the economic capacity of households, or consumer demographics (e.g. population growth) or any other driver of consumption expenditure.

Having accounted for the influence of economic variables on the sales differential, we look to assess the extent to which counterfeiting variables, or relevant proxies, can explain the propensity to purchase fake clothing and footwear. These variables might include measures of consumer and market characteristics, as well as the evolution of a country's legal environment.

Combining the economic and counterfeiting variables allows us to specify a model, whose aim is to explain the aggregate differential (forecast errors) between expected and real sales. The model is specified in the following format.

$$q_{it}^{*} = \alpha * X_{it} + \beta * Z_{it} + \varepsilon_{it}$$

Where X_{it} is a matrix of explanatory economic variables unrelated to counterfeiting and Z_{it} a matrix of variables related to counterfeiting. Finally, ε_{it} is the remaining error.

Economic variables considered to have explanatory power, but not related to counterfeiting include:

1 - Per capita consumption of clothing, footwear and accessories;

2 - Gross Disposable Income (GDI) of the household sector: per capita income and growth;

3 - Prices: Harmonized Index of Consumer prices (ICP) for clothing and footwear;

4 - GDP per capita and GDP growth;

5 - Population growth;

6 - Exchange rate of Euro vs. other EU currencies.

Before commencing with estimation, it is clear that some of these variables will be correlated with each other. Such correlation is a possible sign of the existence of multicollinearity. If correlated explanatory variables are included in the model, the estimated coefficients for these variables could be mistakenly considered as insignificant (small t-statistics), although possessing a high overall significance for the model, as measured by the F-Test. This situation can pose problems when trying to interpret the meaning and significance of parameter estimates and when testing the significance of other variables in the model specification.

Consequently, when selecting variables, we aim to only include variables which are uncorrelated with one another. For instance, per capita consumption of clothing and footwear, per capita GDI of the household sector and per capita GDP are highly correlated.

We therefore include in the model only those variables with the greatest explanatory power in order to avoid the problems described.

The second term of the equation, Z_{it}, contains the matrix of variables relating to counterfeiting[15].

These variables include:

1 - Population at risk of poverty or social exclusion; share of total population and growth;

2 - Distribution of income by quartiles (including the share attributed to the lowest quartile and the ratio between the highest and lowest quartile);

3 - Gini coefficient (as a measure of income inequality);

4 - Variables selected from the Observatory's IP Perception study[16] and from the Eurobarometer (including counterfeiting and corruption related variables);

5 - Corruption Perceptions Index, (level and growth);

6 - Intellectual Property Right Index;

7 - Worldwide Governance Indicators (World Bank), covering Government effectiveness, regulatory quality, rule of law and control of corruption (level and growth);

8 - World Bank International Tourism Index;

9 - Sales of clothing in stalls and markets (from survey of trade enterprises);

10 - Internet purchases of clothes and sportswear (as a percentage of population and growth).

Variables 1 to 4 in the list are considered to be consumer related drivers of demand for counterfeiting. The Population at risk of poverty, the share and concentration of income of households in quartiles, along with the Gini coefficient are all variables that describe degrees of income inequality. As summarized in WIPO (2010), some studies find that a high degree of income inequality appears to cause a greater demand for fake goods. Only one of these variables was included in each model in order to avoid multicollinearity.

The variables considered for inclusion in the Z matrix from the IP Perception study and the Eurobarometer include; the percentage of the population that has bought counterfeit products intentionally or been misled into the purchase of counterfeit products and the percentage of the population that considered, in certain circumstances, it acceptable to buy counterfeit products.

15 - A list of factors affecting demand and consumption for counterfeit goods is available in OECD (2008)

16 - Available at: https://oami.europa.eu/ohimportal/en/web/observatory/ip_perception

Corruption variables considered for use in the Z matrix from the Eurobarometer survey include; the percentage of the population declaring that corruption is widespread, that it is in the business culture, that it is a major problem and the percentage of the population that believed corruption had increased over the last three years. The Tolerance Index to Corruption in the same survey measure the percentage of the population that declares that corruption is acceptable.

Variables 5 to 7 are considered to be drivers of counterfeiting related to institutional characteristics of each country.

The Corruption Perception Index is published by Transparency International and measures how corrupt public sectors are seen to be by the public in each country. In this study the updated index is used as a time invariant variable with reference year 2012.

The Intellectual Property (IP) Rights Index used is published by Property Rights Alliance and measures the strength of protection accorded to IP. The 2010 index is used in this study and the same value is used for each country across the six years studied as a time invariant variable.

The Worldwide Governance Indicators reflect the perception of government effectiveness, regulatory quality, rule of law and corruption. They are published annually and range from 2.5 for favourable aspects of governance to -2.5 for poor. These indicators are considered as potential proxies for the perceived risk of buying or selling counterfeit goods and is considered an explanatory variable in WIPO (2010). These indices have a high negative correlation with poverty indicators and with the variables from the IP Perception study and Eurobarometer.

Finally, variables 8 to 10 reflect country market characteristics that might be related to counterfeiting.

Having defined the model and acknowledged potential estimation issues (multicollinearity) we begin testing the specified model. Our first observation is that there is correlation between the residuals of the specified model and the variations in the sales differential, namely our dependent variable.

This relationship indicates that we might have a problem with heteroscedasticity, which implies that the variance of our estimated residuals is not stable (variance stability is a key assumption behind statistical validity of Ordinary Least Squares, OLS estimations).

There are different solutions to this issue (Tests and solutions are discussed in Appendix D below), although on this occasion we employ Weighted Least Squares (WLS) estimation to resolve the problem, since OLS estimators are not efficient in the presence of heteroscedasticity.

In order to operationalise WLS, a measure of residual variance is required. In this instance we use the standard errors of our initial ARIMA forecasts as a measure of variability. Applying these errors as weights and estimating the specified model produces the following results[17]:

17 - All results of diagnostic tests are available on request.

Variable	Coefficient	Standard Error	t Statistic	95% Confidence interval	
				Lower	Upper
Constant	-0.0059	0.0377	-0.1575	-0.0806	0.0687
Per capita GDI growth	-0.0198	0.0031	-6.4176 ***	-0.0259	-0.0137
Growth in clothing & footwear price index	-0.023	0.0082	-2.8209 ***	-0.0392	-0.0068
Euro exchange rate growth	-1.7642	0.7197	-2.4511**	-3.1901	-0.3382
IP Perception study: buy counterfeit intentionally	1.4654	0.5139	2.8514 ***	0.4472	2.4835
Tolerance Index to Corruption	0.1450	0.0936	1.5494	-0.0404	0.3305

R square = 54%
F statistic = 21.8 ***

* significant at 90% confidence level
** significant at 95% confidence level
*** significant at 99% confidence level

The combination of economic and counterfeiting variables explains approximately 54% of the variation in the differential between expected and actual sales as outlined in the first stage of the estimation process.

The three economic variables (per capita GDI growth, exchange rate, clothing and footwear prices) all have negative coefficients, meaning that higher values of those variables are associated with smaller forecasting errors.

The remaining two variables in the model relate to counterfeiting and cover the percentage of the population who have acknowledged/recognised that they have bought fake goods intentionally in the IP Perception study, and the Tolerance Index to Corruption estimated in the Eurobarometer for 2013.

Having optimised this second stage specification for multicolinearity and heteroscedasticity we estimate the impact of counterfeiting via the following relationship;

$$C_i^* = \widehat{\beta_1} * Z_{1_i} + \widehat{\beta_2} * Z_{2_i}$$

Interpretation of this specification is made on the following basis. For a country where 5% of the population declares having bought counterfeit products and 30% tolerate corruption, the effect of counterfeiting on legitimate sales of clothing and footwear sales is a decrease of 11.7% (1.4654*0.05 + 0.1450*0.3=0.1168).

Appendix C: Description of NACE Rev 2 classes

1413 Manufacture of other outerwear

This class includes:

- manufacture of other outerwear made of woven, knitted or crocheted fabric, non-wovens etc. for men, women and children: coats, suits, ensembles, jackets, trousers, skirts etc.

This class also includes:

- custom tailoring
- manufacture of parts of the products listed

1414 Manufacture of underwear

This class includes:

- manufacture of underwear and nightwear made of woven, knitted or crocheted fabric, lace etc. for men, women and children: shirts, T-shirts, underpants, briefs, pyjamas, nightdresses,
- dressing gowns, blouses, slips, brassieres, corsets etc.

1419 Manufacture of other wearing apparel and accessories

This class includes:

- manufacture of babies' garments, tracksuits, ski suits, swimwear etc.
- manufacture of hats and caps
- manufacture of other clothing accessories: gloves, belts, shawls, ties, cravats, hairnets etc.

This class also includes:

- manufacture of headgear of fur skins
- manufacture of footwear of textile material without applied soles
- manufacture of parts of the products listed

1520 Manufacture of footwear

This class includes:

- manufacture of footwear for all purposes, of any material, by any process, including moulding
- manufacture of leather parts of footwear: manufacture of uppers and parts of uppers, outer and inner soles, heels etc.
- manufacture of gaiters, leggings and similar articles

4616 Agents involved in the sale of textiles, clothing, fur, footwear and leather goods

4642 Wholesale of clothing and footwear

This class includes:

- wholesale of clothing, including sports clothes
- wholesale of clothing accessories such as gloves, ties and braces
- wholesale of footwear
- wholesale of fur articles
- wholesale of umbrellas

4771 Retail sale of clothing in specialised stores

This class includes:

- retail sale of articles of clothing
- retail sale of articles of fur
- retail sale of clothing accessories such as gloves, ties, braces etc.

4772 Retail sale of footwear and leather goods in specialised stores

This class includes:

- retail sale of footwear
- retail sale of leather goods
- retail sale of travel accessories of leather and leather substitutes

Appendix D: Diagnostic tests for checking regression model assumptions

Checking the stability of coefficients

As the main objective of the model is to estimate the coefficients of the counterfeiting variables, it is clear that the characteristics of these coefficients should be investigated.

To check the stability of these coefficients, other explanatory variables were introduced into the 2nd stage model. The resulting estimated coefficients of the counterfeiting-related variables are presented in the following table.

	IP Perception	Tolerance corruption
1	1.4654	0.1450
2	1.6699	-
3	-	0.2136
4	1.6767	0.0575*
5	1.3608	0.1098*
6	1.7466	0.1830
7	1.6265	0.1569
8	1.6028	-
9	-	0.1237*

It is clear that the IP perception variable coefficient is more stable than the Tolerance Corruption Index, whose coefficient is not statistically different from zero in 3 out of the 9 models estimated.

All in all, other statistical tests however support the decision of maintaining this variable in the model.

Heteroscedasticity

As noted in Appendix B, a number of tests and solutions to the issue of heteroscedasticity were investigated. Some of these considerations are discussed below.

Applying a White Test to the residuals of the first OLS regressions revealed that the hypothesis of homoscedasticity should be rejected at the 99% confidence level.

Heteroscedasticity can be corrected (at least partially) via the construction of a consistent estimator which can be obtained via the application of Weighted Least Squares (WLS) method. This approach requires assumptions about the pattern of residuals. A number of different alternatives were tested.

A two-step WLS estimation method (2SLS) was adopted using as weights the squared estimated residuals of the original OLS estimation. In panel data another alternative to addressing heteroscedasticity is to assume that each group (country) has a common variance. Then, the sample variance by country is estimated based on the residuals from the original OLS estimation and used in the second step of 2SLS.

Heteroscedasticity might also arise as a measurement error of the dependent variable when it is estimated in auxiliary analysis and some observations are more accurate than others.

In our 2nd stage model, the dependent variable is the forecasting error provided by the univariate ARIMA models. This is an example of an Estimated Dependent Variable (EDV) model. In the first stage of the estimation process, we not only have the estimated forecasting errors, but also a measure of their accuracy, namely the Standard Error (SE) of the forecast.

Employing a Goldfeld and Quandt test allows the testing for heteroscedasticity of residuals as explained by different variables. This test was carried out using the standard errors of the forecasting errors as the variable which influences the error variance. Again homoscedasticity is rejected with 99% of confidence level.

The Breusch and Pagan test also rejects homoscedasticity based on standard errors of forecasting errors at a similar confidence level.

Following Lewis and Linzer, a Feasible Generalized LS (FGLS) method was applied, considering that if the dependent variable were directly observed without error it would be homoscedastic.

It is clear that heteroscedasticity can be explained by the SE of forecasting errors estimated in the 1st stage of the estimation process with an ARIMA model. The preferred method for tackling this kind of heteroscedasticity is using the WLS method with the SE of forecasting errors as weights.

Multicollinearity

Variation Inflation Factor tests recorded outputs of 4.96 and 6.87 and tolerance statistics of 0.20 and 0.15, implying moderate influence of multicollinearity.

Normality

Jarque-Bera test confirms normality of residuals.

Appendix E: Results at a country level

Sales lost due to counterfeiting

	Lower 95%	Average	Upper 95%	Lost sales (million €)
AUSTRIA	7.4	10.7	14.1	632
BELGIUM	11.5	14.7	17.8	881
BULGARIA	13.6	17.5	21.3	56
CYPRUS	12.6	16.2	19.7	89
CZECH REP.	9.2	13.6	17.9	228
GERMANY	5.3	7.9	10.4	3,539
DENMARK	6.3	8.6	11.0	367
ESTONIA	8.7	11.7	14.7	32
GREECE	14.5	18.7	22.9	953
SPAIN	12.4	15.8	19.2	4,127
FINLAND	2.6	3.4	4.2	82
FRANCE	7.0	9.3	11.6	3,520
CROATIA	9.6	13.3	17.0	146
HUNGARY	8.4	13.5	18.5	167
IRELAND	5.4	7.5	9.5	221
ITALY	6.2	8.5	10.9	4,548
LITHUANIA	17.4	23.0	28.6	81
LUXEMBOURG	8.3	10.7	13.1	49
LATVIA	16.8	22.5	28.1	70
MALTA	6.6	8.4	10.3	13
NETHERLANDS	5.3	7.8	10.2	988
POLAND	7.2	10.0	12.9	550
PORTUGAL	8.2	10.4	12.7	452
ROMANIA	12.3	15.8	19.4	143
SWEDEN	6.1	8.0	9.9	627
SLOVENIA	7.1	9.2	11.3	54
SLOVAKIA	8.5	13.7	18.8	84
UNITED KINGDOM	5.8	8.0	10.2	3,644
EU28	8.8	9.7	10.5	26,343

References

OECD (2008) The economic impact of counterfeiting and piracy.
http://www.oecd-ilibrary.org/trade/the-economic-impact-of-counterfeiting-and-piracy_9789264045521-en

OHIM (2013) Intellectual Property Rights intensive industries: contribution to economic performance and employment in the European Union.
https://oami.europa.eu/ohimportal/en/web/observatory/ip-contribution

OHIM (2013) The European Citizens and intellectual property: perception, awareness and behaviour.
https://oami.europa.eu/ohimportal/en/web/observatory/ip_perception

OHIM (2015) The economic cost of IPR infringement in the cosmetics and personal care sector: report of a pilot study.
https://oami.europa.eu/ohimportal/en/web/observatory/quantification-of-ipr-infringement

RAND (2012) Measuring IPR infringements in the internal market. Development of a new approach to estimating the impact of infringement on sales.
http://ec.europa.eu/internal_market/iprenforcement/docs/ipr_infringment-report_en.pdf

UNICRI (2012) Counterfeiting as an Activity Managed by Transnational Organised Crime.
http://www.unicri.it/topics/counterfeiting/organized_crime/mapping/contraf_unicr2%281%29.pdf

WCO (2012) Informal Trade Practices. WCO Research Paper No. 22.
http://www.wcoomd.org/en/topics/research/activities-and-programmes/~/media/CE615C7CC64746688498F807A0F032A3.ashx

WEFA (1998) The Economic Impact of Trademark Counterfeiting and Infringement. Report prepared for the International Trademark Association.

WIPO (2010) The economic effects of counterfeiting and piracy: a literature review.
http://www.wipo.int/edocs/mdocs/enforcement/en/wipo_ace_6/wipo_ace_6_7.pdf

The Economic Cost of IPR Infringement in the Clothing, Footwear and Accessories Sector

The Economic Cost of IPR Infringement in the Clothing, Footwear and Accessories Sector

OFFICE FOR HARMONIZATION IN THE INTERNAL MARKET
(TRADE MARKS AND DESIGNS)

Avda Europa, 4
E03008 - Alicante, SPAIN
Tel. +34 965 139 100
information@oami.europa.eu

www.oami.europa.eu