THE ECONOMIC COST OF IPR INFRINGEMENT IN SPIRITS AND WINE

Quantification of infringement in distilling, rectifying and blending of spirits (NACE 11.01) and Manufacture of wine from grape (NACE 11.02)

July 2016

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ACKNOWLEDGEMENTS

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EXECUTIVE SUMMARY

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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 Intellectual Property Rights (IPR) infringements.

In a study carried out in collaboration with the European Patent Office[1], the European Union Intellectual Property Office (EUIPO)[2], acting through the Observatory, estimated that approximately 39% of total economic activity and 26% of all employment in the EU is directly generated by IPR-intensive industries, with a further 9% of jobs in the EU arising from purchases of goods and services from other industries by IPR-intensive industries.

Another study[3] compared economic performance of European companies that own IPRs with those that do not, finding that IPRs owners' revenue per employee is 28% higher on average than for non-owners, with a particularly strong effect for Small and Medium-Sized Enterprises (SMEs). Although only 9% of SMEs own registered IPRs, those that do have almost 32% more revenue per employee than those that do not.

Perceptions and behaviours of European citizens regarding Intellectual Property and counterfeiting and piracy[4] were also assessed as part of an EU-wide survey. This survey revealed that although citizens recognise the value of IP in principle, they also tend to justify infringements at individual level in certain cases.

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 point of view, as it attempts to shed light on 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 IPR intensive industries whose products are known or thought to be subject to counterfeiting have been selected. Previous studies have examined the following sectors: cosmetics & personal care; clothing, footwear and accessories; sports goods; toys & games; jewellery & watches; handbags & luggage; and recorded music.

1 - "Intellectual Property Rights intensive industries; contribution to economic performance and employment in the European Union", OHIM/EPO, September 2013.

2 - Until 23 March 2016, the name of the Office was Office for Harmonization in the Internal Market (OHIM). The name was changed to EUIPO as part of the trade mark reform legislation which came into force on that date.

3 - "Intellectual Property Rights and firm performance in Europe: an economic analysis", June 2015.

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

This report presents the results of the eighth sectorial study, covering the production of two products: spirits and wine[5]. The EPO/OHIM (2013) study revealed that both sectors are intensive in their use of trade marks and Geographical Indications and that designs are also used intensively in the spirits sector.

It is estimated that the legitimate industries loses approximately **€1.3 billion** of revenue annually due to the presence of counterfeit spirits and wine in the EU marketplace, corresponding to **3.3% of the sectors' sales.**

These lost sales translate into direct employment losses of approximately 4,800 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. Nor does it include losses suffered by EU producers as a result of counterfeiting in non-EU markets. Estimated employment losses in the EU therefore relate to goods produced and consumed within the EU.

If the knock-on effects on other industries and on government revenue are added, when both the direct and indirect effects are considered, counterfeiting in this sector causes approximately €3 billion of lost sales to the EU economy, which in turns leads to employment losses of about 23,400 jobs and a loss of €1.2 billion in government revenues, of which €739 million are excise duties.

It is important to note that, in contrast to the first two reports in this series[6], the impacts of counterfeiting for spirits and wine refers only to the manufacturing industries and so does not include wholesale and retail trade[7]. For that reason, the absolute numbers in this report cannot be directly compared to those previously presented for cosmetics and personal care and for clothing and footwear.

1. INTRODUCTION

A major problem which has hindered the effective enforcement of Intellectual Property Rights (IPR) in the EU is related to a lack of knowledge in relation to the precise scope, scale and impact of IPR infringements. Many attempts to quantify the scale of counterfeiting and its consequences for businesses, consumers and society as a whole have suffered from the absence of a consensual and 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 all the more difficult to aggregate results for the whole economy. The very nature of the phenomenon under investigation makes it extremely challenging to quantify reliably, as obtaining comprehensive data for a hidden and secretive activity is by necessity difficult.

These challenges have in turn 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 policies as well as evidence-based public awareness campaigns.

To help overcome these challenges while taking fully into account of methodological constraints, the Observatory developed a specific approach that has so far been applied to the Cosmetics and Personal Care; Clothing, Footwear and Accessories; Sports Goods; Games and Toys; Jewellery and Watches; Handbags and Luggage; and Recorded Music sectors.

In the present report the Observatory focuses its attention on two sectors officially labelled *Distilling, rectifying and blending of spirits and Manufacture of wine from grape* by Eurostat. The two sectors have been analysed separately and results will be presented for each one, but, due to the similarity of the products covered both are presented in a join report. The products included in each sector, as defined by Eurostat, are:

Distilling, rectifying and blending of spirits

- Manufacture of distilled, potable, alcoholic beverages: whisky, brandy, gin, liqueurs, etc. ;
- Manufacture of drinks mixed with distilled alcoholic beverages;
- Blending of distilled spirits.

Manufacture of wine from grape

- Manufacture of wine;
- Manufacture of sparkling wine;

- Manufacture of wine from concentrated grape must;
- Blending, purification and bottling of wine;
- Manufacture of low or non-alcoholic wine.

Both sectors exclude activities that consist of merely bottling and labelling.

This study aims to estimate the scale of the two major economic 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 composed of lost sales due to counterfeiting. Estimation of lost sales is therefore a necessary first step, both because it constitutes a major economic consequence in itself and because it drives other consequences, for example the loss of public fiscal revenue.

The methodology builds on an adaptation of a methodology developed for the European Commission[8] so that it can be used on a sectorial level rather than on a firm level which proved very difficult to apply in practice.

Variations 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 sectors, which can be derived from European statistical data on employment for the sectors in question.

2) INDIRECT EFFECTS OF COUNTERFEITING

In addition to the direct loss of sales in the identified sectors, 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.

8 - RAND (2012): Measuring IPR infringements in the internal market. Report prepared for the European Commission. RAND proposed to analyse ex-post the forecast errors on the level of individual companies, using company-specific explanatory variables. However, attempts at implementing the methodology in this manner were not successful, mainly due to the fact that most companies are not able or willing to provide the required data on past budgeted and actual sales revenues. Therefore, the methodology has been modified to allow its use on sector-level data which can be obtained from public sources.

3) IMPACTS ON PUBLIC FINANCES

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

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

Step 1: Estimation of lost sales due to counterfeiting

Predicted sales of relevant sectors are generated and compared with actual sales in each country, as reported in official statistics. The difference can then be partly explained by socio-economic factors such as GDP growth or per capita GDP. In addition, factors related to counterfeiting are considered, such as behaviour of consumers[9], and the characteristics of a country's markets and its legal and regulatory environments[10]. The difference between forecast and actual sales is analysed in order to extract the effect of counterfeit consumption on legitimate sales.

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. 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 sectors being analysed, there are also indirect impacts elsewhere in the economy, 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, essentially tax revenue such as VAT, household income tax and tax on company profits, but also social security contributions. The products analysed in this report are subject to excise duties in many of the EU countries, so that these lost revenues for governments can be significant and are therefore also calculated.

9 - Results from the IP Perception Study published by the EUIPO in November 2013 are used, such as propensity of EU citizens to buy counterfeit goods intentionally or as a result of being misled.

10 - Two of the Worldwide Governance Indicators from the World Bank are used for the sectors analysed in this report.

It should be noted that the indirect effect of sales lost due to counterfeiting only includes losses in sectors that provide inputs to the manufacture of legal products in the EU. Possible positive effects of inputs provided for production 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. The net employment effect could therefore be smaller than the gross effect calculated here[11].

Similarly, while illicit activities do not generate the same levels of tax revenue as legal activities, to the extent that sales of counterfeits happen in the legitimate sales channels, some direct and indirect taxes are paid, 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.

11 - On the other hand, this report only estimates the effect on sales of the spirits and wine sectors within the EU marketplace. So, to the extent that counterfeit products in non-EU markets displace exports of legitimate EU producers, there is a further employment loss in the EU which is not captured here.

2. IMPACT OF COUNTERFEITING IN THE SPIRITS AND WINE SECTORS

THE ECONOMIC COST OF IPR INFRINGEMENT IN SPIRITS AND WINE

The starting point of this analysis is the estimation of consumption of each product by Member State based on official data from Eurostat on production and intra- and extra-EU trade. Information on wholesale and retail trade of spirits and wine cannot be obtained from official (Eurostat) statistics, as the relevant NACE classes include wholesale and retail trade of all types of beverages, alcoholic as well as non-alcoholic. Therefore, estimation of consumption for the products analysed in this report is at producer prices and thus does not include the value of trade margins paid to distributors and retailers.

The Spirits sector in the EU

During the period 2008-2013, EU annual production of spirits amounted to €22 billion. The EU exports to third countries were worth €8 billion, and imports from third countries amounted to €1 billion, resulting in a positive trade balance of €7 billion, and leaving nearly €15 billion (at producer prices) for consumption of EU spirits in the internal market.

The United Kingdom is the largest producer of spirits, with production valued at more than €5 billion, followed by France with more than €4 billion. United Kingdom exports represent more than 40% of total EU exports of spirits. France is also a major exporter of spirits, accounting for nearly 30% of total extra-EU exports.

The industry engaged in distilling, rectifying and blending of spirits in the EU is comprised of 5,500 enterprises, most of which are SMEs, with an average of less than 10 workers per firm. The average size of firms in this sector differs between the two big producers: in France there are 860 enterprises with an average of about 10 persons employed, while in the United Kingdom there are 150 enterprises employing an average number of 66 workers. Across the EU, employment in this sector totalled approximately 54 thousand people in 2013.

The Wine sector in the EU

Production of wine in the EU in the period 2008-2013 totalled €27 billion as an annual average. EU exports to third countries amounted to €7 billion annually, with imports of €2.5 billion, leading to net exports of more than €4 billion. Therefore, total consumption of EU wine at producer prices was approximately €23 billion.

The main EU producers of wine are France (€9 billion), Italy (€8 billion) and Spain (€6 billion). These three countries' production represents 80% of total EU production of wine in 2013. Exports of French wine outside the EU represent 45% of total EU exports of wine, and exports of Italian wine contribute a further 25% of extra-EU exports. Both countries have similar market shares in intra-EU trade.

The EU wine manufacturing industry contains 10,900 enterprises, of which 3,700 are located in Spain, 1,800 in Italy and less than 1,500 in France. The average employment per enterprise is about 11 in EU as a whole and ranges from 30 in France to 6.5 in Spain, with Italy at 9.3. In terms of total employment, the French wine industry employs more than 44 thousand workers, 36% of total EU employment in this sector; nearly 20% of total EU employment, or 24 thousand workers, are located in Spain and 14% of total employment is in Italy and totals 17 thousand workers. Overall, total employment in the EU in the wine manufacturing industry is more than 120 thousand workers.

CASE STUDY: OPERATION OPSON V

Opson V was a seizure operation focusing on fake and substandard food and drink, covering 57 countries and jointly coordinated by Interpol and Europol. Involving police, customs, national food regulatory bodies and partners from the private sector, checks were carried out at shops, markets, airports, seaports and industrial estates between November 2015 and February 2016.

Large quantities of fake food and drink were seized across the world. Within the EU, seizures related to alcoholic drinks included:

- In Greece, officers discovered three illicit factories producing counterfeit alcohol. Police seized equipment used in the manufacturing process including labels, caps, empty bottles in addition to more than 7,400 bottles of fake alcohol and counterfeit labels.

- In the UK, authorities recovered nearly 10,000 litres of fake or adulterated alcohol including wine, whisky and vodka.

Three illicit production sites of spirits have been discovered and raided by the police forces in Greece in the course of OPSON. In the warehouses, police found and seized all the equipment used to manufacture the fake bottles.

Source:
https://www.europol.europa.eu/content/largest-ever-seizures-fake-food-and-drink-interpol-europol-operation
http://www.interpol.int/News-and-media/News/2015/N2015-013

Direct impact

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

- **GDP growth** and **the exchange rate of the Euro vs other currencies** (socio-economic variables);

- **The percentage of the population reporting having bought counterfeit products intentionally or as a result of being misled** as reflected in the IP Perception study and the **World Bank Indexes of Government Effectiveness**[12] **and Rule of Law**[13] (variables related to counterfeiting).

The resulting estimates of the lost sales due to counterfeiting in the spirits and wine sectors, for all Member States, are shown in the two figures below. This is the **direct impact** of counterfeiting discussed above, although as noted, for these two sectors, due to limited available information, only the impacts on the manufacturing industry are included, as opposed to wider considerations incorporating the wholesale and retail trade sectors.

For each country, the bars indicate the impact of counterfeiting on each of the two sectors, expressed as a percentage of sales revenue at producer prices, while the diamonds indicate the 95% confidence interval of that estimate[14]. The figures represent an annual average for the six years 2008-2013.

12 - The World Bank Index of Government Effectiveness captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.

13 - The World Bank Index of Rule of Law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of crime and violence.

14 - The 95% confidence interval is a statistical calculation which means that 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 in the spirits sector is 4.4%, with a 95% probability that the true percentage lies between 3.7% and 5.1%. In the same way, the estimated lost sales due to counterfeiting in the wine sector is 2.3%, with a 95% probability that the true percentage lies between 2% and 2.6%.

SPIRITS LOST SALES (%)
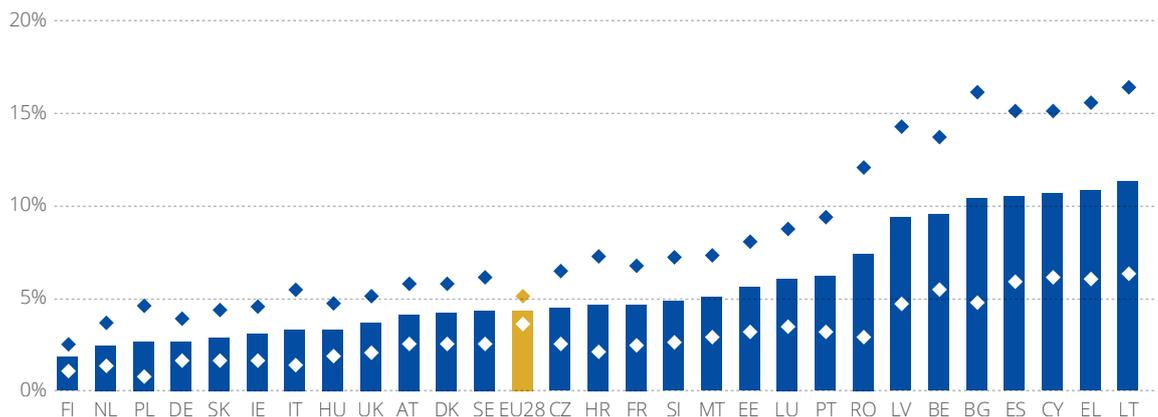
WINE LOST SALES (%)
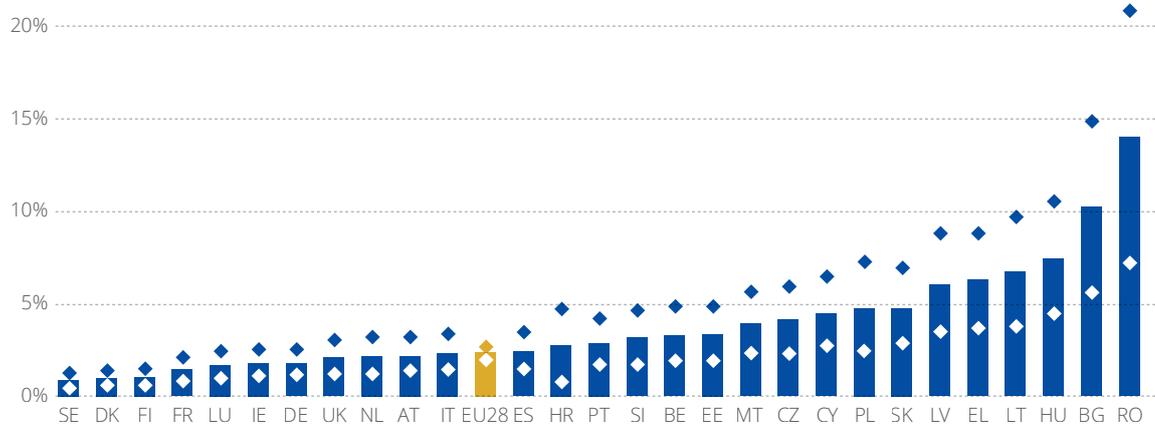
For the EU as a whole[15], the estimated total counterfeiting effect amounts to 4.4% of consumption of spirits (€740 million) and 2.3% of consumption of wine (€530 million). Considering both products, total lost sales represent 3.3% of consumption in the EU and amount to €1.3 billion. This is a direct estimate of sales lost by legitimate spirits and wine producers in the EU each year due to counterfeiting.

Country-level estimates of lost sales, expressed both as a percentage of total sales and in € million, are shown in the table below, for each sector separately and for both sectors combined.

	Spirits		Wine		Total	
	Relative effect (% of sales)	Lost sales (million €)	Relative effect (% of sales)	Lost sales (million €)	Relative effect (% of sales)	Lost sales (million €)
AUSTRIA	4.1	8	2.1	5	3.0	13
BELGIUM	9.5	27	3.2	26	4.9	53
BULGARIA	10.3	17	10.1	11	10.7	29
CYPRUS	10.6	15	4.4	2	8.8	18
CZECH REP.	4.5	14	4.0	11	4.3	26
GERMANY	2.7	81	1.7	60	2.2	140
DENMARK	4.2	6	0.9	3	1.8	9
ESTONIA	5.6	4	3.3	1	4.9	5
GREECE	10.7	26	6.2	21	8.1	46
SPAIN	10.4	173	2.3	90	4.8	263
FINLAND	1.6	4	1.0	2	1.4	6
FRANCE	4.7	100	1.4	36	2.9	136
CROATIA	4.6	4	2.6	4	3.4	7
HUNGARY	3.3	9	7.4	21	5.4	30
IRELAND	3.0	12	1.7	4	2.3	15
ITALY	3.3	78	2.3	83	2.7	162
LITHUANIA	11.3	11	6.6	NA	NA	NA
LUXEMBOURG	6.1	1	1.6	1	2.4	2
LATVIA	9.4	20	6.0	0	9.0	20
MALTA	5.1	1	3.9	1	4.2	1
NETHERLANDS	2.5	8	2.1	17	2.2	25
POLAND	2.6	59	4.7	10	2.8	69
PORTUGAL	6.2	8	2.8	19	3.3	27
ROMANIA	7.4	19	13.9	32	11.3	51
SWEDEN	4.3	7	0.8	4	1.7	11
SLOVENIA	4.8	1	3.1	1	3.5	2
SLOVAKIA	3.0	3	4.7	6	4.0	9
UNITED KINGDOM	3.6	25	2.0	62	2.3	87
EU28	4.4	739	2.3	531	3.3	1,260

The biggest absolute impact of counterfeiting (€263 million) is observed in Spain. The relative effect of lost sales due to counterfeiting in spirits is significantly higher than the EU average (10.4%), while lost wine sales are at the EU average. Italy and Germany present relative lost sales below the EU average in both sectors but are second and third in absolute combined effect, at €162 million and €140 million, respectively. The French spirits sector suffers significant losses, at €100 million, second only to Spain. In the wine sector, France has lower relative effect with a 1.4% lost sales ratio. Considering both sectors jointly, France is fourth in the EU, with combined lost sales valued at €136 million. Finally, in the United Kingdom, relative effects of counterfeiting in lost sales are below the EU average in both sectors and total lost sales are €87 million.

Since the legitimate industry sells less than it would have sold in the absence of counterfeiting, it also employs fewer workers[16]. Data from Eurostat on sectorial employment-to-sales ratios are used to estimate the corresponding employment lost in the legitimate spirits and wine sectors due to counterfeiting, resulting in a total of 4,815 lost jobs across the EU.

16 - The total lost sales figure of €1.3 billion is not used to calculate employment impacts, since €118 million of this total is attributable to imports. Therefore, the figure used to estimate employment impacts within the EU is €1.2 billion, representing the difference between estimated total lost sales and imports

Employment lost as a result of lost sales relates to countries where the products are manufactured, not where they are sold. The table below presents sales and employment lost by legitimate industries due to counterfeiting in the ten countries with the biggest effects. The table shows the losses in million EUR and number of jobs, both in absolute figures and as a percentage of sales and employment in legitimate industries, respectively.

	Sales		Employment	
	million €	%	persons	%
SPAIN	263	4.8%	969	3.5%
ITALY	162	2.7%	425	2.0%
GERMANY	140	2.2%	232	2.1%
FRANCE	136	2.9%	545	1.6%
UNITED KINGDOM	87	2.3%	191	1.7%
POLAND	69	2.8%	133	2.5%
ROMANIA	51	11.3%	694	10.1%
GREECE	46	8.1%	241	6.2%
HUNGARY	30	5.4%	298	4.6%
BULGARIA	29	10.7%	562	8.1%
EU28	1,260	3.3%	4,815	3.1%

Spain is by far the country suffering the highest employment losses, followed by Romania, Bulgaria and France.

Direct employment impacts are calculated at the country level by estimating lost sales by that country's sectors across the entire EU market. For example, the direct sales lost by the French wine industry as a result of counterfeiting are estimated by adding sales lost in France to sales of French wine lost in other EU countries. The latter total is calculated from the differing counterfeiting rates prevalent within each of the Member States.

Indirect impact

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

To assess this indirect impact, data from Eurostat[17] are used, showing how much the spirits and wine sectors buy from other sectors in the EU in order to produce what they deliver[18].

Final demand for spirit and wine, as estimated in this report, includes imported goods (about 9% of total consumption) and not only the value of EU production (even though on balance the EU is a net exporter of spirits and wine). Employment and indirect effects arising from these imports occur outside the EU and therefore are not included in the calculations. Consequently, of the total lost sales figure of €1.3 billion, only the value of domestic production (€1.2 billion) is used to calculate indirect impacts[19].

The total direct and indirect effect in the EU of lost sales due to counterfeiting, as an annual average for the period 2008-2013, amounts to €3 billion.

These total effects estimated are assigned to the following industries (in million EUR):

Food products and beverages	1,460
Products of agriculture	313
Wholesale trade	140
Imported goods	118
Electricity and gas	64
Land transport	62
Legal and accounting	57
Other industries	758
TOTAL	2,972

Thus, beyond the direct effects on the spirits and wine sectors (€1.3 billion in annual sales), an additional €1.7 billion are lost in other sectors of the economy due to counterfeiting. This is the *indirect* effect of counterfeiting[20].

17 - Input-Output Tables (IOT) published by Eurostat provide the structure of input requirements for the production of a certain final demand acknowledging whether the origin of these inputs is either domestic or imported. The IOT used in this report refer to year 2011 and are based in the new European System of Accounts (ESA) 2010 methodology.

18 - The input-output tables are provided by Eurostat at division level (2 digit NACE level) or aggregation of divisions instead of class level (4 digit level). This means that for calculating the impact of the sales reduction in 11.01 and 11.02 NACE classes, it is necessary to use the structure of 'Food products, beverages and tobacco products' as a whole (NACE 10-12).

19 - On the other hand, this report only estimates the effect on sales of spirits and wine within the EU marketplace. So, to the extent that counterfeit products in non-EU markets displace exports of legitimate EU manufacturers, there is a further employment loss in the EU which is not captured here.

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

Turning to employment, if losses in the supplier sectors are added to the direct employment loss in the spirits and wine sectors, the total employment loss resulting from counterfeiting is estimated at 23,300, reflecting the fact that the employment multiplier of the food industry is one of the biggest of the economy. The sectors suffering the biggest employment losses are agriculture (8,600 jobs) and food industry (6,100 jobs) but also wholesale trade with 1,200 lost jobs; retail trade, land transport and security and investigation services each suffer between 600-700 lost jobs, and legal and accounting and employment services with 500 lost jobs in each of the two industries.

Total effects (direct plus indirect) are calculated at country level based on ESA 2010 harmonized IOT published by Eurostat. The high effect on employment in Spain, France and Italy (44% of total losses in the EU among the three countries) reflects the importance of employment in wine and agriculture industries in those countries.

	Total effects	
	Sales million €	Employment persons
SPAIN	670	5,064
FRANCE	492	2,553
ITALY	476	2,740
GERMANY	233	1,378
UNITED KINGDOM*	207	2,658
POLAND	141	2,782
GREECE	64	886
EU28	2,972	23,295

* Based on ESA 1995 harmonized Input-Output Tables

Finally, the reduced economic activity in the legitimate private sector has an impact on government revenues[21] as well. If this assumption is accepted, the lost taxes that sales of spirits and wine valued at €1.3 billion would have generated can be calculated, as well as the tax revenues corresponding to the total (direct + indirect) loss of € 3 billion calculated above.

Four main types of taxes have been considered[22]: Value Added Tax (VAT), taxes on household income, taxes on the income or profits of companies and excise duties.

1) Lost VAT is estimated on the basis of household consumption of direct lost sales in the spirits and wine sectors (€1.3 billion)[23], amounting to €181 million.

2) Lost household income tax, estimated on the basis of the share of wages corresponding to lost employment in total wages, considering direct and indirect effects on employment, amounts to €89 million.

21 - 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.

22 - National Accounts tax aggregates are published by Eurostat and provide information on total payments for VAT and income taxes to all levels of government. For the calculation of lost excise duties, data published by Directorate-General Taxation and Customs Union (DG TAXUD) at country level have been used, allowing us to estimate with high confidence losses at country level.

23 - VAT generated by indirect effects is not estimated because inputs are intermediate uses that in general do not pay VAT.

3) The lost tax on corporate profits is estimated from the share of direct and indirect costs to industry and amounts to €35 million.

4) The lost excise duties are estimated based on revenues from taxes on consumption of alcoholic beverages, considering taxes on ethyl alcohol, still and sparkling wine, at country level. Ratios of lost sales of spirits and wine are applied to tax revenues separately for each of the two sectors, yielding a total of €739 million in lost excise duty revenue.

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 €133 million.

The total loss of government revenue (household income taxes and social security contributions, corporate income taxes, excise duties and VAT) can therefore be roughly estimated at €1.2 billion.

Excise duties on alcoholic beverages have been estimated separately for spirits and wine at country level. Revenues from wine taxes are only significant in a limited number of Member States, such as Belgium, Denmark, Finland, Ireland, the Netherlands, Sweden and United Kingdom. Lost revenues from excise duties due to counterfeiting of spirits and wine are shown in the table below for the countries with the biggest losses:

LOST REVENUES FROM EXCISE DUTIES (€ MILLION)

UNITED KINGDOM	197
FRANCE	100
SPAIN	90
GERMANY	65
POLAND	47
GREECE	33
SWEDEN	24
ITALY	18
EU28	739

3. CONCLUSIONS AND PERSPECTIVES

The studies aiming to quantify the scale and impact of IPR infringements in cosmetics and perfumes, clothing and footwear, sports goods, toys and games, jewellery and watches, handbags and luggage, recorded music and now spirits and wine have provided coherent estimates of the size of the problem of counterfeiting for legitimate businesses and society in terms of lost sales, leading to lost jobs and loss of public revenue. These studies have used a common methodology and demonstrated the benefits from working in cooperation with stakeholders to take advantage of their knowledge of market conditions, while relying on harmonised European statistical data for the analysis.

The eight sectorial studies published to date will be followed in the coming months by other similar studies covering additional sectors, applying the same methodology and combining it with knowledge from industry stakeholders. These sectors include medicines; computers; and other sectors, such as smartphones, depending on availability of data.

In parallel, the Observatory has carried out a joint study with the Organization for Economic Cooperation and Development (OECD) to estimate the value of counterfeit and pirated goods in international trade. That study, published in April 2016, estimated the value of international trade of counterfeit goods in 2013 at €338 billion (USD 461 billion) globally, corresponding to 2.5% of world trade. The corresponding figures for the EU were €85 billion (USD 116 billion), representing 5% of EU's imports from the rest of the world.

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.

APPENDIX A: THE FIRST STAGE FORECASTING MODEL

THE ECONOMIC COST OF IPR INFRINGEMENT IN SPIRITS AND WINE

The methodology used for the estimation of the economic effects of counterfeiting is depicted in the following figure and explained in detail in this Appendix and in Appendix B.
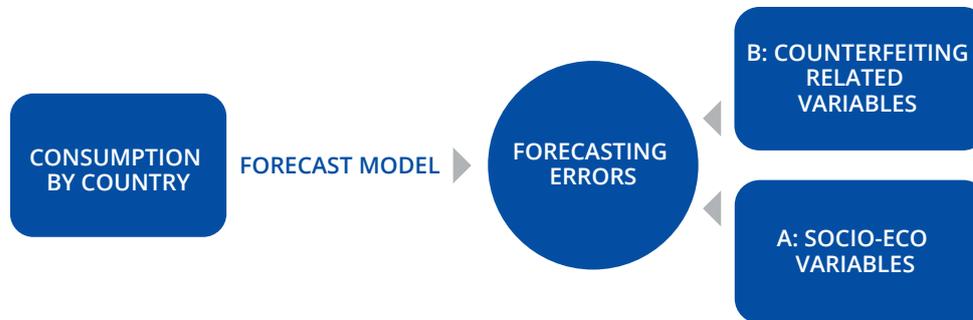
The first stage is comprised of a forecasting model of sales of products in each country. Assuming that a reasonably long time series of sales by country is available, a model is created that explains the trend of this time series and predicts the value of sales in subsequent years.

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[24].

The forecast error is the difference between predicted and actual consumption and for the purposes of comparability is expressed as a proportion of actual consumption, as expressed in the following equation:

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

where Y_{it} is consumption in country i and year t (measured in EUR) 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. Two series of relative forecasting errors q^*_{it} are estimated, one for spirits and one for wine consumption.

24 -For the spirits and wine sectors, a bivariate Vector Autoregressive (VAR) model that takes into account the possible interdependence between sales of both products was also considered in the first stage. Forecasting errors generated by VAR as well as univariate ARIMA models were analysed in the second stage but the econometric models considered more appropriate are based on ARIMA models. Results using the different forecasting models are available on request.

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 2008 to 2013 are constructed for Member States for which sufficient data is available, 19 for the spirits model and 24 for wine. It must be underlined that the one-period-ahead forecasting errors estimated with ARIMA models follow a white noise process that is stationary and thus uncorrelated in time with zero mean and constant and finite variance.

The forecast errors of both products are presented in the following table. It is evident that these errors exhibit a large degree of variability. However, the forecast errors are not interesting in themselves. The purpose of this study is not to produce a "good" forecast but rather to generate a set of relative errors which can then be quantitatively analysed to construct estimates of counterfeiting. Forecasts are produced using univariate models and using an automatic procedure, which ensures that they are comparable and "unpolluted" by a priori knowledge of factors influencing changes in demand.

	Spirits						Wine					
	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013
AT	-6,-0	-5,6	-0,3	-1,9	-12,0	-8,6	-7,8	-16,4	-2,5	-7,0	-2,5	15,1
BE	-4,9	30,7	-8,6				-2,6	11,0	-17,9	2,1	3,8	-2,0
BG							-3,4	19,5	0,5	-17,1	20,6	-23,2
CY							6,4	6,6	65,8	68,2	21,4	22,0
CZ												
DE	2,6	1,5	-1,9	7,5	-6,1	10,3	-29,0	-27,9	1,1	-3,5	-5,4	-3,5
DK							5,7	7,6	-10,5	-2,2	16,7	-2,0
EE	-24,3	14,3	-13,2	-31,1	-22,2	66,8	-7,8	36,3	-41,8	-14,3	-10,8	7,0
EL	23,1	-17,5	12,3	42,4	29,3	19,0	-21,2	15,6	-5,0	12,5	25,3	3,8
ES	19,8	55,4	0,6	0,8	-0,1	-1,3	-3,2	25,6	-1,3	-14,0	0,7	0,8
FI	0,6	14,3	-9,5	-9,1	0,9	-1,2	-0,6	12,3	2,2	0,2	-2,7	3,4
FR	21,0	-15,7	19,9	14,3	16,2	-4,7		-66,1	-26,6	-38,1	1,0	-45,6
HR							-3,8	-1,5	-12,2	-6,0	22,9	22,6
HU	19,0	30,1	-0,6	-21,2	17,1	-1,0	2,6	50,1	58,5	-25,6	18,2	-1,1
IE							37,2	-17,7	2,3	10,6	11,1	-7,5
IT	-4,9	1,4	-10,6	-12,4	9,6	0,9	-12,9	20,2	6,0	-30,0	-7,7	-2,1
LT	13,3	17,9	-32,8	-25,0	19,3	-23,8						
LU							-9,2	-6,4	-3,8	-2,3	0,7	-13,0
LV												
MT	0,8	6,6	-17,5	-39,1	1,0	-26,5						
NL	-3,1	-2,6	-5,5		-32,1	-13,5	2,6	3,0	-4,0	8,7	-1,4	-1,6
PL	-9,0	35,7	-15,9	-13,7	-0,4	-18,0	-25,5	25,0	-29,7	43,4	30,4	-13,7
PT	9,3	27,1	26,4	19,4	20,4	-10,9	-25,6	-3,9	-18,4	6,6	-14,4	-26,4
RO	-3,6	-5,0	-3,9		63,0		-6,5	65,9		-14,8	4,0	-6,8
SE							13,8	0,5	-0,8	1,8	1,0	0,2
SI	-22,1	18,2	-20,8	-16,4	-28,8	-21,3	4,8	-34,8	-1,5	-11,7	36,2	9,5
SK	-24,0	17,8	8,3	2,2	-13,6	-3,9	-42,8	13,0	-34,5	-8,0	-11,7	8,0
UK	-24,1	68,4	-48,2			26,4	9,4	26,4	-9,1	12,7	-2,5	6,2

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

APPENDIX B: THE SECOND STAGE ECONOMETRIC MODEL

Counterfeiting might be one of a number of factors impacting on the level of legal sales of spirits and wine, 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, an attempt is made to assess the extent to which counterfeiting variables, or relevant proxies, can explain the propensity to purchase fake spirits and wine. 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 for the specification of two independent models, for spirits and wine, whose aim is to explain the aggregate differential (forecast errors) between expected and real sales. Each 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 variables unrelated to counterfeiting and Z_{it} a matrix of variables related to counterfeiting. Finally, ε_{it} is the remaining error.

Socio-economic variables considered to have explanatory power, **unrelated to counterfeiting**, include:

1. Gross Disposable Income (GDI) of the household sector: per capita income and growth;
2. GDP per capita and GDP growth;
3. Exchange rate of Euro vs. other EU currencies;
4. Per capita consumption of each product;
5. Prices: Harmonized Index of Consumer Prices (ICP) for alcoholic drinks, growth rate;
6. Percentage of people consuming alcoholic drinks and behaviour of consumers as reflected in Eurobarometer on *'EU citizens' attitudes towards alcohol'*;
7. Population growth.

The second term of the equation, Z_{it}, contains the matrix of **variables thought to be related to counterfeiting**[25]. These variables include:

1. Population at risk of poverty or social exclusion, as a 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 quartiles);
3. Gini coefficient (a measure of income inequality);
4. Several variables selected from the Observatory's IP Perception study[26] and from Eurobarometer (including counterfeiting and corruption related variables);
5. Corruption Perceptions Index, CPI (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.

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 in quartiles of the household income distribution, along with the Gini coefficient, are all variables that describe degrees of income inequality.

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, buying counterfeit products to be acceptable.

Corruption variables considered for inclusion in the Z matrix from the Eurobarometer survey include[27]; 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. And from the Tolerance Index to Corruption, the measure covering the percentage of the population that declares that corruption in public administration or public service is acceptable was considered.

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

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

26 - Available at: https://euipo.europa.eu/ohimportal/en/web/observatory/ip_perception.

27 - In WCO (2012) it is stated that: 'The predominance of the informal 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.

The Corruption Perception Index (CPI) 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. These indices have a high negative correlation with poverty indicators and with the variables from the IP Perception study and Eurobarometer.

The rationale behind these variables is that in countries where the population exhibits a high degree of acceptance of counterfeit products and where governance and rule of law are perceived to be weak there is a higher likelihood of consumption of a product to be illicit than in countries with good governance, strong rule of law and low corruption.

Finally, the World Bank International Tourism Index reflects country market characteristics that might also be related to counterfeiting.

Altogether, 77 different explanatory variables were tested and different econometric techniques were applied in order to select two models (one for each product) with robust econometric results and a clear interpretation.

Some of the variables considered in the modelling process are clearly correlated with each other. High correlation coefficients between explanatory variables (referred to as multicollinearity) present a common problem in econometric analysis. 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.

For instance, per capita GDI of the household sector and per capita GDP are highly correlated.

Therefore only those variables with the greatest explanatory power are included in the model in order to avoid the problems described above.

Two methods have been applied considering random-effects models to the panel data[28]: Generalized Least Squares (GLS) and Between-effects methods with very similar results. The first method is preferred as it allows clustered robust standard errors (SE) estimation (by country) and it is a combination of 'between' and 'within' estimators.

Finally, residuals were analysed to check compliance with the usual assumptions of regression models[29].

MODEL RESULTS

The results of the final estimated model are shown in the tables below.

Spirits model:

Variable	Coefficient	Standard Error	t Statistic	95% Confidence interval	
				Lower	Upper
Constant	-0.0550	0.0319	-1.72 *	-0.1175	0.0075
GDP growth	-0.0165	0.0033	-4.96 ***	-0.0230	-0.0010
Euro exchange rate growth	1.2891	0.2759	4.67***	0.7484	1.8298
IP Perception: buy counterfeit intentionally	1.3479	0.7135	1.89 *	-0.0505	2.7462
WB Index: Government Effectiveness (growth)	-0.1413	0.0788	-1.79 *	-0.2959	0.0132

R-square between = 42.6%

Wald Chi-2 statistic = 43.5 ***

28 - Panel data are observations on individual cross-sectional units (countries) over a period of time. The random-effects models are preferred as they allow the inclusion of time-invariant explanatory variables.

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

Wine model:

Variable	Coefficient	Standard Error	t Statistic	95% Confidence interval	
				Lower	Upper
Constant	-0.0419	0.0330	-1.27	-0.1065	0.0226
GDP growth	-0.0125	0.0053	-2.37 **	-0.0228	-0.0022
Euro exchange rate growth	1.0711	0.3914	2.74***	0.3039	1.8383
IP Perception: buy counterfeit mislead	0.5438	0.2991	1.82 *	-0.0424	1.1299
WB Index: Rule of Law (growth)	-0.0625	0.0187	-3.35 ***	-0.0991	-0.0259

R-square between = 16.8%

Wald Chi-2 statistic = 78.8 ***

* significant at 90% confidence level

** significant at 95% confidence level

*** significant at 99% confidence level

The econometric model for spirits explains 43% of total variance of the stage 1 forecast errors and the wine model is quite similar but explains a lower percentage, only 17%. Both models use a combination of the same two economic variables and two counterfeiting-related variables. For each variable, the first column shows the estimated coefficient, the second column shows the standard error, while the third column indicates the statistical significance of the parameter estimates[30].

Both models include the same economic variables: **GDP growth** with negative coefficients, meaning that countries with a higher GDP growth are associated with smaller forecasting errors; and the **Euro exchange rate** with positive coefficients implying that as the euro appreciates, so does the capacity for counterfeiting outside the Euro zone.

The remaining two variables in both models relate to counterfeiting and include one variable from the IP Perception study and one of the Worldwide Governance Indicators from the World Bank. The variables from IP Perception study are the **percentage of the population declaring having bought counterfeits intentionally** as explanatory of forecast errors of spirits sales and purchase of counterfeits as **a result of being misled** as explanatory of errors of wine sales. These variables are time-invariant with positive coefficients, meaning that the percentage of population declaring having bought fakes is positively related to counterfeiting.

31 - If, for example, an estimated coefficient is significant at the 95% confidence level, then one can say that the probability that the true coefficient is zero and the estimated value was obtained solely by chance is 5%. The "t-statistic" shown in the third column is simply the estimated coefficient divided by its standard error. The last two columns show the 95% confidence interval for the coefficient; in other words, the true coefficient lies in the interval between the lower and upper bounds with a 95% probability.

Both models also include as an explanatory variable the growth rate of one of the World Bank indexes: the **Government Effectiveness Index** in the spirits model, that captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies; and the **Rule of Law Index** in the econometric model for wine that captures the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract employment, property rights, the police and the courts, as well as the likelihood of crime and violence. These variables have negative coefficients, so that a higher value of growth rates of each index corresponds to better governance and is related to smaller forecast errors.

As the main objective of the models is to estimate the coefficients of the counterfeiting-related variables, the characteristics of these coefficients should be investigated. Several models have been estimated, including bivariate econometric models such as Simultaneous Equation Models (SEM) and Seemingly Unrelated (SUR) models. These bivariate models consider both sectors jointly and consistently estimate positive and significant coefficients for the IP Perception variables, with the coefficients estimated for the equation of spirits the more stable of the two. The two World Bank indexes are not significant in the different bivariate specifications tested. Considering that bivariate models can only be estimated based on the 17 MS for which forecast errors for both products are available, the two univariate econometric models presented here are considered more appropriate.

Based on coefficients estimated for the counterfeiting-related variables presented above, the impact of counterfeiting is estimated independently for each product via the following relationship:

$$C^*_{it} = \widehat{\beta}_1 * Z_{1i} + \widehat{\beta}_2 * Z_{2it}$$

Where C^*_{it} represents the sales lost due to counterfeiting in country i in year t (expressed as the fraction of the sector's actual sales), Z_{1i} is the value of the IP Perception variables, and Z_{2it} is the value of the correspondent World Bank Index growth rate in that country and year[31]. The β's are the estimated coefficients from the two tables at the beginning of this section.

The counterfeiting effect is calculated for all 28 EU Member States, applying the coefficients estimated in the models above to the values of the explanatory variables.

31 - It should be noted that in this case, the value of Z1i is the same for all t since the variable is time-invariant during the period covered by this study.

Interpretation of this specification is made on the following basis (using the spirits model as an example): for a country where 10% of the population declares having bought counterfeit products internationally and the average growth rate of Government Effectiveness index in 2008-2013 is -1%, the effect of counterfeiting on legitimate sales of spirits is a sales decrease of 13.6% (1.3479*0.10 - 0.1413*(-0.01) = 0.1362).

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