

Intellectual property rights intensive industries: contribution to economic performance and employment in the **European Union**

Industry-Level Analysis Report, September 2013

A joint project between the European Patent Office and the
Office for Harmonization in the Internal Market





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

Intellectual property rights intensive industries: contribution to economic performance and employment in the European Union

Industry-Level Analysis Report, September 2013

A joint project between the European Patent Office and the
Office for Harmonization in the Internal Market

01 / Foreword

Innovation is one of the areas covered by the five key targets set in “Europe 2020”, the ten-year growth strategy adopted by the European Union with a view to creating a more competitive economy with higher employment. It has never been so important to foster the “virtuous circle” leading from Research and Development (R&D) investment to jobs – via innovation, competitive advantage and economic success – as in today’s world of increasingly globalised markets and the knowledge economy. This process depends on several different factors, but an efficient system of intellectual property rights (IPR) undoubtedly ranks among the most important, given IP’s capacity to encourage creativity and innovation, in all its various forms, throughout the economy.

Europe already has a long tradition in this area: European countries have played a major part in shaping a modern and balanced system of IP rights which not only guarantees innovators their due reward but also stimulates a competitive market. It is nevertheless vital to ensure that the system remains a useful instrument in implementing new innovation policies designed to achieve those goals. At the same time, there have been several calls from industry for indicators to measure the economic impact of IP rights. Moreover, in view of the question marks which, in public debate, have sometimes been raised over IP’s role in supporting innovation and creativity, it is essential that facts and figures be produced to ensure such debate is based on sound evidence.

That is why the Office for Harmonization in the Internal Market (OHIM), acting through the European Observatory on Infringements of Intellectual Property Rights, and the European Patent Office (EPO) decided to join forces and carry out this study in co-operation with the European Commission, in particular DG Internal Market and Services and Eurostat.

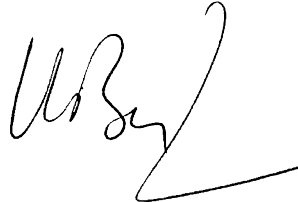
There have already been several studies on specific IP rights, industrial sectors or countries, but the OHIM-EPO study is the first to quantify the overall contribution made by IPR-intensive industries to the EU economy, in terms of output, employment, wages and trade, taking into account the major IP rights (patents, trade marks, designs, copyrights, geographical indications). Despite the conservative approach, reflected in the rigorous methodology applied, the main results are very impressive: IPR-intensive industries generate more than a quarter of employment and more than a third of economic activity in the EU.



We at the EPO and the OHIM hope this study will prove to be a useful source of information for all the target groups (e.g. policymakers, IP offices, business groups and academics). We intend to update the figures regularly to enable us to monitor future trends, and also hope to expand the study to cover other, non-EU European countries. Given the interesting insights to be gained from comparison, we would very much welcome similar studies on other regions of the world.



António Campinos
President, OHIM



Benoit Battistelli
President, EPO

Joint Project Team

OHIM

Nathan Wajzman, Chief Economist
Michał Kazimierczak, Economist
Carolina Arias Burgos, Economist
Francisco García Valero, Economist
Antanina Garanasvili, Economic Consultant

EPO

Nikolaus Thumm, Chief Economist
(until June 2013)
George Lazaridis, Economist
Fabio Domanico, Economist
Geert Boedt, Data Analyst
Andrei Mihailescu, Research Assistant

Acknowledgements

In the course of the preparation of this report, useful input was received from the UK Intellectual Property Office (UK IPO), the Organisation for Economic Co-operation and Development (OECD) and the United States Patent and Trademark Office (USPTO) – whose earlier report on US IPR-intensive industries was the first study of this type.

The statistical office of the European Union, Eurostat, provided valuable assistance in filling in the gaps in the published statistics, and during subsequent verification of the results.

The authors are also grateful for comments on the draft report from the European Commission's Directorate-General Internal Market and Services; Lord John Mogg, Chair of the Advisory Board of the European Observatory on Infringements of Intellectual Property Rights; Ian Hargreaves, Professor of Digital Economy, Cardiff University; Tony Clayton, Chief Economist of the UK IPO; and Mariagrazia Squicciarini, Senior Economist and Head of Unit at the Directorate for Science, Technology and Industry at OECD.

02 / Executive Summary

One of the mandates of the European Observatory on Infringements of Intellectual Property Rights (“the Observatory”)¹ is to provide evidence-based data on the impact, role and public perception of intellectual property in the economy of the European Union (EU). In order to meet that objective, the Observatory is conducting a programme of socio-economic studies. Similarly, the European Patent Office (EPO) aims to raise awareness about the economic and social importance of the industrial property system.

The present report, carried out as a joint project between OHIM and the EPO, and benefiting from input from other IP offices, European Commission services and international organisations, is the first major study resulting from this collaboration. It aims to provide the first broad, credible assessment of the combined contribution of industries that make intensive use of the various types of Intellectual Property Rights (IPR) to the economies of the EU as a whole and of the individual Member States. Croatia became the EU’s 28th Member State on 1 July 2013. However, since not enough data for Croatia was available when the analysis was conducted in autumn 2012 and spring 2013, the study only includes the 27 pre-July 2013 Member States.

The study covers a broad range of IP rights² – trade marks, patents, designs, copyright and Geographical Indications (GIs) – and considers a variety of economic indicators, in particular Gross Domestic Product (GDP), employment, external trade and wages. It makes no policy recommendations, as this is not within its scope. Instead, it is designed to provide evidence that can be used by policymakers in their work, and to serve as a basis for raising awareness of Intellectual Property among Europe’s citizens.

The study is intended to provide results that are comparable to those obtained for the US economy. The methodology used here is therefore closely related to that used in the pioneering study published in March 2012 by the Economics and Statistics Administration in the US Department of Commerce and the United States Patent and Trademark Office (USPTO).³

1 The Observatory was transferred to the Office for Harmonization in the Internal Market (OHIM) under Regulation (EU) No. 386/2012 of the European Parliament and of the Council of 19 April 2012, which entered into force on 5 June 2012.

2 It may be helpful to define more clearly some of the IP-related terms used in this report. “IP” is usually, but not always, a result of innovation. However, it is a broader term than “IPR”, as it includes types of knowledge, such as trade secrets or business methods, that are not registered, either because the relevant legal system does not provide for their registration or because the firm has chosen not to protect them. In this study, “IPR” is used to refer to the five rights included in the analysis: patents, trade marks, registered designs, copyright and Geographical Indications.

3 For the sake of simplicity, the study conducted by the US Department of Commerce and the USPTO is referred to in this report as the “US study” or “USPTO study”.

2.1 Main findings

IPR-intensive industries contribute
26% of employment and
39% of GDP in the EU.

IPR-intensive industries are defined⁴ as those having an above-average use of IPR per employee. The present study shows that about half of European industries can be considered IPR-intensive.

It should be emphasised, however, that all industries use IP rights to some extent. By focusing only on the IPR-intensive industries, this study arguably understates the real contribution of IP rights to the European economy.⁵

Such IPR-intensive industries are shown to have generated almost 26% of all jobs in the EU during the period 2008-2010, with almost 21% in trade mark-intensive industries, 12% in design-intensive industries, 10% in patent-intensive industries, and smaller proportions in copyright-intensive and GI-intensive industries.⁶ On average over this period, 56.5 million Europeans were employed by IPR-intensive industries, out of a total employment of approximately 218 million. In addition, another 20 million jobs were generated in industries that supply goods and services to the IPR-intensive industries. Taking indirect jobs into account, the total number of IPR-dependent jobs rises to just under 77 million (35.1%).

Over the same period, IPR-intensive industries generated almost 39% of total economic activity (GDP) in the EU, worth € 4.7 trillion. They also accounted for most of the EU's trade with the rest of the world, with design-intensive, copyright-intensive and GI-intensive industries generating a trade surplus.

IPR-intensive industries also pay significantly higher wages than other industries, with a wage premium of more than 40%. This is consistent with the fact that the value added per worker is higher in IPR-intensive industries than elsewhere in the economy.

4 See Chapter 4 on "Methodology".

5 It should, however, be borne in mind that large parts of the economy, especially the public sector, cannot be considered IPR-intensive.

6 The total contribution of IPR-intensive industries is less than the sum of the contributions of trade mark-intensive, patent-intensive, design-intensive, copyright-intensive and GI-intensive industries because many industries are intensive in respect of more than one IP right. However, the study methodology ensures that there is no double-counting of industry contributions.

The contribution of IPR-intensive industries to the two principal economic indicators, employment and output, is summarised in tables 1 to 3.⁷

Table 1:
Direct contribution of IPR-intensive industries to employment

IPR-intensive industries	Employment	Share of total employment
Trade mark-intensive	45.508.046	20,8%
Design-intensive	26.657.617	12,2%
Patent-intensive	22.446.133	10,3%
Copyright-intensive	7.049.405	3,2%
GI-intensive	374.345	0,2%
All IPR-intensive	56.493.661	25,9%
Total EU economy	218.400.733	

In addition to their direct employment contribution, IPR-intensive industries also generate employment in other, non-IPR-intensive industries which supply them with goods and services as inputs to their production processes. Using the EU27 Input Output Tables,⁸ published by Eurostat, it is possible to calculate this indirect effect on employment in non-IPR-intensive industries. The result is summarised in table 2, which shows a breakdown by direct and indirect employment. Including the indirect jobs in the calculation implies that 35.1% of EU jobs are contributed by the IPR-intensive industries, directly and indirectly.

Table 2:
Direct and indirect contribution of IPR-intensive industries to employment

IPR-intensive industries	Employment (direct)	Employment (indirect)	Employment (direct+indirect)
Trade mark-intensive	45.508.046	17.600.397	63.108.443
Design-intensive	26.657.617	12.121.817	38.779.434
Patent-intensive	22.446.133	12.738.237	35.184.370
Copyright-intensive	7.049.405	2.331.390	9.380.795
GI-intensive	n/a	n/a	374.345
All IPR-intensive	56.493.661	20.109.003	76.602.664

7 In order to minimise the impact of data gaps in the economic statistics and avoid attaching undue importance to one particular year, the economic indicators were calculated as an average of the years 2008-2010.

8 Input-output tables show the flows of goods and services between all the industries in the economy.

Besides employment, IPR-intensive industries contribute to economic output, as measured by Gross Domestic Product (GDP). Overall, almost 39% of EU GDP is generated in IPR-intensive industries, with trade mark-intensive industries accounting for 34%, design-intensive industries for 13%, patent-intensive industries for 14% and copyright and GI-intensive industries for smaller proportions. Chapter 6 provides a more detailed breakdown of these industries' contributions to the national economies of the EU Member States.

Table 3: Contribution of IPR-intensive industries to GDP

IPR-intensive industries	Value Added (GDP) (€ million)	Share of total EU GDP
Trade mark-intensive	4.163.527	33,9%
Design-intensive	1.569.565	12,8%
Patent-intensive	1.704.485	13,9%
Copyright-intensive	509.859	4,2%
GI-intensive	16.134	0,1%
All IPR-intensive	4.735.262	38,6%
Total EU GDP	12.278.744	

Comparing the results of this EU study with those for the US reveals that the two economies⁹ have a similar structure, as is to be expected given their similar level of development. However, in terms of the contribution of IPR-intensive industries, the shares in employment and GDP are somewhat higher in the EU: 26% vs. 19% for employment and 39% vs. 35% for GDP.

However, in both studies, trade mark-intensive industries account for the highest shares in both employment and GDP, followed by patents and copyright in the US and by designs, patents and copyright in the EU. Similarly, the wage premiums in IPR-intensive industries compared to other industries are similar: 41% in the EU and 42% in the US, with copyright-intensive and patent-intensive industries having the highest premiums on both sides of the Atlantic.

Given that 39% of GDP (value added) in the economy and 26% of employment is generated in IPR-intensive industries, the value added *per employee* is higher in IPR-intensive industries than in the rest of the economy. Economic theory suggests that, all else being equal, industries in which the average worker produces more value added can be expected to pay their workers higher wages than other industries. It is therefore of relevance to examine whether this higher value added is reflected in the relative wages in the IPR-intensive industries.

9 Unlike the USPTO study, this study included designs. Since most of the design-intensive industries are also trade mark-intensive or patent-intensive, they would have been included as IPR-intensive in any event. However, there are 13 industries, employing 3.4 million workers in the EU, which are exclusively design-intensive. If those industries were removed from the analysis in order to assure strict comparability with the US, then the employment share of IPR-intensive industries in the EU would be 24.3%, still higher than the result reached in the USPTO study.

Wages in IPR-intensive industries are indeed higher than in non-IPR-intensive industries. The average weekly wage in IPR-intensive industries is € 715, compared with € 507 in non-IPR-intensive industries – a difference of 41%. This “wage premium” is 31% in design-intensive industries, 42% in trade mark-intensive industries, 46% in GI-intensive industries, 64% in patent-intensive industries and 69% in copyright-intensive industries.

Table 4: Average personnel cost in IPR-intensive industries, 2010

IPR-intensive industries	Average personnel cost (€ per week)	Premium (compared to non-IP intensive industries)
Trade mark-intensive	719	42%
Design-intensive	666	31%
Patent-intensive	831	64%
Copyright-intensive	856	69%
GI-intensive	739	46%
All IPR-intensive	715	41%
Non-IPR intensive	507	
All industries (included in SBS)	589	

Finally, the role played by IPR-intensive industries in the EU’s external trade is examined. The bulk of EU trade is in IPR-intensive industries. It may be somewhat surprising at first glance that such a high share of imports is IPR-intensive. This is because even industries producing commodities such as energy are IPR-intensive,¹⁰ while on the other hand, many non-IPR-intensive activities are also non-tradable.¹¹ For that reason, 88% of EU imports consist of products of IPR-intensive industries. However, an even higher share of EU exports, 90% is accounted for by IPR-intensive industries.

The EU as a whole had a trade deficit of approximately €174 billion, or 1.4% of GDP. Since the IPR-intensive industries as a whole account for a higher share of EU exports than EU imports, they make a positive contribution to the Union’s trade position¹². The EU has a trade deficit in trade mark-intensive and patent-intensive products, to some degree offset by trade surpluses in copyright-intensive, design-intensive, and GI-intensive industries.

10 Both industries contained in NACE division 06, extraction of crude petroleum and natural gas, are patent-intensive.

11 For example, service industries such as those included in NACE division 86 (human health activities) or 96 (other personal service activities). Such services are generally consumed at the point of production.

12 Another manner in which this can be seen is by noting that IPR-intensive industries account for 89% of EU’s total external trade but only 72% of the trade deficit.

Table 5 summarises trade in IPR-intensive industries, based on data from 2010.¹³

Table 5: EU external trade in IPR-intensive industries

IPR-intensive industries	Export (million €)	Import (million €)	Share of export	Share of import	Net export (million €)
Trade mark-intensive	1.023.981	1.158.860	75,5%	75,7%	-134.879
Design-intensive	724.292	703.586	53,4%	46,0%	20.707
Patent-intensive	957.748	1.049.795	70,6%	68,6%	-92.047
Copyright-intensive	57.051	41.727	4,2%	2,7%	15.325
GI-intensive	10.577	1.836	0,8%	0,1%	8.741
Total IPR-intensive	1.226.015	1.351.890	90,4%	88,3%	-125.875
Non-IPR intensive	130.585	178.640	9,6%	11,7%	-48.055
Total EU Trade	1.356.600	1.530.530	100,0%	100,0%	-173.930

2.2 Methodology and data

A large part of this report, specifically Chapter 4 and Appendix 9, is devoted to documenting the methodology of the study, for two main reasons:

- 1) Given the complexity of dealing with a large amount of data from 27 Member States, contained in several large databases, a novel and sophisticated data-matching methodology was needed;
- 2) In the interest of transparency, it was important to provide as thorough a description of the methodology as possible.

Another distinguishing feature of this study is the extensive variety of databases and other data sources that were used to determine which industries are IPR-intensive and to assess their contribution to employment, GDP and other economic indicators. A full list is given in Chapter 4.

In addition, industry-specific third-country data was used where needed, in particular in connection with the estimation of trade in GI products.

¹³ As in the case of the employment and GDP calculations, the figures for the five IP rights do not add up to the overall figure for IPR-intensive industries due the fact that many industries are intensive in more than one IP right.

In order to determine which industries are IPR-intensive, the register databases of OHIM and EPO were matched with the commercial database ORBIS.¹⁴ The resulting matched database contains data on approximately 240,000 companies, including the number of Community Trade Marks, Registered Community Designs and patents applied for by each company, along with the industry classification and various financial and economic variables for each, providing a set of data that can be used in future, more detailed studies.

Using this database, the number of trade marks, designs and patents per employee was calculated for each industry, and the industries which were above average according to this measure were considered to be IPR-intensive. This calculation was performed at the level of the EU, not taking into account national filings by the companies in the database. This approach, partly made necessary by data limitations, is nevertheless justified by the assumption that an industry which is defined to be IPR-intensive based on its registration of EU-level IP rights would also be deemed IPR-intensive if national IP rights per employee were included as well.

A fundamental assumption behind the methodology employed in the present study is that the degree to which an industry is IPR-intensive is an intrinsic characteristic of that industry, regardless of where it is located.¹⁵ In assessing the contribution of each industry to the economy, what is being measured are the jobs and GDP generated by that industry in each Member State and in the EU, and not the origin of the underlying IPR.

For example, if a car company based in country A builds an assembly plant in country B, then the jobs and value added created as a result accrue to the economy of country B. Therefore, no conclusions as to how innovative a particular country is can be drawn on the basis of this study alone. The higher contribution of patent-intensive industries could equally be the result of decisions on where to site production which were taken in a different country.

Chapter 7 shows in which countries the patents, trade marks and designs in the database used for this study originate and presents statistics on the proportion of jobs in IPR-intensive industries in each Member State that are created in companies based in other Member States or outside the EU.

14 ORBIS is a database of financial information on European companies, provided by Bureau van Dijk and based on data obtained from company filings in company registers or similar records in the various countries.

15 The exception is GI, which is analysed on a country-by-country basis.

Contents

01	Foreword	3
02	Executive Summary	5
2.1	Main findings	6
2.2	Methodology and data	10
03	Introduction	17
3.1	IP rights and their function in the economy	19
3.1.1	Overview of patents	19
3.1.2	Overview of trade marks	20
3.1.3	Overview of designs	21
3.1.4	Overview of copyright	22
3.1.5	Overview of Geographical Indications	23
3.2	Summary of the five IP rights	25
04	Methodology of the study	26
4.1	Data sources and selection criteria	28
4.1.1	Economic data	30
4.2	Data matching for patents, trade marks and designs	32
4.3	Identification of patent-intensive industries	34
4.3.1	Absolute intensity	34
4.3.2	Relative intensity	36
4.4	Identification of trade mark-intensive industries	38
4.4.1	Absolute intensity	38
4.4.2	Relative intensity	39

4.5	Identification of design-intensive industries	40
4.5.1	Absolute intensity	40
4.5.2	Relative intensity	41
4.6	Identification of copyright-intensive industries	42
4.7	Identification of GI-intensive industries	46
4.7.1	Contribution of GIs to external trade	49
05	IPR-intensive industries at EU level	50
5.1	Patent-intensive industries	50
5.2	Trade mark-intensive industries	52
5.3	Design-intensive industries	53
5.4	Copyright-intensive industries	54
5.5	GI-intensive industries	55
5.6	All IPR-intensive industries	55
06	Contribution of IPR-intensive industries to the EU economy	58
6.1	Contribution to employment, GDP and trade at EU level	58
6.1.1	Employment	58
6.1.2	Indirect employment	59
6.1.3	GDP	61
6.1.4	Trade	63
6.1.5	Wages	66
6.2	The main IPR-intensive industries at EU level	68
6.2.1	The overlapping use of IP rights	70
6.3	Primary, secondary and tertiary sectors	71
6.4	Analysis by Member State	72
6.4.1	Patent-intensive industries	72
6.4.2	Trade mark-intensive industries	74
6.4.3	Design-intensive industries	76
6.4.4	Copyright-intensive industries	78
6.4.5	GI-intensive industries	80
6.4.6	All IPR-intensive industries	82
07	Additional analysis	84
7.1	Origins of IPR within the EU	84
7.2	Job creation in the Internal Market	86

08	Appendix: List of all 321 IPR-intensive industries	90
09	Appendix: Methodology	99
9.1	Data matching methodology: detailed description	99
9.1.1	Data pre-processing	102
9.1.2	Legal form cleaning	102
9.1.3	Preparation of data for the matching algorithm	103
9.1.4	Matching data between OHIM and EPO	104
9.1.5	Matching OHIM/EPO dataset with ORBIS	106
9.1.6	Post-match data processing (disambiguation)	108
9.1.7	Manual matching phase	110
9.1.8	Preparation of the final concordance tables	111
9.1.9	Adjustments to absolute intensity calculations	113
9.2	Patent-intensive industries	116
9.3	Trade mark-intensive industries	120
9.4	Design-intensive industries	127
10	Appendix: Copyright-intensive industries according to the WIPO methodology	132
10.1	Core copyright industries	132
10.2	Non-core copyright industries	135
10.3	Total contribution of core and non-core copyright industries	140
11	List of abbreviations	141
12	References	142

List of tables and figures

Tables

Table 1:	Direct contribution of IPR-intensive industries to employment	7
Table 2:	Direct and indirect contribution of IPR-intensive industries to employment	7
Table 3:	Contribution of IPR-intensive industries to GDP	8
Table 4:	Average personnel cost in IPR-intensive industries, 2010	9
Table 5:	EU external trade in IPR-intensive industries	10
Table 6:	Main characteristics of IP rights	25
Table 7:	Copyright-intensive industries	43
Table 8:	Copyright-intensive industries (NAICS-NACE correspondence)	45
Table 9:	GI sales by country, 2010	48
Table 10:	The 20 most patent-intensive industries	51
Table 11:	The 20 most trade mark-intensive industries	52
Table 12:	The 20 most design-intensive industries	53
Table 13:	Copyright-intensive industries	54
Table 14:	GI-intensive industries	55
Table 15:	Share of exports and imports of IPR-intensive industries	64
Table 16:	Top 10 IPR-intensive exporting industries	65
Table 17:	Top 10 IPR-intensive importing industries	66
Table 18:	Top 20 IPR-intensive industries (employment)	68
Table 19:	Top 20 IPR-intensive industries (GDP)	69
Table 20:	Overlapping use of IP rights: employment	70
Table 21:	Employment, GDP and trade in IPR-intensive industries, grouped by sector	71
Table 22:	GDP and employment shares in GI-intensive industries by Member State, 2010	80
Table 23:	GI products value added in relation to food and drink value added, 2010	81
Table 24:	IP rights by country of origin (all industries), 2004-2008	85
Table 25:	Jobs in the EU 27 Member States attributed to foreign companies (IPR-intensive industries)	87
Table 26:	Jobs attributed to companies from EU Member States in other Member States	89
Table 27:	List of all IPR-intensive industries	90

Table 28:	Patent-intensive industries	116
Table 29:	Trade mark-intensive industries	120
Table 30:	Design-intensive industries	127
Table 31:	The list of core copyright-intensive industries according to WIPO and USPTO	133
Table 32:	Economic contribution of core copyright-intensive industries	134
Table 33:	Inter-dependent copyright-intensive industries	136
Table 34:	Partial copyright-intensive industries	137
Table 35:	Non-dedicated support copyright-intensive industries	139
Table 36:	Contribution to the EU economy of core and non-core copyright-intensive industries	140

Figures

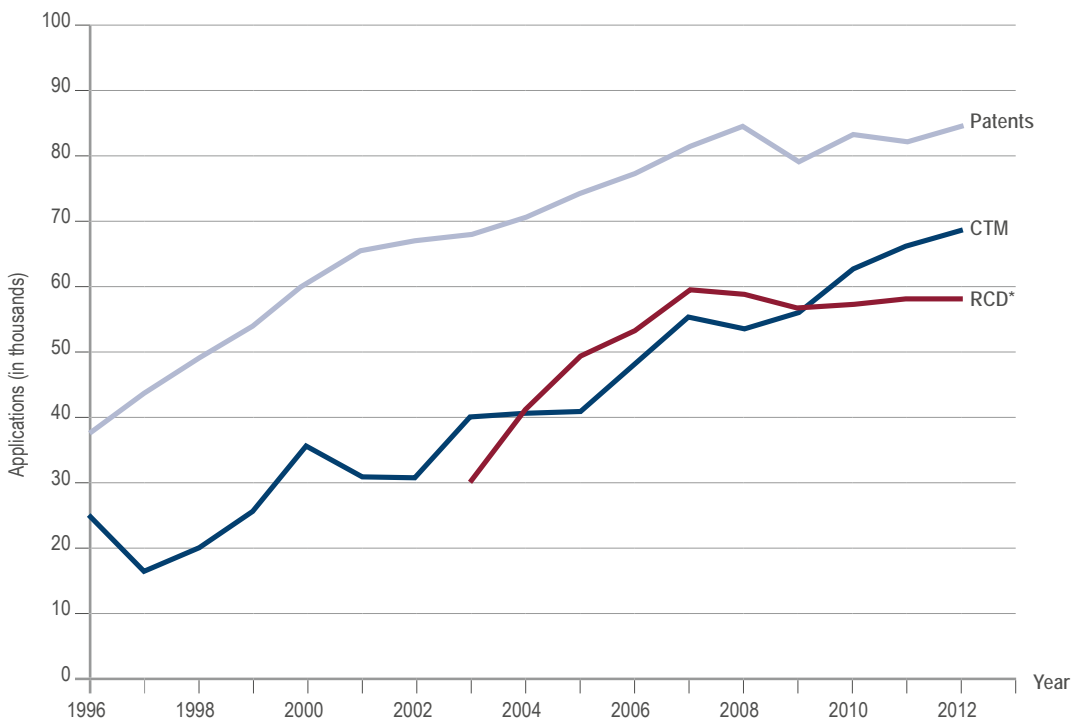
Figure 1:	Number of EPC patent, CTM and RCD applications filed by EU applicants between 1996 and 2012	17
Figure 2:	Example of the hierarchical NACE structure	27
Figure 3:	Representation of the data matching process	33
Figure 4:	Overlap in IPR-intensive industries	56
Figure 5:	Employment in IPR-intensive industries	59
Figure 6:	Direct and indirect employment in IPR-intensive industries	61
Figure 7:	Contribution of IPR-intensive industries to GDP	62
Figure 8:	EU external trade in IPR-intensive industries	64
Figure 9:	Average personnel cost in IPR-intensive industries, 2010	67
Figure 10:	GDP and employment shares in patent-intensive industries by Member State, 2010	73
Figure 11:	GDP and employment shares in trade mark-intensive industries by Member State, 2010	75
Figure 12:	GDP and employment shares in design-intensive industries by Member State, 2010	77
Figure 13:	GDP and employment shares in copyright-intensive industries by Member State, 2010	79
Figure 14:	GDP and employment shares in all IPR-intensive industries by Member State, 2010	83
Figure 15:	Outline of harmonisation and matching process	101
Figure 16:	Matching data between OHIM and EPO	105
Figure 17:	Matching OHIM/EPO dataset with ORBIS	107
Figure 18:	Post-match data processing (disambiguation)	109
Figure 19:	Manual matching phase	111
Figure 20:	Preparation of the final concordance tables	112

03 / Introduction

Intellectual Property (IP) plays an increasingly important role in modern economies. The development of the knowledge economy, the globalisation of markets as well as the increasing complexity of products and services has further increased the importance of IP rights. For many companies in advanced countries, the value of their intangible assets far exceeds the value of their physical assets. Empirical evidence suggests that, in their attempt to extract additional value from their innovations, companies consider alternative means of IP protection, often in a complementary way.¹⁶ Most policymakers recognise that future growth and prosperity in Europe (and other regions) depends on knowledge-intensive industries.

As shown in figure 1,¹⁷ filings of patents, trade marks and designs by European applicants have grown strongly over the past two decades, and by and large, this growth has continued (albeit at a slower rate) over the most recent years, despite the global economic crisis.

Figure 1: Number of EPC patent, CTM and RCD applications filed by EU applicants between 1996 and 2012



* RCD have only been in existence since 2003

16 See, for example, Schwiebacher (2010).

17 In the figure, EPC stands for European Patent Convention. Filings from EPC Member States which are not EU Members, such as Switzerland or Norway, are excluded from the analysis. CTM and RCD are abbreviations for Community Trade Mark and Registered Community Design, respectively.

This resilience of IPR filing activity even in the face of the most challenging economic conditions of the post-war decades is yet another indication of the increasing importance of IPR.

The growth in patent filings has been driven primarily by the electronics-related industries, while the growth in trade mark filings is concentrated in service industries. Growth in designs has been particularly strong in industries related to clothing.

So far, the evidence available for quantifying IP rights and their economic contribution has tended to be fragmentary and disaggregated, focusing on individual rights and/or specific industries. Traditionally, research into the economic impact of IP has concentrated on patents. In recent years, a number of studies have also considered the impact of trade marks on innovation, growth, employment and wages, but those studies have typically been limited to individual countries.

The present study aims to provide a broad, credible assessment of the contribution made to the European economy by industries that use IP rights intensively, in particular their contribution to gross domestic product (GDP), employment and external trade.¹⁸ Of course, IP also affects the economy in other ways, which are not assessed here. These include, for example, technology transfer, the long-run effects on innovation and growth, and externalities related to the creation and use of IP that are not monetised through transactions in markets.

The IP rights considered by this study are trade marks, patents, designs, copyright, and Geographical Indications (GIs). The report identifies the industries characterised by above-average use of those rights, at EU level, in relation to the size of their workforce, and then quantifies the weight of those industries in the economy.

The results of this study do not allow for identifying *causal* relationships between IP and economic variables. Nor are the effects of the different types of IP protection compared. Rather, their collective contribution to the economy is quantified. The various IP rights serve different purposes, are used in different sectors of the economy and have different scope. Nor does the study analyse the value of IPR for individual companies, but rather is concerned with its contribution at the level of industries and Member States. Within any industry, some companies use IPR more intensively than others. Such variations are not captured in this report. Likewise, companies follow different IP protection strategies. For example, some companies rely more on trade secrets than on patents, or on unregistered rather than registered designs. Thus, there are important forms of IP that are not registered and are not included in this study.

IPR intensity is defined in this study as the number of IP rights divided by the number of employees in an industry. This means that there could be industries which have a relatively small number of valuable IP rights but a large number of employees. Such industries would not be identified as IPR-intensive according to this methodology.

18 A similar study on the US economy was published by the USPTO in 2012.
See: http://www.uspto.gov/news/publications/IP_Report_March_2012.pdf.

A companion report, to be published at a later date, will present a firm-level analysis, comparing individual IPR-intensive firms with non-IPR intensive firms in the same industries in order to detect whether the IPR-intensive firms perform better on indicators such as employment or wages.¹⁹

This report is structured as follows: the remainder of this introduction provides a brief overview of the IP rights covered by the analysis and their economic function. In the following Chapter 4, the methodology of the study, including compilation of the data and its analytical treatment, is explained. In Chapters 5 and 6, the results of the industry-level analysis are presented for each of the five IP rights analysed, at both EU level and the level of individual Member States. In addition, the most IPR-intensive industries are discussed in more depth. In the concluding Chapter 7, the origin of the IP rights underlying this study is examined.

3.1 IP rights and their function in the economy

The increasing centrality of intellectual assets in today's competitive markets is reflected in the growth in the economic and management literature dealing with IPR since the mid-1990s. The rise in the number of scientific publications (and the parallel increase in coverage in management press and newspapers) mirrors the steep increase in the number of patents, trade marks and registered designs worldwide during the past two decades and their usage as output indicators for observing economic phenomena.

As a policy instrument, legal protection of intellectual property provides individuals and organisations with incentives to undertake creative and innovative activity, by granting them exclusive legal rights to the results of their inventive and creative work. This section briefly introduces the five forms of IPR studied in this report — patents, trade marks, registered designs, copyright and GIs — by specifying the relevant subject matters, requirements for protection and principal rights conferred. A brief summary of the economic rationale behind each IP right is also provided.

3.1.1 Overview of patents

Patent protection is available for inventions intended to serve as new solutions to technical problems. To be patentable, inventions must be new, non-obvious (i.e. include an inventive step) and industrially applicable. The novelty requirement means that, at the filing date, the invention must not be known to the public anywhere. To satisfy the inventive step requirement, the invention must not be obvious to a person who has ordinary skills in the applicable field. Finally, the invention must be susceptible of an industrial application. For a patent to be fully valid and enforceable, it must be granted by a patent authority, following an administrative process whereby the authority examines the application and checks that the invention satisfies the legal requirements. Once granted, the patent confers on its owner the right to prevent any other entity from commercially exploiting the invention. This exclusive right is limited in time (typically, patent protection lasts 20 years from the date of the application, though there are differences between jurisdictions, and some exemptions apply) and space (i.e. exclusionary power can be enforced within the geographic boundaries of the granting state).

19 A study published by the UK IPO in 2011 indicates that this is indeed the case for UK firms. See Christine Greenhalgh, Mark Rogers, Philipp Schautschick, Vania Sena: "Trade Mark Incentives", UK IPO July 2011, available at: <http://www.ipo.gov.uk/ipresearch-tmincentives-full-201107.pdf>.

According to the economic literature, there are two main ways patent rights promote the progress of technology, innovation and social welfare²⁰. The first reflects the private reward granted for innovation in the form of the inventor's exclusive right to use or sell the patented invention ("reward theory"). The need to introduce some ex ante incentive mechanism follows from the acknowledgement that the ultimate result of the innovation process is the production of new knowledge which rival firms could exploit, at little or no cost, and ultimately reduce the innovator's rewards to a point at which it is no longer worthwhile to conduct innovative activity at all. Exclusive legal rights to inventions in the form of patents help limit this risk by providing adequate incentives to engage in innovative activity.

The "contract theory" describes the second main way in which patents can promote innovation,²¹ namely by giving exclusive rights to the inventor in exchange for the disclosure of information about the underlying technical solution. The public availability of patent documents in national and international patent offices facilitates the dissemination of technical information that can then be used by others to develop other novel solutions, creating additional gains for society.

Thus, there are two traditional economic arguments in favour of patent rights — they serve as instruments for incentivising innovation and promoting the dissemination of new knowledge.

3.1.2 Overview of trade marks

A **trade mark** is a distinctive sign that identifies certain goods or services as those provided by a specific person or organisation, thereby distinguishing them from those of other organisations. Trade marks are intended to reduce information and transaction costs in the marketplace by allowing customers to identify the nature and quality of goods and services before purchase. Among the most common signs eligible for trade mark protection are: words, pictures, stylised words, logos, a colour or colour combination, a shape, a sound or some combination of those signs. Generally, a sign must fulfil the requirements of distinctiveness to serve as a trade mark. Distinctiveness means that consumers can recognise the sign as a trade mark and distinguish it from other trade marks in the same field. If trade marks are likely to deceive the public as to the nature, quality or any other characteristics of the goods and services to which they refer, they do not qualify for registration. Trade marks can be protected on the basis of either registration through a trade mark office (i.e. registered trade marks) or, in some countries, through their actual use in the marketplace (i.e. unregistered trade marks). Registering trade marks is not compulsory in all countries, but it offers advantages with regard to enforcement of the associated legal rights, which is more difficult in the case of unregistered trade marks.²² The owner of a registered trade mark has the exclusive right to use it on the goods and services in the product classes in which it is registered, and to prevent others from exploiting, in the same fields, any sign that is identical or similar to it. The term of protection of a registered trade mark is typically ten years, but it can be renewed indefinitely, subject to payment of fees, for successive periods (typically, ten years).

20 See, for example, Menell and Scotchmer (2007) and Rockett (2010).

21 Rockett (2010); Denicolò and Franzoni (2004).

22 To enforce an unregistered trade mark, the proprietor must usually prove through factual evidence that it has an established trade mark that has acquired a reputation in the mind of the relevant public.

The economic rationale underlying the protection of trade marks has its roots in economic theories of information and reputation.

Competing products available in the market may differ from one another in terms of several characteristics and attributes. This difference is not a problem per se if consumers can obtain, at no cost, all the relevant information about these products and evaluate them appropriately to guide their purchase decisions. However, that is typically not the case. Characteristics of a product are often difficult or impossible to observe for the average consumer until he has actually purchased the product. In this context, a brand, protected by a trade mark, acts as signal to consumers that the product is of a given, consistent quality.

The legal protection of trade marks provides an incentive to develop and maintain distinguishing product features and create information about them for the benefit of markets. Creating this information and building up the reputation that the trade mark conveys is likely to require significant investments in product quality, service and advertising. In the absence of legal protection, and given the limited costs of imitating a competitor's trade mark, there would be limited incentives to incur such quality investments.

3.1.3 Overview of designs

Design²³ protection covers the visual appearance of a product, part of a product or its ornamentation. A product can be any industrial or handicraft item, including packaging, graphic symbols and typefaces. Therefore, a design covers the appearance of a product, but it cannot protect its functions, which fall under the regime of patent protection. The requirements that must be satisfied to register a design include that it must be new and have an individual character. It is new if no identical design has been made available to the public at the filing date; it has an individual character if the overall impression it produces on an informed user signifies that it differs from any previous designs. Industrial design protection is usually granted pursuant to a procedure for its registration (i.e. registered design), though under certain laws, design rights may also be automatically acquired by disclosing the design in a document or product (i.e. unregistered design). Like trade marks, registered designs provide more comprehensive cover than unregistered ones. Owners of registered designs have exclusive rights to use the design and can prevent any third parties from using it. In the EU, the rights conferred by registered designs can apply for a maximum of 25 years. The Registered Community Design has an initial life of 5 years from the date of filing and can be renewed for successive periods of 5 years, up to a maximum of 25 years.

The economic case for design registration builds primarily on the idea of promoting innovation. Production of new designs is a creative activity, requiring significant investments of time, skills and labour. If no exclusive rights were available, any party could replicate a creative design and directly compete with the original creator. Therefore, providing a legal mechanism to protect new designs should ultimately enhance investments in design production and creative work.

23 As used in the remainder of this report, the term "design" is to be understood to mean "registered design".

3.1.4 Overview of copyright

Copyright gives right holders exclusive rights to control the use (or economic exploitation) of their works, e.g. reproduction, distribution, adaptation, translation, performance or public display. It is important to note that copyright is applicable only to the expression of ideas, not to the ideas themselves. No copyright registration is required (or possible) at EU level;²⁴ the protection is granted automatically from the moment a work is created. In this respect, copyright differs significantly from the other IP rights considered in this report.

Despite considerable harmonisation of copyright and related rights at EU level, there are still some differences in copyright protection at national level. However, certain standards of copyright and related rights protection apply in all the EU Member States under legislation implementing international instruments such as, for example, the Berne Convention for the Protection of Literary and Artistic Works.

Beside international legislation, nine directives have been adopted to harmonise substantive copyright law provisions in the EU Member States.

The most important economic rights granted to EU creators, performers, producers and broadcasters are:

- *right of reproduction* for authors, performers, producers of phonograms and films and broadcasting organisations
- *right of communication to the public* for authors, performers, producers of phonograms and films and broadcasting organisations
- *right of distribution* for authors and for performers, producers of phonograms and films and broadcasting organisations
- *right of fixation* for performers and broadcasting organisations
- *right of rental and/or lending* for authors, performers, producers of phonograms and films, with an associated *right of equitable remuneration for lending and/or rental* for authors and performers
- *right of resale (droit de suite)*
- *right of broadcasting* for performers, producers of phonograms and broadcasting organisations
- *right of communication to the public by satellite* for authors, performers, producers of phonograms and broadcasting organisations
- *right of computer program reproduction, distribution and rental for authors*

It should be noted, however, that not all rights are applicable to all right holders or may be applicable only if certain conditions are met.

²⁴ Voluntary registration is, however, possible in many Member States.

The types of works that are protected under most national copyright laws include the following:

- Literary works (including novels, short stories, poems, dramatic works and any other writings, irrespective of their content, both fiction and non-fiction).
- Dramatic works
- Musical works
- Artistic works (whether two-dimensional such as drawings, paintings, etc. or three-dimensional such as sculptures, architectural works)
- Maps and technical drawings (including cartographic works, plans, blueprints, diagrams, etc.)
- Photographic works
- Cinematographic works
- Computer programmes and databases

Independently of the economic rights, authors are granted moral rights (the right of authorship, the right of integrity of work and the right of divulgation). These rights can be asserted by the author even if the copyright has been transferred to a third party.

Related rights provide both moral and economic protection for performers, producers of phonograms and broadcasting organisations. In the EU, film producers are also protected by related rights.

In the EU, copyright protection is now valid for the author's lifetime and 70 years afterwards. The protection conferred by related rights lasts for 50 years after the performance, film or transmission of a broadcast was published or communicated to the public. In 2011, the copyright term for performers and sound recordings producers in the EU was extended from 50 to 70 years.

The economic aspects of copyright are complicated, reflecting various trade-offs between the interests of creators, distributors, performers and consumers, and short-run versus long-run effects. The general objective of the system is to ensure adequate compensation for creators (so that a socially optimal level of creative activity takes place), while at the same time providing broad public access to the creative works and making it possible for other creators to build upon prior works.

3.1.5 Overview of Geographical Indications

A geographical indication (GI) is a name or sign used on certain products to link them to a specific geographical location or origin (e.g. a town, region or country). The use of a GI may act as certification that the product has certain qualities, is made according to traditional methods or enjoys a certain reputation due to its geographical origin.

The connection with the "land" and the strict controls on manufacturing of the product often lead to vertical integration in the different sectors involved in producing GI goods: starting with the farmer and continuing to the manufacturer and even wholesale and retail distributor.

GIs are mainly used in the agriculture, food and beverage sector, and mainly in Europe. Hence, the present study only considers agricultural GIs.

The EU recognises GIs of non-EU countries if certain reciprocity conditions are met.

The two main types of GI are summarised below.



Protected Designation of Origin (PDO): a product that is *produced, processed and prepared* in a defined geographical area using recognised know-how. Products owe their characteristics exclusively or essentially to their place of production and the skills of local producers.



Protected Geographical Indication (PGI): a product whose reputation or characteristics are closely linked to production in the geographical area. For PGI agricultural products and foodstuffs, at least one of the stages of production, processing or preparation takes place in the area. For PGI wines, at least 85% of the grapes come from the area.

Another difference between GIs and other IP rights is that while trade marks, designs, patents and copyright are usually applied for and owned by private entities, most often individual companies, GIs are typically applied for and managed by producer associations in the relevant geographical area. The GI can then be used by all individual producers located in the area and complying with the defined production methods.

In terms of their economic function, GIs share with trade marks the basic function of addressing the information asymmetries between sellers and buyers and assisting consumers in reducing their search costs, by certifying the origin and method of manufacture of the product. This is reflected in the fact that consumers are often prepared to pay a price premium for GI products.

3.2 Summary of the five IP rights

The main characteristics of patents, trade marks, registered designs, copyright and GIs are summarised in table 6.

Table 6: Main characteristics of IP rights

IP right	Patents	Designs	Trade marks	Copyright	Geographical Indication
Subject matter	Inventions (solutions to technical problems)	Original ornamental and non-functional features of an article or product or parts of it	Distinctive signs that identify certain goods or services and distinguish them from those of other businesses	Artistic, literary, dramatic, musical, photographic and cinematographic works; maps and technical drawings; computer programs and databases	Product originating in a particular geographical location whose quality or reputation is linked to its geographical origin
Requirements for protection	Novelty; inventive step (non-obviousness); industrial applicability	Novelty; individual character	Distinctiveness	Originality of the work, irrespective of its literary or artistic merit	Technical specifications justifying the special characteristics of the product and their link to the geographical location
Acquisition of right	Examination by the patent office, followed by grant and validation	For registered designs, examination by the IP office. For unregistered designs, automatically acquired by the act of disclosure	For registered trade marks, examination by the IP office. For unregistered trade marks, use in commerce	Automatic upon creation in a tangible form of expression	Examination by the national authority (depending on the country), then by the European Commission
Conferred rights	Exclusive right to make, use and sell the patented invention	Exclusive right to use the design and to prevent any third party from using it without the right holder's consent	Exclusive right to use the trade mark in trade	Reproduction, communication, including making the work available to the public, distribution, rental, resale, translation, adaptation, public performance	Collective right. Exclusive rights to commercialise comparable products and prevent imitation or evocation
Duration	Typically 20 years from filing, subject to payment of annual renewal fees	For registered designs, the usual maximum term is 25 years. In the case of Registered Community Design, up to 25 years (in successive 5-year terms)	For registered trade marks, commonly 10 years from filing, but can be renewed indefinitely, on payment of fees, for successive periods	For authors, lifetime plus 70 years. For performers, generally 70 years from the date of first public performance, fixation, publication or transmission. For producers of phonograms, 70 years after the fixation is made, the phonogram is published or communicated to the public. For film producers, 70 years after the fixation is made, the film is published or communicated to the public. For broadcasters, 50 years after first transmission.	Indefinite, no need for renewal

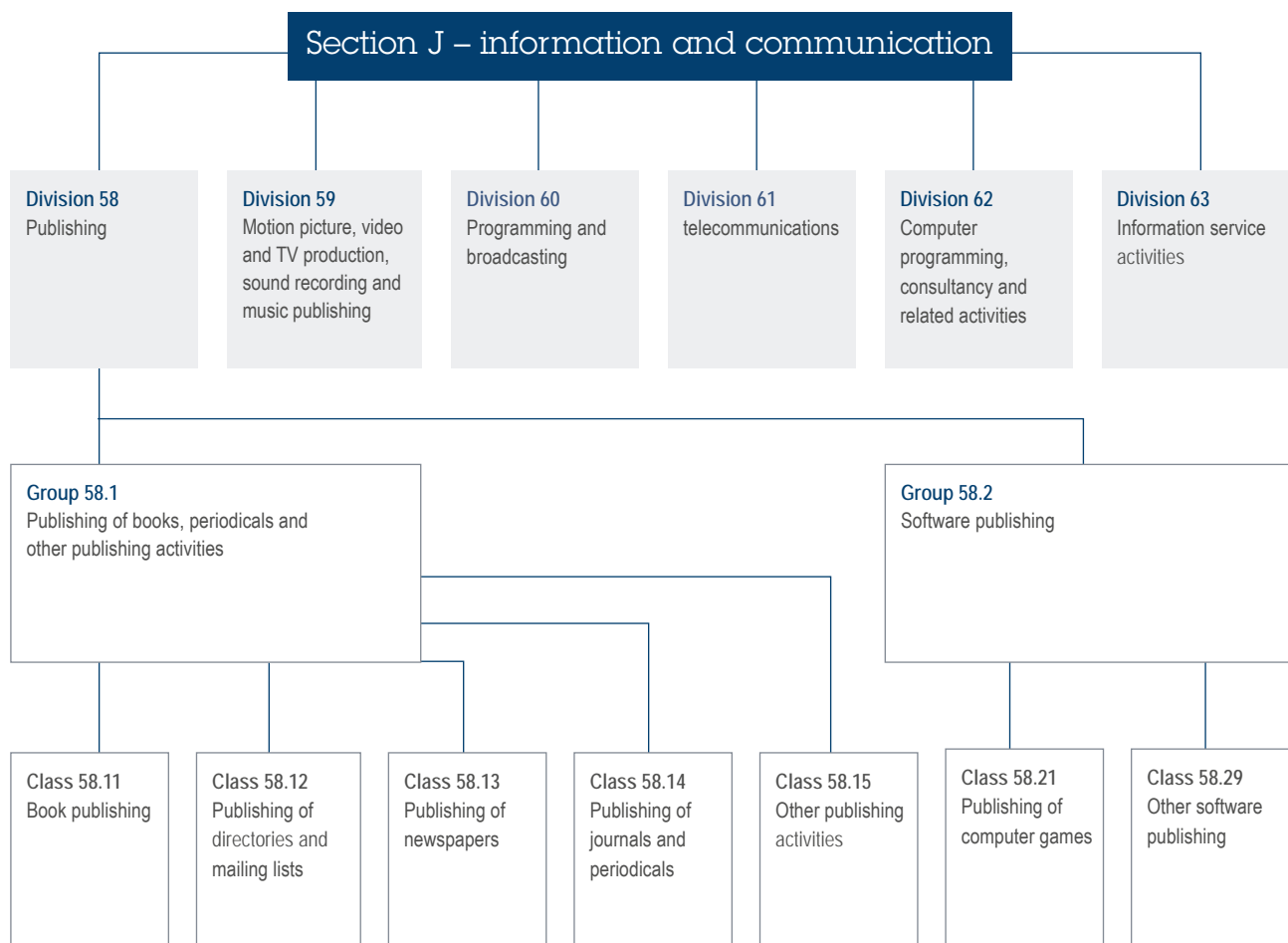
04 / Methodology of the study

The purpose of the present study is to examine the economic characteristics of IPR-intensive industries. The methodology used for this followed, as closely as possible, that applied in the USPTO study (2012) to achieve maximum comparability of the respective study results. However, this study covers 27 countries and is based on data from two separate IP offices (OHIM and EPO), so the methodology by necessity has some distinct aspects. Nevertheless, the *principles* behind the methodologies of the two studies are the same: first, determine which industries use IPR more than others; second, use industry-level economic statistics to determine employment and value added (GDP) generated in those industries; third, compare the industry-level economic aggregates to those for the overall economy in order to determine the weight in the economy of IPR-intensive industries.

The basic unit of analysis in this study is the *industry*, as defined in the NACE classification used by Eurostat.²⁵ In this classification, overall economic activity is divided into 22 sections, which are further subdivided into 88 divisions (often referred to as the 2-digit level), 272 groups (3-digit level) and 615 classes (4-digit level). An example of the hierarchical NACE structure is shown in figure 2.

25 For details of the NACE classification, see: http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-07-015/EN/KS-RA-07-015-EN.PDF. It should be borne in mind that "industry", as used here and in Eurostat literature, simply means "economic activity", even one that is not industrial in the everyday sense of the word.

Figure 2: Example of the hierarchical NACE structure



The list of industries that are intensive in their use of copyright and GIs is pre-determined, as explained in sections 4.6 and 4.7 below. However, for patents, trade marks and designs, IPR intensity is determined by examining the volume of IP rights obtained by all industries at OHIM and the EPO in relation to the level of employment in those industries. This was the most labour-intensive part of the study and is explained in section 4.2 below. How the data was used is explained in more depth in sections 4.3 for patents, 4.4 for trade marks and 4.5 for designs.

4.1 Data sources and selection criteria

One of the distinguishing features of this study is the variety of databases and other data sources that were used to determine which industries are IPR-intensive, and to assess their contribution to employment, GDP and other economic indicators. Specifically, the following databases were brought together to accomplish these objectives:

- OHIM's register of Community Trade Marks and Registered Community Designs;
- EPO's PATSTAT database, containing information on patent applications that have been published and/or granted by the EPO;
- ORBIS, a commercial database containing industry classification and other information for more than 20 million European companies. Together with the OHIM and EPO databases, this was the basic database of industrial property rights (patents, designs and trade marks) used for the analysis. ORBIS is provided by a Brussels-based company, Bureau van Dijk, which compiles the data based on filings made by companies in company registers and similar government records in their respective countries.
- COMEXT, Eurostat's reference database for the EU's external trade. This data was used to quantify the contribution of IPR-intensive industries to external trade.
- Eurostat's Structural Business Statistics (SBS) data, showing employment, labour cost and value added for each industry at the level of the EU and the Member States, using the NACE classification of economic activity. This data was the main source for the contribution of IPR-intensive industries to employment and GDP (except for GIs).
- Eurostat's Labour Force Survey (LFS), used to estimate employment in certain industries not reported in SBS.
- Eurostat's National Account statistics, the main source for official data on total GDP and employment at the level of the EU as a whole and for individual Member States.
- Eurostat's Input-Output Tables (IOT), showing flows of products and services among the different industries. This data was mainly used to quantify the indirect employment contribution of IPR-intensive industries.
- Economic Accounts for Agriculture (EAA), Eurostat's main data source for statistics on EU agricultural sectors. This database was used in the analysis of GI-intensive industries.
- Farm Structure Survey (FSS), Eurostat's data source for employment in the agricultural sectors; used to quantify employment in GI-intensive sectors.
- Economic data from national statistics offices in several EU Member States; this data was used to supplement the Eurostat data, particularly for some of the copyright-intensive sectors.
- Eurostat's Foreign Affiliate Statistics (FATS), used to calculate the number of jobs in IPR-intensive industries created by companies based outside each Member State.
- E-Bacchus/E-Sprits-Drinks/DOOR, three databases of the European Commission's DG AGRI, showing all GIs registered in the EU.
- Data on sales of GI products provided by DG AGRI, used to quantify the GDP contribution of GI-intensive industries.

In addition, industry-specific data for non-EU countries were used where needed, in particular to estimate trade in GI products, as explained in section 4.7.1 below.

The IP rights chosen for the analysis were patents, trade marks and designs applied for at the EPO and OHIM during the period 2004-2008 and subsequently granted²⁶ This time period was chosen partly to ensure comparability with the USPTO study and partly to avoid the post-2008 crisis years, which might have affected the results. Using a five-year period rather than a single year has the added advantage of avoiding bias resulting from factors that might have affected the economy in any particular year.

When selecting the sample of IP rights for the analysis, a time lag of 3-4 years was applied, as an innovation is expected to yield economic benefits only after a certain amount of time has elapsed. Accessing complementary assets such as marketing channels, cost-effective manufacturing and after-sales support takes time and is a prerequisite for successful commercialisation in a dynamic environment. Moreover, in the case of new products and services, negotiating licence agreements and attracting financing can be a lengthy process. This may explain why empirical research suggests that there may be a time lag between successful patent applications and subsequent changes in company performance.²⁷ A similar case can be made for trade marks and designs, since a newly registered trade mark or design may not confer the same benefits as one that has been in the market for several years, giving consumers time to gain confidence in that particular company or product.

For those reasons, once the IPR-intensive industries had been identified according to the methodology described in this chapter, their contribution to the economy was analysed using economic data for the period 2008-2010.

The IP rights used were those registered at the level of the EU, not taking into account national filings by the companies in the database. This approach, partly made necessary by data limitations, is nevertheless justified by the assumption that an industry which is defined as IPR-intensive based on its registration of EU-level IP rights would also be deemed IPR-intensive if national IP rights were included as well.

The OHIM and EPO data had to be matched to ORBIS, but only patents, trade marks and designs with at least one EU-based owner were included in this exercise because the version of the ORBIS database used for this study only contains data on EU-based companies.²⁸ However, the exclusion of non-EU IPR owners does not affect the ultimate goal of the data matching exercise, namely the selection of IPR-intensive industries. It is a fundamental assumption of this study that whether or not an industry is IPR-intensive is an inherent characteristic of that industry, irrespective of its geographical location. In the subsequent economic analysis of the employment and GDP contribution of IPR-intensive industries to the EU economy, all relevant industries are included, regardless of the ultimate ownership of the companies within each industry. For example, jobs at a Korean-owned car factory located in an EU Member State, are included in Eurostat's statistics and are included in the quantification in Chapter 6.

26 In other words, the application was filed during the period 2004-2008, but the corresponding IP right could have been granted at any time up to February 2013 (when the data used for this study were extracted from the underlying databases).

27 Holger Ernst (1999) examined the relationship between patent applications and subsequent changes of corporate performance for 50 German machine tool manufacturers between 1984 and 1992 and found that the time lag effect can be up to 3 years after priority in the case of European patents.

28 It should be noted that the USPTO study (2012) was subject to a similar limitation in that the trade marks selected for the analysis were those filed by US entities and, in the case of patents, publicly-traded US corporations.

4.1.1 Economic data

The primary source of employment and value added data is Eurostat's Structural Business Statistics (SBS) data series, which in principle shows employment in each 4-digit NACE sector for the EU and for each Member State. In practice, there are data gaps in the statistics published by Eurostat for some years, owing to one or more of the following factors:

- **Quality of the data:** in some cases, Eurostat and/or the relevant national statistical office may decide that the data for a particular industry is of questionable quality. In those cases, Eurostat does not publish the data. However, it is important to note that even then, the data is included in Eurostat's aggregate estimate at the EU27 level.
- **Confidentiality:** it may be that only one company is active in a particular industry in a Member State (obviously, this is especially true for the smaller Member States). In such cases, Eurostat does not report the data at Member State level to preserve confidentiality. However, the data is included in aggregate EU-level estimates, and also for higher-level (2-digit) NACE industries.
- **Exclusion of certain copyright-intensive industries:** for five of the copyright-intensive industries, no data at all is reported in SBS²⁹

Many of the gaps in the data were closed in close co-operation with Eurostat. In some cases where SBS data was not available, data from another Eurostat data series, the Labour Force Survey (LFS), was used instead. This series uses a slightly different definition than SBS but the impact on the results is minimal.³⁰

In the case of the five copyright-intensive industries for which Eurostat does not collect data, the employment data was obtained from the national statistics offices of Italy, Spain and the United Kingdom. A ratio of employment in each of the five industries to total employment was calculated for these three countries, and subsequently these ratios were applied to the other EU countries in order to obtain the missing employment numbers. In effect, this procedure assumes that the share of the five industries in total employment in the EU is the same as their average share in total employment for Italy, Spain and the UK.

²⁹ The five industries are: 90.01 *Performing arts*, 90.02 *Support activities to performing arts*, 90.03 *Artistic creation*, 91.01 *Library and recreation activities* and 93.29 *Other amusement and recreation activities*.

³⁰ Specifically, SBS data was missing for three 2-digit industries: 66 *Activities auxiliary to financial services and insurance activities*, 92 *Gambling and betting activities* and 93 *Sports activities and amusement and recreation activities*. For those three industries, employment data was obtained from LFS.

All in all, for the EU as a whole, SBS data was available for 313 of the 321 IPR-intensive industries, while data for the remaining 8 industries was completed by using the LFS (3 industries) or by imputation based on Member State data (5 industries), as described above.³¹

The basic source of data on the EU's external trade is Eurostat's COMEXT database. One difficulty with trade data is that it is organised on the basis of products rather than industries or economic activities. COMEXT, however, provides a "translation" through its Classification of Products by Activities (CPA 2008) nomenclature, which is consistent with the NACE classification used throughout this report. The CPA classification includes both goods and services.

In the case of some of the copyright-intensive industries, trade data was obtained from Eurostat's input-output database³² because it was not available in COMEXT. This was the case for the following NACE divisions:

- 58 Publishing activities
- 59 Motion picture, video and television programme, sound recording and music publishing activities
- 60 Programming and broadcasting activities
- 62 Computer programming, consultancy and related activities
- 63 Information service activities
- 73 Advertising and market research

Since all the classes in divisions 58, 59, 60 and 62 are copyright-intensive, the fact that trade data is only available at the 2-digit (division) level does not give rise to any methodological issues. However, divisions 63 and 73 each include one non-copyright intensive industry, 63.11 *Data processing, hosting and related activities* and 73.20 *Market research and public opinion polling*. While including these two industries slightly overstates the trade share of copyright-intensive industries, it has no impact on the overall share of IPR-intensive industries, because the two industries in question are both trade mark-intensive.

Because not all the products are tradable, the export/import data for certain NACE industries is missing from the trade statistics published by Eurostat. There are 99 IPR-intensive industries for which trade data is not reported in COMEXT. These industries are mainly in the wholesale, trade and service activities. For the remaining 222 IPR-intensive industries, trade data was available.

31 In theory, 8,667 data points (employment or value added for 321 industries for 27 Member States) were needed at the level of the Member States. However, 890 data points (10.3% of the total needed) were missing from the published Eurostat statistics, of which 642 were due to the absence of data for the Czech Republic and Malta. Some of the gaps were filled with assistance from Eurostat, while the others were closed by imputation.

32 http://epp.eurostat.ec.europa.eu/portal/page/portal/esa95_supply_use_input_tables/data/workbooks

4.2 Data matching for patents, trade marks and designs

In order to determine which industries are IP intensive, the OHIM register and the PATSTAT database were matched with the commercial database ORBIS, which contains industry classification and other information for more than 20 million European firms. The first step of the data preparation process (name harmonisation) was carried out using an algorithm developed at the Catholic University in Leuven (KUL) and further refined by the project team.³³ The second part, the actual matching of databases, was based on an original methodology developed by the project team. The firms in the three databases were matched using name, legal form, postal code and other criteria, in order to overcome the inherent difficulties resulting from inconsistencies in spelling, abbreviations, etc. between the different databases. Depending on the country, between 40-70% of OHIM and EPO owners are found in ORBIS. There are various reasons why not all patent, CTM or RCD owners can be found: ORBIS does not contain data on private individuals (who may be owners of IP rights), changes of name of applicants may not be communicated to OHIM and EPO, there may be errors or gaps in the ORBIS data or there are spelling differences that are not captured by the matching algorithms.

In order to ensure that no bias was introduced into the data by the inability to match some rights owners to the ORBIS database, an algorithm was developed to check that the frequency distribution of CTMs, RCDs and patents among the firms that were matched to ORBIS was as close as possible to the frequency distribution in the entire population of owners.³⁴ If the algorithm indicated that there was a difference between the matched and non-matched firms, a second, manual, matching exercise was carried out in order to ensure representativity.

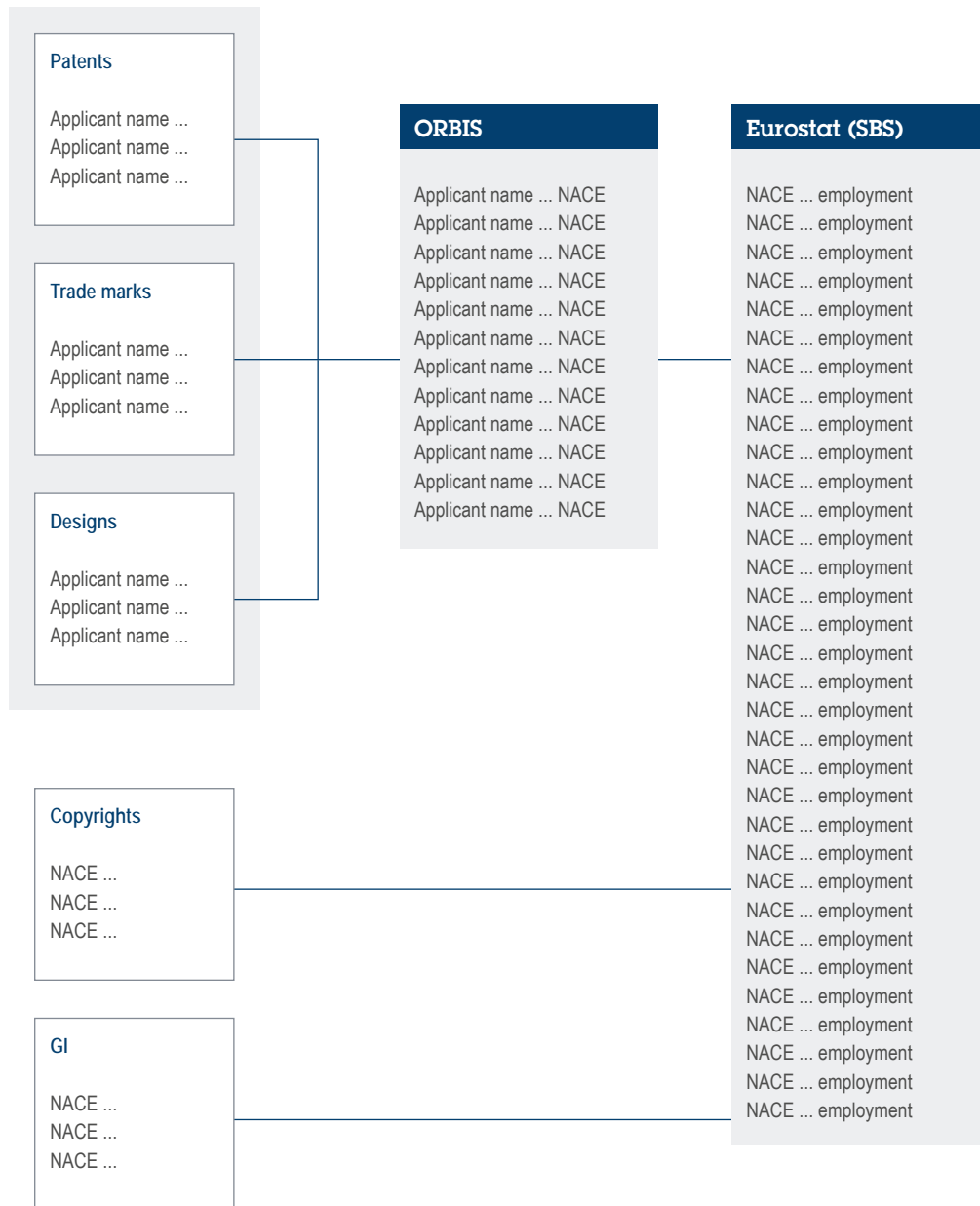
The end result of this was a matched database containing data for almost 240,000 companies (ORBIS ids) with the number of CTMs, RCDs and patents applied for by each company. Following the matching, the data was filtered to include only those applications filed during the period 2004-2008 and subsequently registered/granted. When combined with the industry classification (NACE) used by Eurostat, the data could be aggregated to show which *industries* own these IP rights, which could in turn be used to determine which industries are intensive in their use of trade marks, designs and patents.

Figure 3 illustrates the data-matching process in simplified form.

³³ For a detailed description of this step, see sections 9.1.1-9.1.3 in the Appendix.

³⁴ "Frequency distribution" here refers to the number of patents, trade marks or designs registered. In other words, this is the percentage of firms having registered one trade mark, two trade marks, three trade marks, and so on.

Figure 3: Representation of the data matching process



4.3 Identification of patent-intensive industries

This sub-section explains how the patent-intensive industries were identified. Intensity was determined at the EU level in two steps. First, the total number of European Patent Convention (EPC) patents for each industry was calculated. This is termed *absolute intensity*. Secondly, for each industry, the total number of patents was divided by the number of persons employed in that industry at the EU level, as reported by Eurostat in its Structural Business Statistics (SBS) series. The result is called the *relative intensity* of that industry. Finally, the overall employment-weighted average of relative patent intensities was calculated for all the industries that have patents. Those industries whose relative patent intensities were above this average value were considered to be patent-intensive.

In calculating the absolute intensity for patents, as well as for trade marks and designs, two important issues had to be dealt with. The first was the so-called *head offices*, i.e. the presence of general, non-specific industry codes in the ORBIS data, such as 7010 *Activities of head offices* and 6420 *Activities of holding companies*. This phenomenon reflects the common business practice of concentrating IP portfolios at the head offices of large companies. In order to avoid distorting the absolute intensity calculations, a procedure was developed and applied in order to allocate those IP rights to bona fide industry codes. This procedure is described in the Appendix, section 9.1.9.

Another data limitation, also common to patents, trade marks and designs, is the assignment in ORBIS of NACE codes at a higher level of aggregation than the 4-digit level used in the analysis. As in the case of the *head offices* issue, this problem was solved by re-allocating the IP rights within the division (2-digit level) or group (3-digit level).

4.3.1 Absolute intensity

1. The starting point for the calculation of absolute patent intensities was the PATSTAT database (version October 2011), which contains all published EPC applications. In total there were 3,525,852 records available in this database.
2. In the subsequent step, only applications with at least one applicant having its seat or domicile in an EU Member State were selected, yielding a total of 2,014,558 records. As noted above, this did not affect the identification of patent-intensive industries because patent intensity is a fundamental characteristic of an industry, independent of its geographical location or ownership.
3. Next, the applications that were filed between 1 January 2004 and 31 December 2008 were extracted, reducing the overall number of records to 684,953.
4. The dataset resulting from step 3 was then matched with the PATSTAT-ORBIS concordance table prepared during the matching procedure described in section 4.2.

The PATSTAT-ORBIS concordance table is comprised of records that were:

- matched automatically with the respective ORBIS id based on the normalised names (matching level 1);
- matched manually with the respective ORBIS id (matching level 2 and 3);
- matched manually with the NACE industry code corresponding to the activity of the applicant based on the information available in other data sources (matching level 4). This matching was limited to applicants that had not been matched with ORBIS in the previous stages.
- matched automatically with the NACE code derived using the NACE codes-patent classes concordance table³⁵ (matching level 5). This matching was limited to applicants that had previously been matched with ORBIS ids but for which there was no NACE class information available in ORBIS.

5. After eliminating records for which there was no NACE information after joining with the PATSTAT-ORBIS concordance table, 352,726 records were left for further analysis.
6. For each patent application, a fraction based on the number of applicants linked with it (*applicant's factor*) was computed, e.g. if there were 4 applicants based in the EU for a given application, the fraction $\frac{1}{4}$ was assigned to each applicant. Those fractional counts were applied only to those applications where the NACE codes for all multiple applicants were available. In other cases, for instance if there were two distinct applicants for a patent, one being a company with an identified NACE code and the other a natural person or a company with an unknown NACE code, the whole patent would be associated with the industry whose NACE code was identified.
7. The dataset was subsequently filtered to include only applications that were ultimately successful, leaving only the applications that were granted between 1 January 2004 and 8 February 2013. In other words, applications that had been filed but either refused or not yet granted as at February 2013 were not included in the analysis. Following the application of this filter, the dataset contained 94,471 records.
8. Subsequently, it was checked whether any of the applicants for each patent had its seat outside the EU. If so, the corresponding fraction of that patent was subtracted from the final fractional count for the application.
9. Next, the fractional counts for each unique NACE industry code present in the dataset were aggregated.

In the case of granted patents, the total number of unique application ids filed by at least one applicant having its seat in the EU between 1 January 2004 and 31 December 2008 was 100,967 (31,569 person ids). The NACE code was available for at least one applicant in the case of 91,289 unique application ids (21,740 person ids, 16,213 BvD ids), i.e. for 90.4% of all the applications filed during the time span of the analysis that were subsequently granted.

4.3.2 Relative intensity

Relative patent intensity is defined as the number of patents assigned to an industry, divided by the total employment figure for that industry. For presentation reasons, intensity is shown as the number of patents per 1000 employees.

A patent-intensive industry is defined as one in which the number of patents per 1000 employees is above the overall, employment-weighted average for all industries. In order to make this comparison, Eurostat employment data were matched with the database of absolute intensities by industry described in section 4.3.1.

As a first step, employment data at EU level for each industry was extracted from the SBS Eurostat table for the years 2008-2010.³⁶ Not all industries are covered for every year at the 4-digit (class) level. For some years, data is available at the group (3-digit) level, with data at the class level missing for just one industry within the group. In those cases, the value for the missing NACE class could be inferred by subtracting the aggregated value for all the available class codes from the group code. The resulting difference could then be treated as a value for the missing NACE class. The values thus inferred were added to the employment data available at the class level for further analysis.

Using this procedure, previously missing employment data was inferred for classes 22.11 and 22.22 for years 2008 and 2009, for class 77.35 for years 2009 and 2010 and for class 28.49 for 2008. Similarly, it was sometimes possible to infer employment data at the class level from the data available at the division level (2 digits). Data for class 52.10 was inferred in this manner.

In order to minimise the impact of missing data points for individual years, and to eliminate the peculiarities of any given year, the employment data used throughout the analysis is the *average employment for each class from the available data (2008-2010)*.³⁷ This approach is similar to that taken in the USPTO study. The alternative approach of choosing only one year, such as 2010, would result in more missing data points and thus more gaps that would need to be filled through imputation or inference. Even then, there were still 65 NACE classes present in the absolute patent-intensity ranking (out of a total of 501 classes) for which employment data was not available in SBS for any of the years 2008-2010.

When joining the data on absolute patent intensity with the employment figures from SBS, these missing data points were dealt with by conducting the analysis at the next higher level of aggregation for which data was available.

36 Specifically, variable V16110 from Eurostat's SBS database was used.

37 In other words, if data for, say, 2008 and 2009 are available, the figure used is the average of those two years. If data for 2008, 2009 and 2010 is available, the average of all three years is used. If data is only available for one of the three years, that figure is used.

Thus, for those NACE classes with missing employment data for all three years, the first step was to check whether data was available at the group level. If so, patent data would be aggregated up to the group level and joined with the employment data at the group level. Similarly, where employment data could not be used at either class level or group level, the patent data was grouped at the division level (2-digits) and matched with the employment data for the division. This procedure was necessary for division 35 because employment data was missing for class 35.21. It was not possible to infer data for this class as described above or to aggregate the data to the group level because employment data was missing for group 35.2. Therefore, the patent rights were aggregated to division level and matched with the employment data for this division.

There were 16 divisions in the patent ranking for which no SBS employment data was available. In those cases, employment data from another Eurostat source, the Labour Force Survey (LFS) was used. The methodology for calculating LFS employment figures is different from that for SBS statistics and the lowest level of data available for LFS is division (as opposed to class). For the purpose of this analysis, average LFS employment figures for 2008-2010 for the age group 15-64 years were used.

Upon close examination of the resulting data, it was apparent that several of the industries for which only LFS data was available had very few patents but a very high number of employees. These industries were principally in the public sector: public administration, education, health care and similar sectors.

Including those industries in the calculation of the overall, employment-weighted average patent intensity would lower the average, so that a higher number of industries would be classed as patent-intensive industries. In effect, the threshold for patent intensity would be set at a lower level and result in inclusion of more industries in the patent-intensive category.

Therefore, in order to avoid such a distortion of the results, it was decided to disregard the public sector industries when calculating the overall average value of patents per 1000 employees.³⁸ On the other hand, once the overall average value had been calculated, for the purpose of selecting the group of patent-intensive industries, all the NACE codes were considered (that is, their patent intensity was compared to the overall average), including those for which only LFS employment data was available. In the event, no industry for which only LFS employment data was available proved to be patent-intensive.

38 Specifically, the NACE codes excluded from the calculation of the overall average were divisions 84, 85, 86, 87 and 88.

4.4 Identification of trade mark-intensive industries

4.4.1 Absolute intensity

1. The starting point for the calculation of absolute trade mark intensities was OHIM's data warehouse, which contains data on all the CTM applications³⁹ filed directly with OHIM or international registrations (IR) filed via WIPO and designating the EU as one of the protection territories, regardless of their current status. At the end of January 2013, this database contained approximately 1.15 million records.
2. As for patents, the dataset was filtered to include only those applications that were filed between 2004 and 2008 (receiving date between 1 January 2004 and 31 December 2008), reducing the number of records to 381,990. Receiving date rather than filing date was used since the latter is not available for International Applications.
3. Furthermore, only applications with at least one applicant based in an EU Member State were selected, which reduced the number of records to 268,524.
4. The resulting dataset was then matched with the OHIM-ORBIS concordance table prepared during the matching procedure described in section 4.2 (see also step 4 in section 4.3.1).
5. In the next phase, trade mark applications that were never published were excluded, leaving the number of records at 245,030. After eliminating records for which information on the NACE code of the applicant was not available, the number of records was reduced to 175,388.
6. For each of those applications, the fraction based on the number of applicants linked with it (*applicant's factor*) was calculated, using the same protocol as described for patents in step 6 of section 4.3.1.
7. The dataset was subsequently filtered to include only the applications that were successful, i.e. the trade mark was subsequently registered. Given that the time from application to registration at OHIM can be as short as 6 months, this means in practice that the vast majority of the successful applications from 2004-2008 would have been registered by early 2013, with just a few still in opposition proceedings. This step resulted in the creation of the final dataset for further analysis, consisting of 159,020 unique trade mark applications.
8. It was then checked whether any of the applicants for each trade mark (in case of multiple applicants) had its seat outside the EU. If so, the corresponding fraction of that trade mark was subtracted from the final fractional count for the application.
9. In the next step, the fractional counts for each NACE industry code present in the dataset were aggregated.

The total number of unique trade marks application ids filed by at least one applicant having its seat in the EU between 1 January 2004 and 31 December 2008 and subsequently registered was 215,000 (106,795 unique owner ids). The NACE code was available for at least one applicant in 159,020 unique application ids (67,522 unique owners' ids, 61,367 unique ORBIS ids), that is, 74% of all granted applications filed during the time span of the analysis.

³⁹ For practical/computational reasons, the number of trade marks was actually represented by the number of NICE classes. The NICE classification is used to specify the goods and services to which a trade mark applies. On average, each CTM covers approximately 3 NICE classes.

4.4.2 Relative intensity

Relative trade mark intensity is defined as the number of trade marks assigned to an industry, divided by the total employment figure for that industry. For presentation reasons, intensity is shown as the number of trade marks per 1000 employees.

A trade mark-intensive industry is defined as one in which the number of trade marks per 1000 employees is above the overall, employment-weighted average for all industries. In order to make this comparison, Eurostat SBS employment data were matched with the database of absolute intensities by industry described in section 4.4.1.

As a first step, employment data at EU level for each industry was extracted from the SBS Eurostat table for the years 2008-2010 and the average for the three years (or any available subset of the three years) calculated. As was the case with the analysis of patents, employment data was missing for some classes. Where possible, the missing values were inferred using the procedure described in section 4.3.2 above. This still left 108 NACE classes present in the absolute trade mark-intensity ranking (out of a total of 596) for which no employment data was available in SBS for any of the years 2008-2010. As was done for patents, when joining the data on the absolute trade mark intensity with the employment figures from SBS, the missing data points were dealt with by conducting the analysis at the next higher level of aggregation for which data was available.

SBS employment data was not available at all for 18 divisions present in the trade mark ranking. In those cases the LFS data from Eurostat was used instead, as described in Section 4.3.2.

As was the case for patents, several of the industries for which only LFS data was available had very few trade marks but a very high number of employees. These industries were principally in the public sector: public administration, education, health care and similar sectors. As described in section 4.3.2, those industries were not included in the calculation of the overall average in order to avoid setting the threshold for trade mark intensity at a very low level and identifying a higher number of industries as trade mark-intensive. However, once the overall average value had been calculated, for the purpose of selecting the group of IPR-intensive industries, all the NACE codes were considered (that is, their trade mark intensity was compared with the overall average), including those for which only LFS employment data was available.

The following division-level industries for which only LFS employment data was available turned out to be trade mark-intensive: 66 (Activities auxiliary to financial services and insurance activities), 92 (Gambling and betting activities) and 93 (Sports activities and amusement and recreation activities).

4.5 Identification of design-intensive industries

The methodology for identifying the design-intensive industries was very similar to that used for trade marks, described in section 4.4 above.

4.5.1 Absolute intensity

1. The starting point for the calculation of absolute design intensities was OHIM's data warehouse. This database contains data on the all RCD applications⁴⁰ filed directly with OHIM and contained almost 700,000 records at the end of January 2013.
2. As for patents and trade marks, the dataset was filtered to include only those design applications filed between 2004 and 2008 (receiving date between 1 January 2004 and 31 December 2008), reducing the number of records to 341,450. Receiving date rather than filing date was used for consistency with the trade mark calculations. However, given that the time between filing a design and its registration is measured in days, this had no practical consequences.
3. Next, the designs which were never published were filtered out, reducing the dataset to 335,411 records. Design information is normally only published for registered designs (and only partially for deferred designs). This means that all published design applications are also registered, so it is unnecessary to distinguish between published and registered designs in the analysis. The resulting dataset was then matched with the OHIM-ORBIS concordance table, in the same way as for trade marks.
4. Limiting the applications only to those having at least one applicant based in an EU table Member State reduced the number of records to 294,285.
5. For each of those applications, a fraction based on the number of applicants linked with it (*applicant's factor*) was calculated, using same protocol as described for patents in step 6 of section 4.3.1. In contrast to trade marks, the number of Locarno classes for which the design was registered was not considered. This procedure is similar to the way patents were handled. Since designs are product-specific, the applicant's choice as regards the number of classes is limited. Therefore, the design right is always counted as one, regardless of the number of classes it covers.
6. After elimination of records for which no information on the NACE code of the applicant was available, the number of records was reduced to 239,561.
7. Subsequently, it was checked whether any of the applicants for each design (in the case of multiple applicants) had its seat outside the EU. If so, the corresponding fraction of that design was subtracted from the final fractional count for the application.
8. In the next step, the fractional counts for each NACE industry code present in the dataset were aggregated. In total, 626 unique industry codes were linked to registered designs.

⁴⁰ OHIM allows the filing of multiple designs in one application, so the term "design application" as used in this report refers to an individual design in an application, not the application itself, which may contain several designs.

The NACE code information for at least one owner was found for 216,825 of the total of 262,101 unique design ids (31,834 owner ids), i.e. more than 82% of all registered designs filed within the time span of the analysis (18,073 owner ids and 16,346 ORBIS ids).

4.5.2 Relative intensity

Once the absolute intensity for designs had been calculated, the methodology used to calculate relative intensity was the same as for patents and trade marks.

After matching the absolute intensity data with the employment data from Eurostat's SBS series, and making the inferences for missing data as described in section 4.3.1, there were still 75 NACE classes present in the absolute design-intensity ranking for which no employment data was available in SBS for the years 2008-2010.

As was the case for trade marks, SBS employment data was not available at all for 18 divisions present in the design ranking. As described in section 4.3.2, in those cases the LFS data from Eurostat was used instead, and certain industries with very high employment but very few designs were excluded from the calculation of the overall average (but included in the comparison to determine relative intensity). None of the industries for which only LFS employment data was available turned out to be design-intensive.

4.6 Identification of copyright-intensive industries

Unlike for trade marks, patents and designs, the IPR intensity (number of rights per 1000 employees) cannot be calculated for copyright because copyright is not registered. Copyright registries do exist in some EU Member States, but their use is not mandatory in order to exercise the legal rights, and there is no EU-level registry. The situation in the US is similar, and hence the approach used to overcome this difficulty is similar to that used by the USPTO in its 2012 study: an adaptation of a methodology developed by the World Intellectual Property Organization (WIPO) and documented in its *“Guide on Surveying the Economic Contribution of the Copyright-based Industries”* published in 2003.⁴¹

The WIPO guidelines group industries into four categories according to the degree to which their activity depends on copyright: core copyright industries, inter-dependent industries, partial copyright industries and non-dedicated support industries.

Core copyright industries, as defined by WIPO, include:

- Press and literature
- Music, theatrical productions, operas
- Motion picture and video
- Radio and television
- Photography
- Software and databases
- Visual and graphic Arts
- Advertising services
- Copyright collecting societies

Some examples of inter-dependent industries are the manufacture of TV sets or musical instruments; partial copyright industries include furniture or museums, while non-dedicated support industries are, for example, general wholesale and transportation.

The most recent adaptation of the WIPO methodology was by the USPTO in its 2012 study. The difference between the WIPO methodology and the adapted USPTO method is that the latter is based on a stricter approach to the definition of core copyright-intensive industries and does not cover inter-dependent, partial or non-dedicated support industries.

Specifically, in the core industries category, the WIPO Guide clearly distinguishes the types of works that can be copyrighted, the industries in which those works are created, and the distribution industries delivering the produced copyrighted works to the public. It defines core copyright industries as *“wholly engaged in creation, production and manufacturing, performance, broadcast, communication and exhibition, or distribution and sales of works and other protected subject matter.”* The underlying idea is that core copyright industries as a category would not exist or would be significantly different without copyright in works.

41 This methodology is referred to in the following as the “WIPO methodology”.

The USPTO, however, adopted an even stricter approach in defining the set of industries that could be defined as core copyright-intensive, considering only the industries primarily responsible for the *creation and production* of copyrighted materials. It thus excluded industries whose primary purpose is to distribute copyright materials to businesses or consumers. Industries that are only engaged in distribution of copyright works but do not create content, such as record shops, are therefore generally not included. However, there are exceptions. For example, the newspaper industry is involved in both the production and distribution of copyrighted materials since both functions are often performed within a single business establishment which creates *and* distributes copyrighted works.

Table 7 lists the copyright-intensive industries as used in the USPTO study.

Table 7: Copyright-intensive industries

NAICS ⁴²	NAICS description
5111	Newspaper, periodical, book, and directory publishers
5112	Software publishers
5121	Motion picture and video industries
5122	Sound recording industries
5151	Radio and television broadcasting
5152	Cable and other subscription programming
5191	Other information services (news syndicates and internet sites)
5414	Specialized design services (visual and graphic arts)
5415	Computer systems design and related services (software and databases)
5418	Advertising, public relations, and related services
5419	Other professional, scientific, and technical services (photography and translation)
7111	Performing art companies
7115	Independent artists, writers, and performers

Source: Intellectual Property and the U.S. Economy: Industries in Focus (USPTO, 2012).

In the present study, in order to ensure that the results are comparable with those obtained by the USPTO, and to arrive at prudent, conservative estimates, the analysis in Chapter 6 is based on the stricter USPTO approach. However, calculations performed according to the standard WIPO approach are shown in the Appendix 10.

According to the strict USPTO approach, the industries listed in table 7 are considered copyright-intensive. However, in order to be able to match this list of core copyright-intensive industries to the employment and value added statistics provided by Eurostat, it had to be “translated” from NAICS to the European classification system NACE.

42 NAICS (North American Industry Classification System) is the US equivalent to the European NACE classification of economic activity.

Eurostat has drawn up a correspondence table for the two taxonomies.⁴³ However, there is no straightforward equivalence between the NAICS and NACE industry classifications. Several issues complicated the conversion:

- Lack of one-to-one correspondence between the two classifications. Several NAICS codes might correspond to one NACE code, and vice versa.
- Different levels in the correspondence table. The Eurostat correspondence table is based on the conversion from NAICS (6 digits) to NACE (4 digits).

Therefore, in order to create the final list of copyright-intensive industries on the basis of the NACE classification, it was necessary to carry out a detailed analysis of the NAICS description of the industries in order to determine which NACE industry codes provided the closest match.

Table 8 shows the correspondence between NAICS and NACE for the copyright-intensive industries. For each NAICS industry present in the USPTO list of copyright-intensive industries, the corresponding NACE industry is shown, along with an indicator showing whether the NACE sector in question was included in this study. A total of eight NACE codes were excluded to ensure that account was not taken of industries such as 6910 (Legal activities) or 7500 (Veterinary activities) which appeared in the list after the NAICS-NACE conversion (because they are part of NAICS 5419 *Other professional, scientific and technical services*) but could not be considered copyright-intensive if the WIPO logic was applied to the activities covered by these NACE classes.

43 http://ec.europa.eu/eurostat/ramon/miscellaneous/index.cfm?TargetUrl=DSP_NACE_2_US_NAICS_2007

Table 8: Copyright-intensive industries (NAICS-NACE correspondence)

NAICS code	NAICS description	NACE code	NACE description	Included (1=yes, 0=no)
5111	Newspaper, periodical, book, and directory publishers	58.11	Book publishing	1
		58.12	Publishing of directories and mailing lists	1
		58.13	Publishing of newspapers	1
		58.14	Publishing of journals and periodicals	1
		58.19	Other publishing activities	1
5112	Software Publishers	58.21	Publishing of computer games	1
		58.29	Other software publishing	1
5121	Motion Picture and Video Industries	59.11	Motion picture, video and television programme production activities	1
		59.12	Motion picture, video and television programme post-production activities	1
		59.13	Motion picture, video and television programme distribution activities	1
		59.14	Motion picture projection activities	1
5122	Sound Recording Industries	59.20	Sound recording and music publishing activities	1
5151	Radio and Television Broadcasting	60.10	Radio broadcasting	1
		60.20	Television programming and broadcasting activities	1
5152	Cable and Other Subscription Programming	61.20	Wireless telecommunications activities	1
5191	All Other Information Services	63.12	Web portals	1
		63.91	News agency activities	1
		63.99	Other information service activities n.e.c.	1
		91.01*	Library and archives activities	1
5414	Specialized Design Services	74.10	Specialised design activities	1
5415	Computer Systems Design and related Services	62.01	Computer programming activities	1
		62.02	Computer consultancy activities	1
		62.03	Computer facilities management activities	1
		62.09	Other information technology and computer service activities	1
5418	Advertising, Public relations and related services	70.21	Public relations and communication activities	1
		73.11	Advertising agencies	1
		73.12	Media representation	1
5419	Other Professional, Scientific, and Technical Services	69.10	Legal activities	0
		73.20	Market research and public opinion polling	0
		74.20	Photographic activities	1
		74.30	Translation and interpretation activities	1
		74.90	Other professional, scientific and technical activities n.e.c.	0
		75.00	Veterinary activities	0
		80.30	Investigation activities	0
88.99*	Other social work activities without accommodation n.e.c.	0		
7111	Performing Art Companies	90.01*	Performing arts	1
		90.02*	Support activities to performing arts	1
		93.29*	Other amusement and recreation activities	1
7115	Independent Artists, Writers, and Performers	90.03*	Artistic creation	1
		32.99	Other manufacturing n.e.c.	0
		33.19	Repair of other equipment	0

* no data in Eurostat SBS

EU-level employment and Gross Value Added (GVA) data for the copyright-intensive industries was obtained from Eurostat's SBS dataset. However, for five industries, it has no data on either employment or value added. These industries, marked with an asterisk in the table, include important activities such as performing arts, amusement and recreation activities, and support activities to performing arts. In order to include these activities in the study, data for those sectors was obtained from the national statistics offices of France, Italy, Spain and the United Kingdom.⁴⁴ By comparing the employment and value added for the sectors in question in those four countries to total employment and value added in those countries, ratios were obtained which can reasonably be assumed to be representative of the EU as a whole. Those ratios were then used to impute EU-level employment and GVA data for those industries.

4.7 Identification of GI-intensive industries

Geographical Indications, like designs, are covered by this study but were not included in the USPTO study (2012).

GIs have two important characteristics which had to be considered when devising the methodology:

- GIs are not owned by private parties; they are usually applied for by regional producer associations. This means that there are no comparable databases that could be used for matching right holder information with economic information. In this respect, there is a certain similarity between GIs and copyright, for which the approach likewise entails applying a pre-defined set of industries (defined by WIPO in that case). The set of industries to be considered in the context of GIs is determined by the relevant EU regulations and sources of information provided by the regulator, in this case the European Commission, more specifically DG AGRI.
- The proportion of a given NACE class corresponding to GIs varies significantly from one Member State to another.⁴⁵ This means that the same industry can be GI-intensive in one Member State but not in another. This is in contrast to the other four IP rights included in this study, for which the intensity in any given industry is a function of the inherent characteristics of that industry, and it can therefore be safely assumed that if a particular industry is, say, patent-intensive in one country, it will also be patent-intensive in other countries. This assumption, however, cannot be made for GIs, and GI-related employment and value added must be quantified on a country-by-country basis.

Furthermore, GI industries are often vertically integrated. For example, GI wine designation (by far the most important GI sector) is based on the grapes having been grown and processed in the particular area. This means, as will be discussed further in Chapter 5, that input-output tables are unsuitable for calculating indirect employment generated by GI industries; in fact, the employment figures for those industries already include both direct and indirect employment.

⁴⁴ Attempts were made to obtain such data from other Member States too, but many national statistical offices simply do not have this kind of data.

⁴⁵ For example, about 25% of German beer sales are protected by GI, while virtually no Belgian beer uses this IP right.

There were 2768 GIs in the EU in 2010, defined in four separate regulations:

- 56.4% related to wines⁴⁶
- 31.3% related to agricultural products and foodstuffs⁴⁷
- 12.2% related to spirits⁴⁸
- 0.1% related to aromatised wines⁴⁹

More than 80% of GI products are registered in six member states: Italy, France, Spain, Greece, Portugal and Germany. GIs are mainly a European phenomenon, although their use in countries outside the EU is increasing.

The GI-intensive industries were identified, and their value added and employment subsequently calculated, on the basis of a study published by DG AGRI in 2012, entitled “Value of production of agricultural products and foodstuffs, wines, aromatised wines and spirits protected by geographical indication (GI)”,⁵⁰ coupled with data from Eurostat and other sources, as described below.

The DG AGRI study calculates the volume and sales of GI-products by product and by Member States. For the EU as a whole, GI products account for 5.7% of all food and drink sales, with significant variation among Member States, as shown in table 9. Note that while all Member States have GIs, some are not shown in the table, because they do not appear in the DG AGRI data. Presumably, those GIs have insignificant sales volumes and their absence from the data does not affect the overall conclusions.

In order to estimate the employment and value added attributable to GI in each Member State, a factor for each industry and each Member State was calculated, showing the percentage of industry sales accounted for by GIs. Since the DG AGRI study does not include data on total sales by industry, turnover data from Eurostat was used to calculate this sales ratio. In other words, the factor by country and by product was computed by dividing the *sales of GIs* from the DG AGRI report by the *turnover for total product (GI+non-GI)* from Eurostat SBS. This ratio was then applied to employment and value added data from SBS in order to calculate the number of jobs and the value added supported by GIs.⁵¹

46 Reg. (EC) No. 1234/2007

47 Reg. (EEC) No. 510/2006

48 Reg. (EC) No. 110/2008

49 Reg. (EC) No 491/2009

50 http://ec.europa.eu/agriculture/external-studies/value-gi_en.htm

51 The underlying assumption is that the value-added and employment ratios between GI and non-GI products are the same as the ratio between GI and non-GI in sales. This may not be accurate, given that GI products usually command a price premium over non-GI products. On the other hand, GI products may also cost more to produce, which would, at least partially, offset this error.

Table 9: GI sales by country, 2010

Country	Total sales of food and drink industry (€ million)	Of which GI (€ million)	GI share
FR	143,600	20,854	14.5%
IT	124,000	11,806	9.5%
GR	11,100	1,058	9.5%
PT	14,000	1,158	8.3%
AT	11,600	932	8.0%
HU	7,400	496	6.7%
UK	88,900	5,506	6.2%
ES	80,700	4,578	5.7%
SK	3,600	165	4.6%
DE	151,800	5,728	3.8%
RO	9,800	268	2.7%
IE	22,200	607	2.7%
BG	4,100	99	2.4%
CZ	10,600	242	2.3%
LT	2,900	23	0.8%
NL	59,800	105	0.2%
BE	39,000	45	0.1%
EU total	956,200	54,346	5.7%

Source: DG AGRI (2012)

The most important GI industry, wine, required special treatment, because Eurostat does not publish SBS statistics for primary sectors, such as agriculture. Therefore, data for value added and employment for NACE 01.21 (growing of grapes) had to be obtained from other sources. Specifically, employment in the industry was estimated on the basis of Farm Structure Survey (FSS) data from Eurostat. Production was taken from another Eurostat data series: Economic Accounts for Agriculture (EAA). Subsequently, the value added/turnover ratio for NACE 11.02 (manufacture of wine) from SBS was applied to the sum of 01.21 and 11.02 production to arrive at an estimate of value added related to wine production.⁵²

⁵² Here again, it is assumed that the turnover/production ratio for the wine industry is the same in Economic Accounts for Agriculture (EAA) as in SBS.

4.7.1 Contribution of GIs to external trade

Exports

The DG AGRI study referred to above contains data on exports by country and by GI industry in 2010, based on DG AGRI's own data and COMEXT, Eurostat's reference database on external trade. This data is used in the presentation of the results in Chapter 5.

Imports

While exports of GI products from the EU to non-EU countries are easy to define, deciding what constitutes a "GI import" is more difficult. This is because, strictly speaking, in 2010, the EU only recognised three GIs (Protected Designations of Origin) from outside the EU: Napa Valley wine from California, Vale dos Vinhedos wine from Brazil and Café de Colombia. However, the EU has bilateral agreements with a total of 11 countries which provide protection essentially equivalent to GIs for a number of wine products.⁵³ There is also an agreement with Mexico on spirits, as well as a number of agreements with other countries. However, only wine from a subset of the 11 countries, tequila from Mexico and coffee from Colombia are significant in terms of import volumes.⁵⁴ In general, while numerous agreements have been signed with non-EU countries since 2010, they were not in effect during the period considered in this study and the resulting trade flows were therefore not included in the analysis.

The COMEXT database provides information on wine imports by country of origin, but does not distinguish between wines covered by a bilateral agreement and those that are not. However, wine export statistics from Chile indicate that 77% of that country's wine exports are GIs, which can be considered a good estimate of the corresponding figure for the EU's wine imports.

Since, by definition, one jurisdiction's exports are another jurisdiction's imports, it is reasonable to assume that the share of GI wine in Europe's wine imports from non-EU countries corresponds to the share of GI wine in Chile's wine exports. The overall wine import figures from the 12 countries mentioned were therefore multiplied by 0.77. Imports of tequila from Mexico and coffee from Colombia were added to the result to arrive at an overall estimate of GI imports into the EU.

53 The 11 countries are: Albania, Australia, Bosnia and Herzegovina, Canada, Chile, Georgia, Montenegro, Serbia, South Africa, Switzerland and the US. The agreement with Switzerland also covers food (various types of cheese) but that part of the agreement did not come into effect until late 2011. The agreement with Georgia came into effect in 2012.

54 The EU also imports significant quantities of wine from countries such as Argentina or New Zealand, but as no bilateral agreements have been concluded with those countries, these imports were not counted as "GI imports."

05 / IPR-intensive industries at EU level

This chapter presents the main results of the analysis described in Chapter 4: the identification of IPR-intensive industries at EU level, separately for each of the five IP rights considered in this study, and in terms of overall IPR-intensity, i.e. taking the simultaneous use of more than one IP right into account.

5.1 Patent-intensive industries

All in all, 449 industries in the matched database filed successful patent applications during the period 2004-2008. Of those, 140 industries are patent-intensive, i.e. have an average number of patents per 1000 employees that exceeds the overall average of 0.69.

Table 10 shows the 20 most patent-intensive industries. The full list of patent-intensive industries is in Appendix 9.2. To indicate the size of each of the top 20 industries, the total employment generated by the industry (at EU level) is also shown.

Table 10: The 20 most patent-intensive industries

NACE code	NACE description	Total employment *	Patents/1000 employees
28.24	Manufacture of power-driven hand tools	25.500	109,74
77.40	Leasing of intellectual property and similar products, except copyrighted works	16.150	69,23
21.10	Manufacture of basic pharmaceutical products	54.600	27,57
20.59	Manufacture of other chemical products n.e.c.	130.250	19,08
72.11	Research and experimental development on biotechnology	46.750	15,64
26.70	Manufacture of optical instruments and photographic equipment	51.100	13,67
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	342.900	13,35
27.51	Manufacture of electric domestic appliances	213.150	13,12
28.91	Manufacture of machinery for metallurgy	52.350	12,33
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	49.250	12,26
28.94	Manufacture of machinery for textile, apparel and leather production	66.100	9,84
72.19	Other research and experimental development on natural sciences and engineering	400.650	9,65
24.45	Other non-ferrous metal production	19.100	9,56
26.30	Manufacture of communication equipment	245.050	9,35
26.11	Manufacture of electronic components	241.950	8,51
06.20	Extraction of natural gas	25.250	8,51
30.99	Manufacture of other transport equipment n.e.c.	6.100	7,99
20.11	Manufacture of industrial gases	38.600	7,77
28.95	Manufacture of machinery for paper and paperboard production	40.500	7,58
30.40	Manufacture of military fighting vehicles	11.400	7,58

* rounded to nearest 50

The list of patent-intensive industries is dominated by manufacturing activities (often referred to as the secondary sector), accounting for 16 of the top 20 industries. There are three service industries (tertiary sector) on the list, including two research-related industries and industry 77.4, which covers activities such as licensing and managing IP portfolios. There is one primary sector industry, natural gas extraction, among the 20 most patent-intensive industries.

5.2 Trade mark-intensive industries

All in all, 501 industries use trade marks, of which 277 are trade mark-intensive, i.e. have an average number of trade mark classes per 1000 employees that exceeds the overall average of 3.16.

Table 11 shows the 20 most trade mark-intensive industries. The full list of trade mark-intensive industries is in Appendix 9.3. To indicate the size of each of the top 20 industries, the total employment generated by the industry (at EU level) is also shown.

Table 11: The 20 most trade mark-intensive industries

NACE code	NACE description	Total employment *	Trade marks/ 1000 employees
77.40	Leasing of intellectual property and similar products, except copyrighted works	16.150	212,22
21.10	Manufacture of basic pharmaceutical products	54.600	38,81
11.02	Manufacture of wine from grape	106.150	38,78
72.11	Research and experimental development on biotechnology	46.750	35,91
20.42	Manufacture of perfumes and toilet preparations	136.750	32,40
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	49.250	27,08
30.99	Manufacture of other transport equipment n.e.c.	6.100	26,63
32.40	Manufacture of games and toys	52.000	26,21
32.30	Manufacture of sports goods	42.500	25,52
61.90	Other telecommunications activities	332.000	25,46
58.21	Publishing of computer games	9.100	25,05
11.01	Distilling, rectifying and blending of spirits	75.400	24,47
59.13	Motion picture, video and television programme distribution activities	24.150	24,35
63.12	Web portals	39.650	24,32
17.24	Manufacture of wallpaper	5.650	23,42
24.45	Other non-ferrous metal production	19.100	22,70
32.99	Other manufacturing n.e.c.	140.550	22,54
10.73	Manufacture of macaroni, noodles, couscous and similar farinaceous products	49.650	22,17
18.11	Printing of newspapers	30.400	21,51
59.20	Sound recording and music publishing activities	37.750	21,26

* rounded to nearest 50

As is the case for patents, manufacturing (or secondary) industries are prominent in the top 20 list for trade marks, occupying 13 of the 20 spots. The remaining 7 industries on the list belong to the service sector (tertiary industries).

5.3 Design-intensive industries

All in all, 470 industries use designs, and 165 of them are design-intensive, i.e. have an average number of designs per 1000 employees that exceeds the overall average of 1.61.

Table 12 shows the 20 most design-intensive industries. The full list of design-intensive industries is in Appendix 9.4. To indicate the size of each of the top 20 industries, the total employment generated by the industry (at EU level) is also shown.

Table 12: The 20 most design-intensive industries

NACE code	NACE description	Total employment *	Designs/ 1000 employees
26.52	Manufacture of watches and clocks	9.950	90,68
77.40	Leasing of intellectual property and similar products, except copyrighted works	16.150	78,59
25.71	Manufacture of cutlery	19.750	70,23
23.41	Manufacture of ceramic household and ornamental articles	66.850	66,24
46.48	Wholesale of watches and jewellery	54.650	39,80
27.40	Manufacture of electric lighting equipment	173.300	39,18
28.24	Manufacture of power-driven hand tools	25.500	36,98
14.11	Manufacture of leather clothes	14.500	35,52
32.30	Manufacture of sports goods	42.500	30,79
27.51	Manufacture of electric domestic appliances	213.150	29,08
32.40	Manufacture of games and toys	52.000	26,25
28.14	Manufacture of other taps and valves	138.600	25,21
23.49	Manufacture of other ceramic products	8.400	24,36
32.99	Other manufacturing n.e.c.	140.550	23,70
23.42	Manufacture of ceramic sanitary fixtures	30.950	23,05
46.47	Wholesale of furniture, carpets and lighting equipment	145.900	22,17
30.99	Manufacture of other transport equipment n.e.c.	6.100	22,13
25.72	Manufacture of locks and hinges	157.850	21,57
46.42	Wholesale of clothing and footwear	394.150	19,66
17.22	Manufacture of household and sanitary goods and of toilet requisites	79.800	17,08

* rounded to nearest 50

Design-intensive industries are also mostly in the manufacturing (secondary) sector of the economy, with 16 of the top 20 spots. The remaining four are occupied by service industries, including three wholesale industries. As was the case for patents and trade marks, sector 77.4 is also one of the most design-intensive industries.

5.4 Copyright-intensive industries

Table 13 lists the 33 copyright-intensive industries included in this study. All these industries are involved in the creation and/or recording (in print, magnetically or digitally) of copyright-protected works. To indicate the size of each industry, the total employment it generates (at EU level) is also shown.

Table 13: Copyright-intensive industries

NACE code	NACE description	Total employment *
58.11	Book publishing	317.150
58.12	Publishing of directories and mailing lists	231.500
58.13	Publishing of newspapers	164.000
58.14	Publishing of journals and periodicals	13.300
58.19	Other publishing activities	76.600
58.21	Publishing of computer games	9.100
58.29	Other software publishing	129.000
59.11	Motion picture, video and television programme production activities	224.350
59.12	Motion picture, video and television programme post-production activities	24.150
59.13	Motion picture, video and television programme distribution activities	231.500
59.14	Motion picture projection activities	39.950
59.20	Sound recording and music publishing activities	37.750
60.10	Radio broadcasting	71.650
60.20	Television programming and broadcasting activities	180.750
61.20	Wireless telecommunications activities	199.550
62.01	Computer programming activities	39.000
62.02	Computer consultancy activities	147.450
62.03	Computer facilities management activities	39.650
62.09	Other information technology and computer service activities	72.150
63.12	Web portals	191.300
63.91	News agency activities	986.750
63.99	Other information service activities n.e.c.	994.600
70.21	Public relations and communication activities	162.800
73.11	Advertising agencies	388.500
73.12	Media representation	797.900
74.10	Specialised design activities	89.650
74.20	Photographic activities	149.000
74.30	Translation and interpretation activities	152.000
90.01	Performing arts	85.800
90.02	Support activities to performing arts	266.950
90.03	Artistic creation	61.000
91.01	Library and archives activities	397.800
93.29	Other amusement and recreation activities	220.950

* rounded to nearest 50

All copyright-intensive industries belong to the service (tertiary) sector of the economy.

5.5 GI-intensive industries

The methodology used to identify the GI-intensive industries was to some extent analogous to the WIPO methodology used to identify the copyright-intensive sectors. The data from DG AGRI showed that the core GI-intensive industries are:

Table 14: GI-intensive industries

NACE code	NACE description	Total employment *
10.51	Operation of dairies and cheese making	325,200
11.01	Distilling, rectifying and blending of spirits	75,400
11.02	Manufacture of wine from grape (including part of 01.21 <i>Growing of grapes</i>)	106,150
11.05	Manufacture of beer	127,150

* rounded to nearest 50

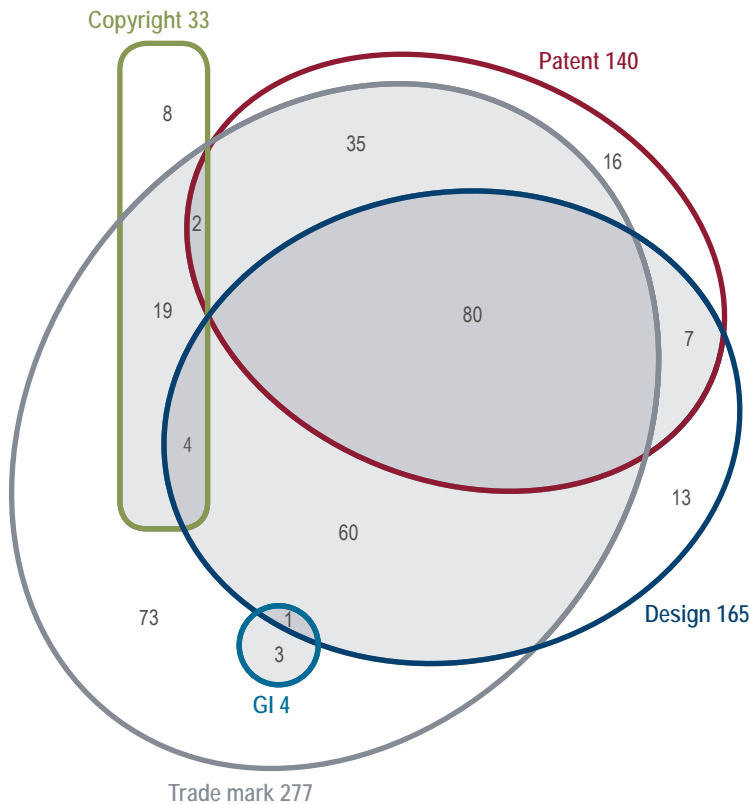
Analogously to the industries considered copyright-intensive, the above industries are responsible for the *production* of GI-labelled goods but not for wholesale or retail distribution. All four GI-intensive industries belong to the manufacturing (secondary) sector. Part of the primary sector 01.21 is also included.

The table also shows total employment at EU level to indicate the overall size of each industry. However, as explained in section 4.7 above, because of the special nature of GIs, only part of that employment is defined as GI-intensive.

5.6 All IPR-intensive industries

It can be seen from the results that many industries are intensive in more than one of the IP rights analysed. For example, 0610 *Extraction of crude petroleum* makes intensive use of both trade marks and patents, while 1032 *Manufacture of fruit and vegetable juice* is an intensive user of both trade marks and designs. Some industries, for example 1083 *Processing of tea and coffee*, intensively use trade marks, designs and patents. Most of the copyright-intensive industries are also trade mark-intensive, and all four GI-intensive industries are trade mark-intensive as well. Table 27 in Appendix 8 summarises the preceding sections by listing all 321 IPR-intensive industries and indicating the IP rights used intensively by each industry. The overlaps are summarised in the diagram of figure 4.

Figure 4: Overlap in IPR-intensive industries



Trade marks are used by most of the industries (277 out of 321). Patents tend to be used more intensively in the manufacturing sector. Eighty industries are intensive in patents, trade marks and designs. Other significant overlaps are between trade marks and designs (60 industries) and between trade marks and patents (35 industries).

Conversely, some industries use only one of the analysed IP rights intensively. Thus, 73 industries are only trade mark-intensive, 16 are only patent-intensive, 13 are only design-intensive and 8 are only copyright-intensive. All four GI-intensive industries also make intensive use of trade marks, and one of them is also design-intensive.

It is worthwhile to examine more closely the industries that are intensive in only one of the IP rights considered, since such industries can be considered to reflect the contribution of that particular IP right as opposed to IPR in general. Of the 73 industries that are exclusively trade mark-intensive, 4 are in the primary sector, 24 in the secondary sector (manufacturing) and the remaining 45 in the tertiary sector (services). Broadly speaking, the 73 exclusively trade mark-intensive industries do not differ significantly from the larger group of 277 trade mark-intensive industries that also use another IP right intensively.

The 16 industries that are exclusively patent-intensive are concentrated in manufacturing, energy and technical services. Examples of such industries include 0620 (extraction of natural gas), 2731 (manufacture of fibre optic cables) and 7120 (technical testing and analysis). What these industries have in common is that they sell their products and services to other industries, not to end consumers.

The 13 exclusively design-intensive industries are concentrated in manufacturing and services, including, for example, 3102 (manufacture of kitchen furniture), 4759 (retail sale of furniture) and 4777 (retail sales of watches). As a group, these 13 industries market their products and services to both businesses and consumers.

The 8 industries that are only copyright-intensive are: 5813 (publishing of newspapers), 5914 (motion picture projection), 7420 (photographic activities), 7430 (translation and interpretation), 9001 (performing arts), 9002 (support activities to performing arts), 9003 (artistic creation) and 9101 (library and archives activities).

To prevent double-counting, the fact that some IPR-intensive industries use multiple rights intensively was taken into account when quantifying their employment and value added contributions in Chapter 6.

06 / Contribution of IPR-intensive industries to the EU economy

6.1 Contribution to employment, GDP and trade at EU level

The preceding chapter explained how the industries that use IP rights intensively were identified. In order to calculate the contribution made by those industries in terms of employment, GDP and external trade to the economy of the EU as a whole and to the economies of the individual Member States, the list of IPR-intensive industries was combined with data from Eurostat and, where necessary, other EU or national sources.⁵⁵

6.1.1 Employment

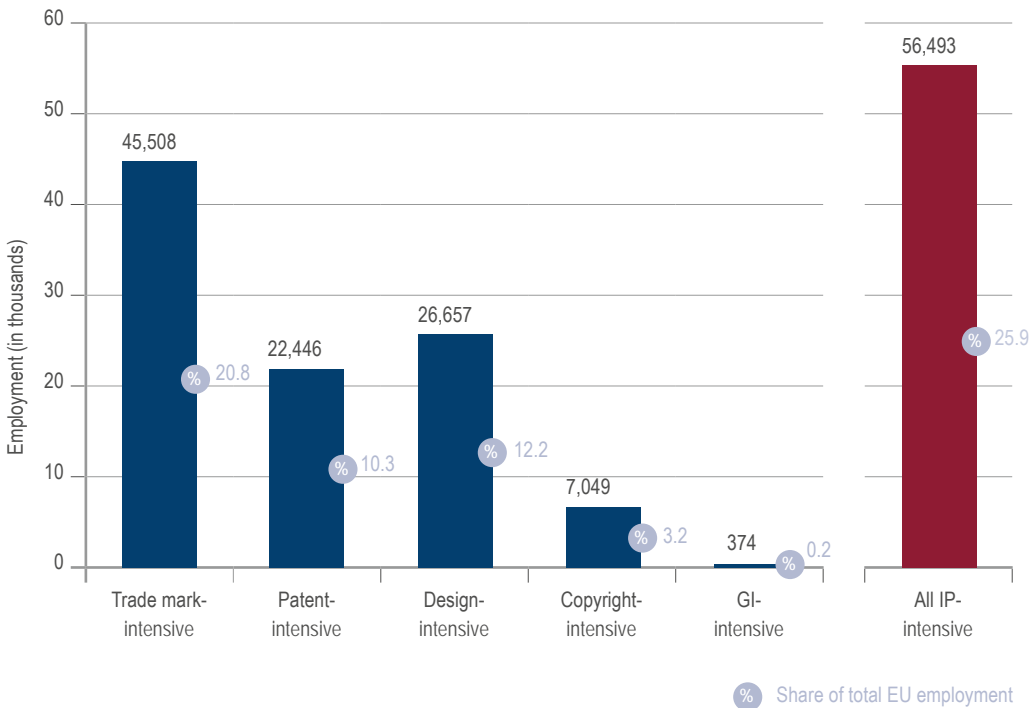
In total, approximately 218 million people are employed within the EU.⁵⁶ A significant proportion of these jobs, about 50 million, are in the public sector, e.g. health care, education and administration.

Figure 5 shows the share of IPR-intensive industries in EU employment for each of the five IP rights.

55 In particular, as discussed in section 4.7, in the case of GIs, extensive use was made of information from agricultural statistics published by DG AGRI. In addition, in the case of copyright, Eurostat data was supplemented with data from several national statistical offices.

56 The definition of “employment”, as used by Eurostat and other statistical agencies, is as follows: employed persons are persons, aged 15 and over (with some country-specific exceptions), who, during the reference week, performed work, even for just one hour a week, for pay, profit or family gain, or who were not at work but had a job or business from which they were temporarily absent because of illness, holidays, industrial dispute or education and training.

Figure 5: Employment in IPR-intensive industries



Thus, IPR-intensive industries account for more than 56 million jobs, or 26% of total employment, in the EU.⁵⁷ Almost 21% of those jobs are in trade mark-intensive industries, 12% are in design-intensive industries, 10% in patent-intensive industries, with lower percentages for copyright-intensive and GI-intensive industries.

As noted above, many industries are IPR-intensive in respect of more than one IP right. Therefore, to avoid double-counting, total employment in all IPR-intensive industries is less than the sum of the individual employment figures for each IP right. In other words, for the purpose of calculating employment in all IPR-intensive industries, each industry was counted only once, even if it used more than one IP right intensively.

6.1.2 Indirect employment

Besides the direct employment shown above, IPR-intensive industries generate employment in non-IPR intensive industries which supply them with goods and services as inputs. In order to calculate this indirect effect on employment in non-IPR intensive industries, the EU27 Input-Output Tables, published by Eurostat, were used. These tables provide information for 65 industries at the level of divisions (NACE 2-digits level).⁵⁸

57 The comparable figure for the US, as reported in the USPTO study, is 19%.

58 The information provided includes the supply and use tables, symmetric Input-Output tables (domestic and total), and input coefficient matrixes and Leontief inverse matrixes (likewise domestic and total). In this context, "domestic" refers to intra-EU supply relationships.

In order to calculate indirect employment, the IPR-intensive industries were aggregated to the 65 divisions provided by the input-output framework. Some of these 65 divisions are completely intensive if all the 4-digit level industries (classes) comprising the division are IPR-intensive. For instance, all 16 classes included in the division *Chemicals and chemical products* are considered trade mark-intensive and all 6 classes of the division *Rubber and plastic products* are patent-intensive. However, other divisions are only partially IPR-intensive because they contain both IPR-intensive and non-IPR intensive industries. For such partially IPR-intensive divisions, information was available on total employment in the division and the share of employment accounted for by the IPR-intensive industries within the division. Accordingly, an “intensity coefficient” was calculated for each division in the Input-Output Tables, corresponding to the share of employment in the IPR-intensive industries within each division. These coefficients were then used to adjust the level of employment in the upstream industries in the input-output framework to ensure that the indirect employment really corresponded to demand stemming from the IPR-intensive industries. For example, if division A is 40% IPR-intensive, then 40% of its purchases from division B are also considered to be IPR-intensive, and therefore 40% of the portion of employment in division B which supports division B’s sales to division A is considered to be indirectly supported by the IPR-intensive division A.

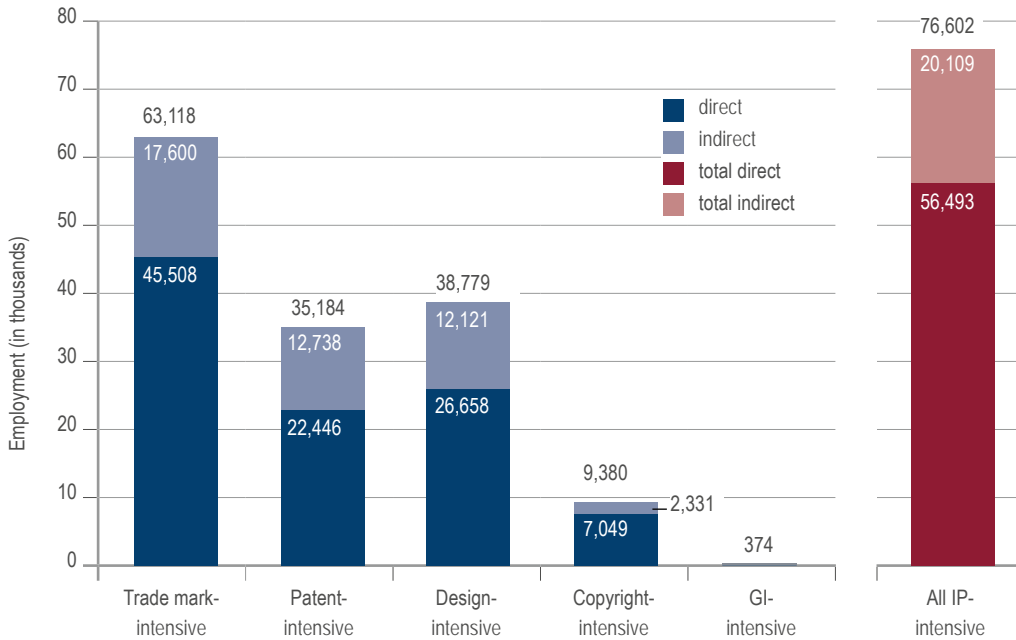
Employment data was obtained from the National Accounts published by Eurostat.⁵⁹

For each IP right (except GI, for which the figures already include indirect employment, as explained in section 4.7), the indirect employment effect in non-IPR intensive industries only was calculated in order to avoid double counting of employment in IPR-intensive industries.

The analysis shows that, in addition to the 56 million jobs in IPR-intensive industries themselves, another 20 million jobs in the EU economy are generated in non-IPR intensive industries that supply goods and services to them. If those additional jobs are considered, then 76.6 million jobs, or more than 35% of all jobs in the EU, are directly or indirectly contributed by IPR-intensive industries.

59 For the calculation of the indirect employment requirements of IPR-intensive industries, the domestic Leontief matrix was used to ensure that only employment generated within the EU was included.

Figure 6:
Direct and indirect employment in IPR-intensive industries



6.1.3 GDP

Gross Domestic Product (GDP) is the total value of the goods and services produced in a given territory during a given time period. It is the most common measure of economic activity. It is calculated in the national accounts of a country (or the EU) by adding up the *value added* produced in each industry, including product-specific taxes and excluding product-specific subsidies. The value added equals the industry’s sales minus its purchases of goods and services from other industries. When these quantities are added up across the entire economy, the inter-industry purchases cancel each other out and what is left is the overall value added, or GDP, for the economy. Total EU GDP is approximately € 12.3 trillion.

The starting point for estimating the share of IPR-intensive industries in GDP were the value added figures for each industry at 4-digit level in Eurostat’s SBS, on the one hand, and the overall GDP figure from the National Accounts on the other. However, before the sectoral figures could be compared with the overall economy-wide figure, they needed to be adjusted in order to ensure that the numerators in the calculations of the weight of IPR-intensive industries in the economy were consistent with the denominator, i.e. overall GDP.

The industry-level value added in SBS is defined at *factor cost*, which excludes taxes linked to production. On the other hand, GDP is the sum of *gross value added (GVA) at basic prices* in all industries of the economy plus taxes less subsidies on products. The difference between factor cost and basic prices is that the latter (for each industry) include other taxes less subsidies on production.

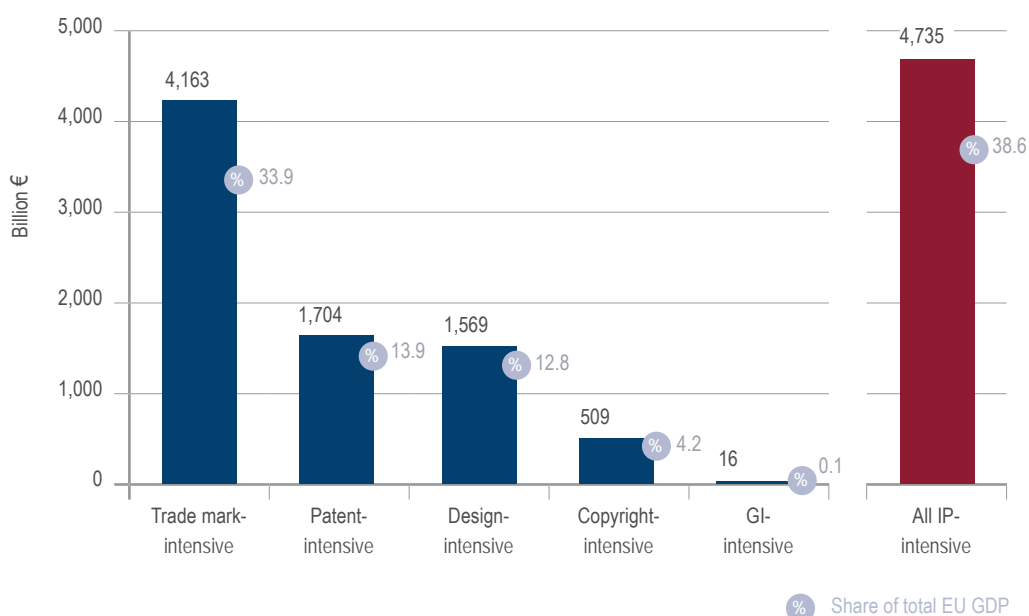
Therefore, in order to obtain a homogenous ratio based on GDP, the figures from SBS had to be converted so as to be consistent with the GDP definition. Otherwise, the ratios of sectoral GDP to total GDP would be understated because the nominator and denominator would not be defined in the same way. In order to achieve consistency, the SBS data was adjusted as follows:

First, a factor was applied to the value added obtained from SBS for each IPR-intensive industry. This factor was calculated for each of the 65 industries (divisions) in National Accounts as the ratio between value added at factor cost in SBS and GVA at basic prices in National Accounts for each industry. All classes within each division were divided by the same factor.

Secondly, the ratio between GDP and GVA for the whole economy was applied to each adjusted value added figure from the first step.

The resulting adjusted industry-level value added figures are compatible with GDP. The contribution of IPR-intensive industries to the EU economy is shown below.⁶⁰ Almost 39% of total economic output in the EU is generated in the IPR-intensive industries.⁶¹ Trade mark-intensive industries contribute almost 34% of GDP, while design and patent-intensive industries contribute 13% and 14%, respectively, with smaller contributions coming from copyright-intensive and GI-intensive industries. As for the employment calculation described in the preceding section, for the purpose of calculating the total contribution of IPR-intensive industries to GDP, each industry was counted only once, even if it used more than one IP right intensively.

Figure 7: Contribution of IPR-intensive industries to GDP



60 As in the case of employment, the value added / GDP figures are averages for the period 2008-2010.

61 The comparable figure in the USPTO study was 35%.

It is notable that the share of IPR-intensive industries in GDP is significantly higher than in employment, most likely reflecting the higher value added associated with their output. This difference is particularly pronounced in the case of trade mark-intensive industries, which account for 21% of employment but 34% of GDP, but the pattern is similar for designs, patents and copyright, and as will be seen in section 6.1.5 below, is also reflected in the wages paid to workers in IPR-intensive industries.

6.1.4 Trade

The third major economic variable to which IPR-intensive industries contribute is the EU's external trade. Indeed, the vast majority of both EU imports and EU exports are IPR-intensive.

Figure 8 and table 15 summarise trade in IPR-intensive industries, based on data from 2010. As in the case of the employment and GDP figures, the trade figures for the five IP rights add up to more than the overall figure for IPR-intensive industries because many industries are intensive in more than one IP right.

The bulk of EU trade is in IPR-intensive industries. It may be somewhat surprising at first glance that such a high share of imports is IPR-intensive. This is because even industries producing commodities such as energy are IPR-intensive,⁶² whereas many non-IPR-intensive activities are also non-tradable. For that reason, 88% of EU imports consist of products of IPR-intensive industries. However, an even higher share of EU exports, 90%, is accounted for by IPR-intensive industries.

62 Both industries in NACE division 06, extraction of crude petroleum and natural gas, are patent-intensive.

Figure 8: EU external trade in IPR-intensive industries

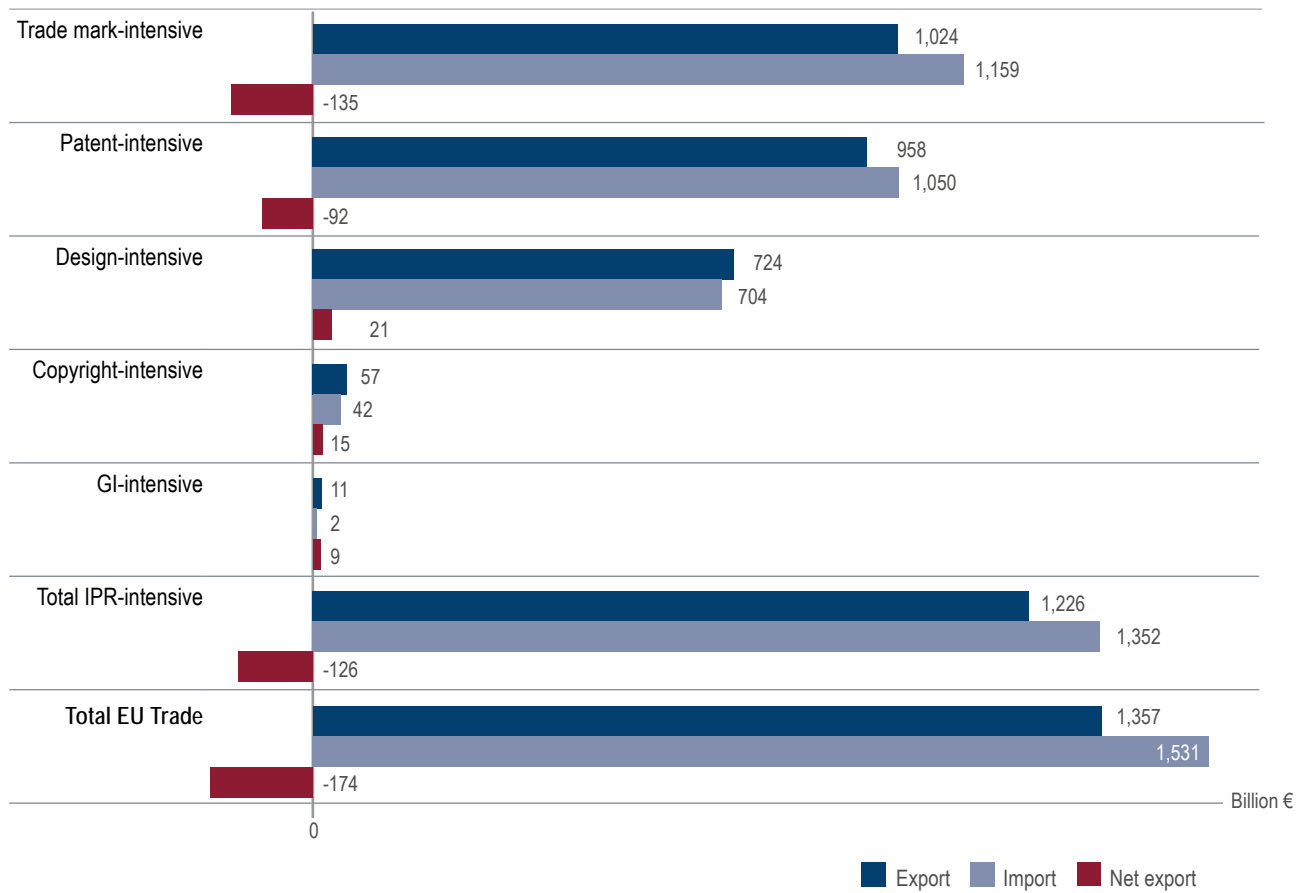


Table 15: Share of exports and imports of IPR-intensive industries

IPR-intensive industries	Share of export	Share of import
Trade mark-intensive	75,5%	75,7%
Design-intensive	53,4%	46,0%
Patent-intensive	70,6%	68,6%
Copyright-intensive	4,2%	2,7%
GI-intensive	0,8%	0,1%
Total IPR-intensive	90,4%	88,3%
Non-IPR intensive	9,6%	11,7%
Total EU Trade	100,0%	100,0%

The EU as a whole had a trade deficit of approximately €174 billion, or 1.4% of GDP. Since the IPR-intensive industries as a whole account for a higher share of EU exports than EU imports, they make a positive contribution to the EU's trade position. Another way of looking at this is that IPR-intensive industries account for 89% of EU's total external trade but only 72% of the trade deficit. In other words, were it not for the IPR-intensive industries, the external trade deficit would be higher than it actually is.

Looking at the individual IP rights, the EU has a trade deficit in trade mark-intensive and patent-intensive products, but this is to some degree offset by trade surpluses in copyright-intensive, design-intensive and GI-intensive industries.

Table 16 shows the top ten IPR-intensive industries involved in external trade. Among the exporting industries, the top ten account for 39% of IPR-intensive exports and 35% of EU's total exports. They are heavily concentrated in the manufacturing sectors, in particular pharmaceuticals and various types of advanced technology.

Table 16: Top 10 IPR-intensive exporting industries

Rank	NACE code	NACE description	Export € million	Share in all IPR-intensive exports	Intensive IPR
1	29.10	Manufacture of motor vehicles	99,567	8%	TM, DES, PAT
2	21.20	Manufacture of pharmaceutical preparations	83,414	7%	TM, PAT
3	19.20	Manufacture of refined petroleum products	62,715	5%	TM
4	30.30	Manufacture of air and spacecraft and related machinery	60,248	5%	PAT
5	20.14	Manufacture of other organic basic chemicals	35,362	3%	TM, PAT
6	29.32	Manufacture of other parts and accessories for motor vehicles	29,527	2%	DES, PAT
7	26.51	Manufacture of instruments and appliances for measuring, testing and navigation	28,781	2%	TM, DES, PAT
8	62.01	Computer programming activities	28,494	2%	TM, CR
9	26.30	Manufacture of communication equipment	27,466	2%	TM, DES, PAT
10	28.99	Manufacture of other special-purpose machinery n.e.c.	25,205	2%	TM, DES, PAT
Top 10			480,779	39%	
All IPR-intensive			1,226,015	100%	

The top ten importing industries account for 48% of IPR-intensive imports and 43% of all EU imports. Energy-related imports (industries 0610, 1920 and 0620) account for more than half of IPR-intensive imports.

Table 17: Top 10 IPR-intensive importing industries

Rank	NACE code	NACE description	Import (million €)	Share in all IPR-intensive imports	Intensive IPR
1	06.10	Extraction of crude petroleum	229,531	17%	TM, PAT
2	26.20	Manufacture of computers and peripheral equipment	66,681	5%	TM, DES, PAT
3	19.20*	Manufacture of refined petroleum products	62,372	5%	TM, PAT
4	26.30*	Manufacture of communication equipment	50,729	4%	TM, DES, PAT
5	06.20	Extraction of natural gas	49,058	4%	PAT
6	30.30*	Manufacture of air and spacecraft and related machinery	45,948	3%	PAT
7	26.11	Manufacture of electronic components	43,447	3%	TM, DES, PAT
8	21.20*	Manufacture of pharmaceutical preparations	38,097	3%	TM, PAT
9	24.41	Precious metals production	35,806	3%	TM, DES, PAT
10	20.14*	Manufacture of other organic basic chemicals	29,197	2%	TM, PAT
Top 10			650,866	48%	
All IPR-intensive			1,351,890	100%	

*These industries are also in the top 10 export list.

It is interesting to note that five of the top ten importing IPR-intensive industries are also among the top ten exporting IPR-intensive industries. Given that the EU's main trading partners are other advanced economies (or emerging economies like China with which the bulk of the trade is in manufacturing products), this is in keeping with the general finding in studies of international trade that a significant proportion of trade is in similar goods flowing in both directions.

6.1.5 Wages

As noted above, 39% of GDP (value added) in the economy and 26% of employment is generated in IPR-intensive industries. This implies that value added *per employee* is higher in IPR-intensive industries than in the rest of the economy. It is therefore relevant to examine whether this higher value added is reflected in relative remuneration in the IPR-intensive industries.

Using the SBS data from Eurostat, it is possible to calculate the average compensation paid by each industry to its workforce.⁶³ In SBS, *personnel costs* are defined as the total remuneration, in cash or in kind, payable by an employer to an employee in return for work done by the latter during the reference period. Personnel costs are made up of wages, salaries and employers' social

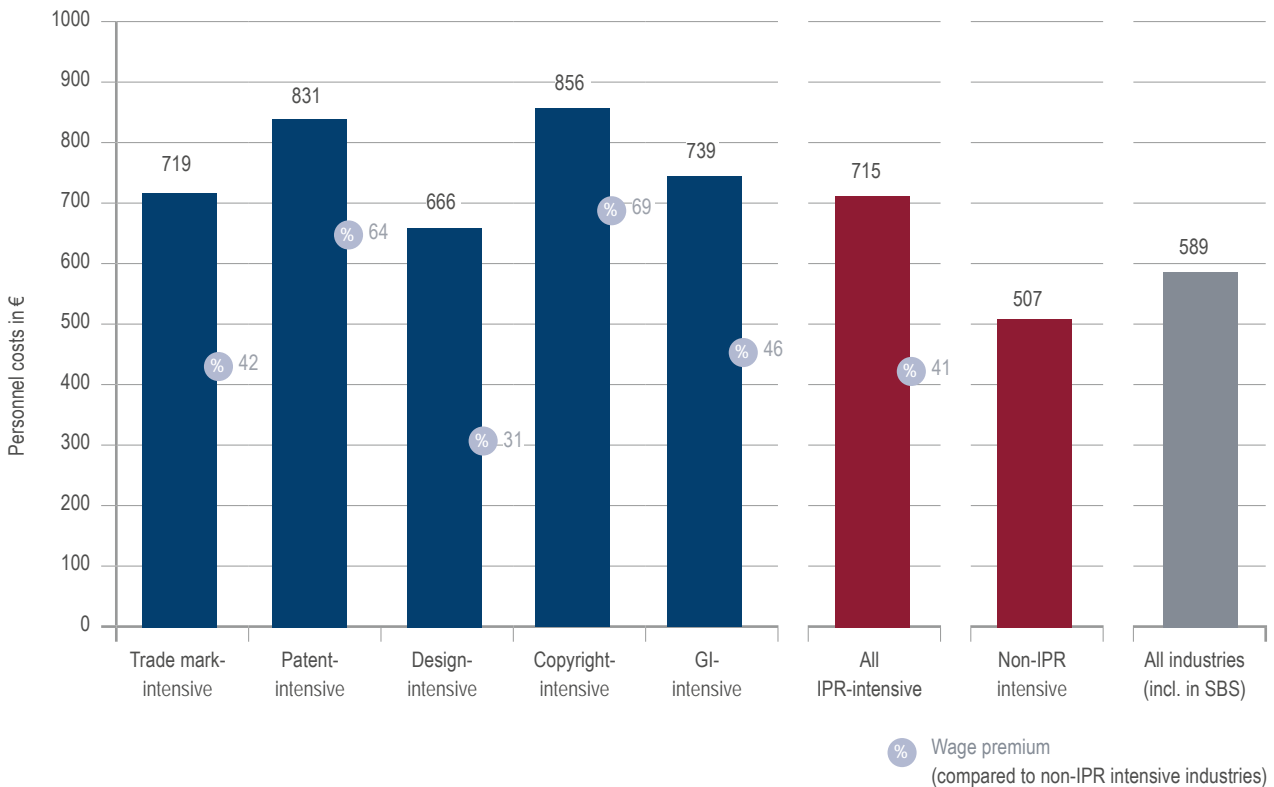
63 Because SBS employment and compensation data is not available for the main public sector industries, the analysis in this subsection is confined to the private sector. The USPTO study (2012) was subject to a similar limitation.

security contributions, both compulsory and voluntary. *Average personnel costs (or unit labour costs)* equal personnel costs divided by the number of employees (persons who are paid and have an employment contract). This is the definition of “wages” used in this report.

Data is available in SBS for most industries for 2010. In the case of 31 IPR-intensive industries, however, 2009 was the most recent year for which data was available, and for a further 8 industries, 2008. In addition, for a further 14 industries, no personnel cost data was available at all.⁶⁴ Those industries were omitted from the analysis.

Remuneration in IPR-intensive industries is indeed higher than in non-IPR-intensive industries. The average weekly wage in IPR-intensive industries is € 715, compared with € 507 in non-IPR-intensive industries – a difference of 41%. This “wage premium” is 31% in design-intensive industries, 42% in trade mark-intensive industries, 46% in GI-intensive industries, 64% in patent-intensive industries and 69% in copyright-intensive industries.⁶⁵

Figure 9: Average personnel cost in IPR-intensive industries, 2010



64 The industries for which no personnel costs data were available are: 1104 (manufacture of other non-distilled fermented beverages), 3013 (manufacture of mattresses), 5913 (motion pictures, video and television programme distribution), 5920 (sound recording and music publishing), 6810 (buying and selling of own real estate), 4799 (other retail sales not in stores, stalls or markets), 6600 (activities auxiliary to financial services and insurance), 9300 (sports activities and amusement and recreation activities), 9329 (other amusement and recreation activities), 9200 (gambling and betting activities), 9001 (performing arts), 9003 (artistic creation), 9101 (library and archives activities) and 9002 (support activities to performing arts).

65 This pattern is very similar to that found in the US, where the wage premium was also highest for copyright at 77%, closely followed by patents at 73%, the overall premium in IPR-intensive industries being 42%. This similarity is an indication that the wage characteristics are an intrinsic characteristic of IPR-intensive industries on both sides of the Atlantic.

6.2 The main IPR-intensive industries at EU level

So far, the analysis in this chapter has focused on the IPR-intensive industries aggregated by IP right or in total. In this sub-section, the contributions to employment and GDP are broken down by industry. Table 18 shows the 20 IPR-intensive industries making the largest contribution to employment.

Table 18: Top 20 IPR-intensive industries (employment)

NACE code	NACE description	Employment	Intensive IPR
71.12	Engineering activities and related technical consultancy	1,923,600	PAT
68.20	Rental and operating of own or leased real estate	1,384,867	TM
70.22	Business and other management consultancy activities	1,377,833	TM
66.00	Activities auxiliary to financial services and insurance activities	1,243,000	TM
93.00	Sports activities and amusement and recreation activities excluding 9329 - Other amusement and recreation activities	1,191,373	TM
29.10	Manufacture of motor vehicles	1,034,500	TM, DES, PAT
47.19	Other retail sale in non-specialised stores	1,016,550	TM
62.02	Computer consultancy activities	994,600	TM, CR
62.01	Computer programming activities	986,767	TM, CR
47.59	Retail sale of furniture, lighting equipment and other household articles in specialised stores	872,933	DES
29.32	Manufacture of other parts and accessories for motor vehicles	861,600	DES, PAT
46.69	Wholesale of other machinery and equipment	815,233	TM, DES, PAT
73.11	Advertising agencies	797,900	TM, DES, CR
31.09	Manufacture of other furniture	749,400	DES
14.13	Manufacture of other outerwear	695,300	TM, DES
46.90	Non-specialised wholesale trade	675,333	TM, DES
46.46	Wholesale of pharmaceutical goods	584,633	TM, PAT
46.49	Wholesale of other household goods	559,000	TM, DES
22.29	Manufacture of other plastic products	556,600	TM, DES, PAT
74.90	Other professional, scientific and technical activities n.e.c.	506,500	TM, DES, PAT
TOP 20		18,827,523	

Employment in these 20 industries, at almost 19 million, accounts for 33% of total employment in the 321 IPR-intensive industries identified in this report. The list is dominated by patent-intensive and trade mark-intensive industries, but designs also play a major role: 11 of the top 20 industries are design-intensive, and 2 of them are *exclusively* design-intensive.

Table 19 shows the top 20 IPR-intensive industries, ranked according to their contribution to GDP.

Table 19: Top 20 IPR-intensive industries (GDP)

NACE code	NACE description	Value-added (adjusted to GDP) (million €)	Intensive IPR
68.20	Rental and operating of own or leased real estate	1,121,347	TM
71.12	Engineering activities and related technical consultancy	116,765	PAT
70.22	Business and other management consultancy activities	103,884	TM
66.00	Activities auxiliary to financial services and insurance activities	86,675	TM
29.10	Manufacture of motor vehicles	83,645	TM, DES, PAT
62.02	Computer consultancy activities	78,423	TM, CR
62.01	Computer programming activities	72,149	TM, CR
21.20	Manufacture of pharmaceutical preparations	67,740	TM, PAT
61.20	Wireless telecommunications activities	62,460	TM, PAT, CR
46.46	Wholesale of pharmaceutical goods	61,694	TM, PAT
41.10	Development of building projects	60,594	TM
93.00	Sports activities and amusement and recreation activities excluding 9329 - Other amusement and recreation activities	58,105	TM
46.69	Wholesale of other machinery and equipment	57,955	TM, DES, PAT
72.19	Other research and experimental development on natural sciences and engineering	51,524	TM, DES, PAT
61.90	Other telecommunications activities	46,020	TM, DES, PAT
29.32	Manufacture of other parts and accessories for motor vehicles	40,885	DES, PAT
06.10	Extraction of crude petroleum	39,561	TM, PAT
92.00	Gambling and betting activities	37,599	TM
68.10	Buying and selling of own real estate	37,128	TM, DES
73.11	Advertising agencies	35,659	TM, DES, CR
TOP 20		2,319,812	

In total, these 20 industries account for 49% of the total GDP generated in the 321 IPR-intensive industries.⁶⁶ There is a great deal of overlap between the two top-20 lists, and the same industries occupy the top three spots in both lists, albeit in a different order. There are, however, some industries, for example *Wireless telecommunications activities* or *Gambling and betting activities*, which generate high value added relative to employment and hence appear on the top 20 GDP list but not on the top 20 employment list.

6.2.1 The overlapping use of IP rights

As explained in section 5.6, there is a high degree of overlap in the use of the various IP rights. Table 20 shows the information on overlapping use of IP rights by industries, but adds the number of jobs created in each of these industry groups.

Table 20: Overlapping use of IP rights: employment

IP right	Number of sectors	Employment	Share of employment
TM	73	15,443,171	27.3%
TM+DES+PAT	80	12,154,200	21.5%
TM+DES	60	8,094,040	14.3%
TM+PAT	35	3,731,550	6.6%
TM+CR	19	4,265,607	7.6%
PAT	16	4,398,667	7.8%
DES	13	3,415,133	6.0%
DES+PAT	7	1,833,150	3.2%
TM+PAT+CR	2	328,567	0.6%
TM+DES+CR	4	1,116,567	2.0%
CR	8	1,338,664	2.4%
TM+GI	3	329,818	0.6%
TM+DES+GI	1	44,527	0.1%
All IP-rights	321	56,493,661	

The 73 exclusively trade mark-intensive industries account for the largest share of employment, followed by the 80 industries that use all three industrial IP rights simultaneously. The 16 exclusively patent-intensive industries account for 8% of employment, while the 13 purely design-intensive industries account for 6%.

⁶⁶ This very high share is partly due to the fact that the top-ranked industry, *Rental and operation of own or leased real estate*, includes € 643.5 billion of imputed rent on owner-occupied housing. This is in keeping with the national accounting standard applied by Eurostat and other statistical offices. Without the imputed rent, the GDP share of the top 20 industries (relative to all IPR-intensive industries) would be similar to their employment share, at 34%. It was decided to retain the imputed rent in order to ensure compatibility between the numerator and denominator in the calculation of GDP shares, since imputed rent is included in the overall GDP figure from national accounts.

6.3 Primary, secondary and tertiary sectors

It is instructive to look at the results when the industries are grouped according to the traditional economic taxonomy of primary, secondary and tertiary sectors. In this taxonomy, the primary sector includes agriculture and the extractive industries (NACE sections A and B), the secondary sector includes manufacturing activities (NACE sections C-F), while the tertiary sector consists of services (NACE sections G-U). Grouping the industries in this way yields additional insights about the contribution of IPR-intensive industries to the economy.

Table 21 shows employment, GDP and external trade for IPR-intensive industries, grouped according to this taxonomy.

Within the IPR-intensive industries, the primary sector contributes the smallest share of employment, with about 250,000 jobs. The secondary sector contributes 24 million of the total 56 million jobs in IPR-intensive industries, while the tertiary sector contributes the remaining 32 million jobs. The share of the tertiary sector in GDP is particularly high, reflecting the well-known fact that services comprise around 2/3 of modern economies.

Table 21: Employment, GDP and trade in IPR-intensive industries, grouped by sector

Sector	Employment	GDP (million €)	Export (million €)	Import (million €)	Net export (million €)
Primary	251,600	70,183	7,486	291,851	-284,365
Secondary	24,479,250	1,535,187	1,161,478	1,018,312	143,166
Tertiary	31,762,811	3,129,892	57,051	41,727	15,325
Total	56,493,661	4,735,262	1,226,015	1,351,890	-125,875

The main trade pattern that emerges from the table is that the EU is a large net importer of primary sector products, mainly oil and gas. The resulting trade deficit in the primary sector of € 284 billion is partly offset by a large trade surplus in IPR-intensive manufacturing (secondary sector) products, amounting to € 143 billion. Because many services are not tradable, imports and exports primarily consist of goods produced by industries belonging to the primary and secondary sectors. However, the EU also has a small trade surplus of € 15 billion in IPR-intensive service industries.

6.4 Analysis by Member State

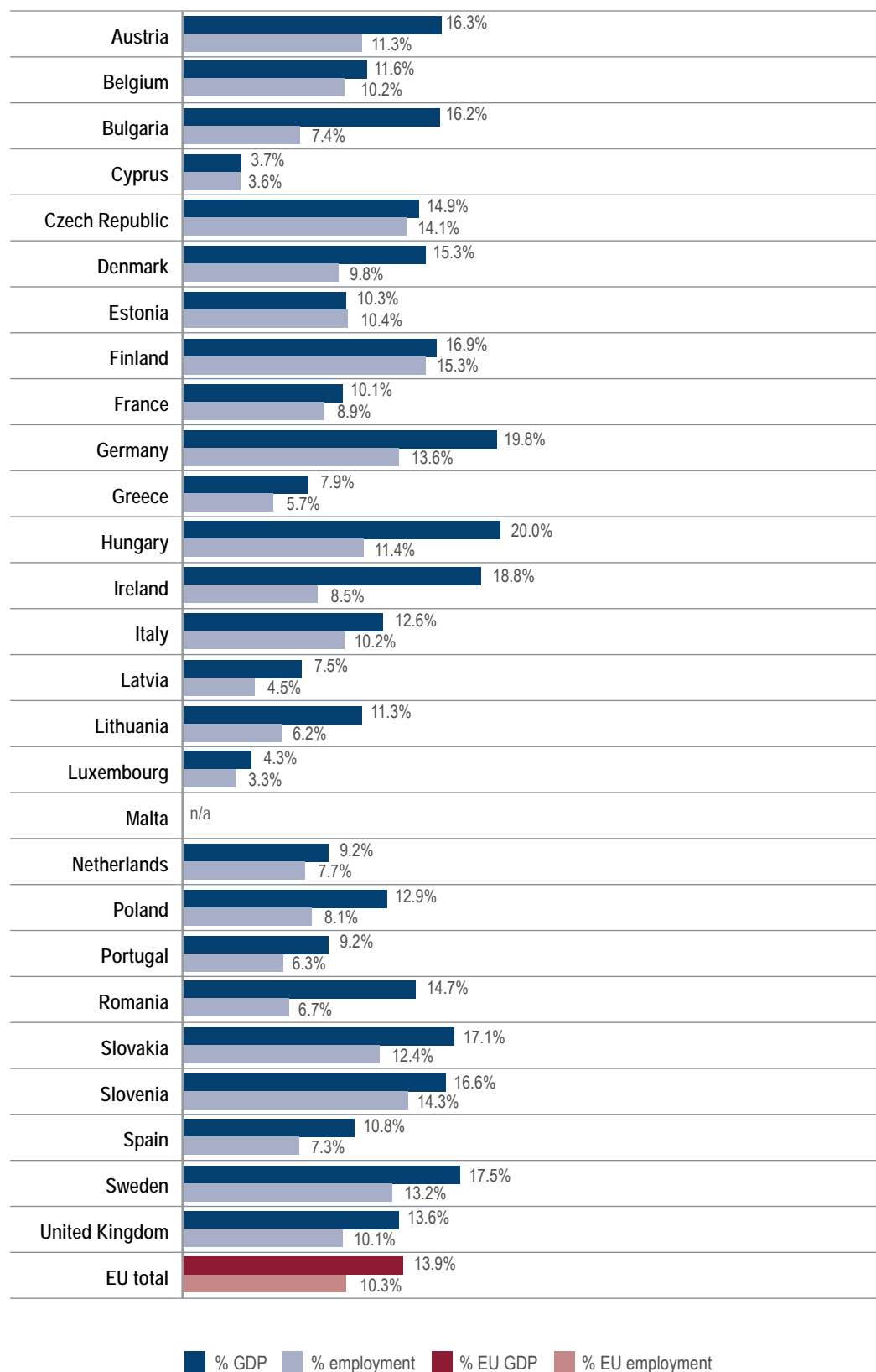
This section presents the contribution of IPR-intensive industries to employment and GDP in each Member State. This part of the analysis was challenging because the availability of data at Member State level is more limited than at EU level. Consequently, more estimations and imputations were required, so that some of the results in this section may be less robust than those in sections 6.1 and 6.2. In some cases, for example Malta, industry-level data on value added is simply not available. It is also important to reiterate that the IPR-intensive industries were identified at the level of the EU, not the individual Member States. As stated above, this study makes the assumption that if an industry is IPR-intensive in one Member State, it is also IPR-intensive in every other Member State because IPR-intensity is considered to be an intrinsic characteristic of each industry. The accuracy of the results presented in this section depend on the validity of this assumption.

The contribution of each industry to the Member State's economy is measured in terms of the jobs and GDP generated by that industry in that Member State. For example, if a car company from Member State A builds an assembly plant in Member State B, then the resulting jobs and value added accrue to the economy of Member State B. In other words, the measure of IPR intensity employed does not address the *origin* of the IPR being used, only its deployment. Therefore, it cannot be concluded on the basis of this study that if patent-intensive industries contribute more in terms of jobs and value added in country A than in country B, then country A is more innovative. The higher contribution made by patent-intensive industries to employment or GDP in country A could equally be the result of decisions on where to site production that were made in country C. The issue of the origin of IPR and its relationship with economic well-being is the subject of Chapter 7 and is an area for potential further study.

6.4.1 Patent-intensive industries

Patent-intensive industries contribute 10.3% of employment and 13.9% of GDP in the EU. Particularly high shares of employment are found in the Czech Republic, Finland, Germany, Slovakia, Slovenia and Sweden. When measured on their contribution to value added, however, patent-intensive industries are also very important in Austria, Bulgaria, Hungary and Ireland. Among the biggest EU economies, Germany has the highest shares of patent-intensive employment and GDP, reflecting the high share of manufacturing industries (which predominate among the patent-intensive industries) in the German economy. The high shares of employment and GDP in patent-intensive industries in several of the Member States that joined the EU in 2004 and 2007 could also be related to the high share of manufacturing in their economies.

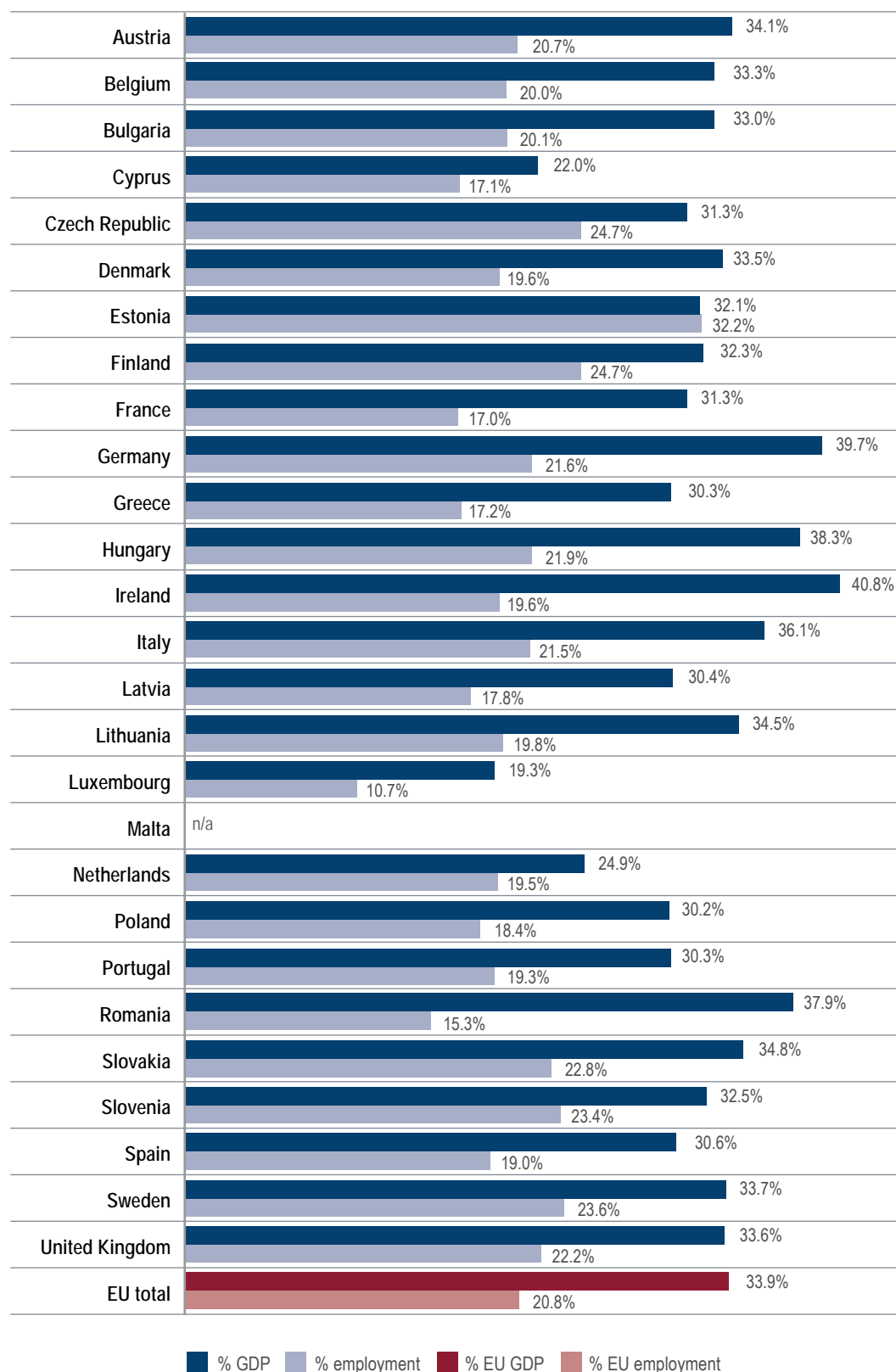
Figure 10: GDP and employment shares in patent-intensive industries by Member State, 2010



6.4.2 Trade mark-intensive industries

In the EU as a whole, trade mark-intensive industries contribute 20.8% of employment and 33.9% of GDP. Countries with above-average shares of employment in trade mark-intensive industries include the Czech Republic, Estonia, Finland, Germany, Hungary, Italy, Slovakia, Slovenia, Sweden and the UK. Germany and Hungary, along with Ireland, have the highest shares of trade mark-intensive value added in their GDP. Other countries with above-average shares of GDP coming from trade mark-intensive industries include Austria, Italy, Lithuania, Romania and Slovakia.

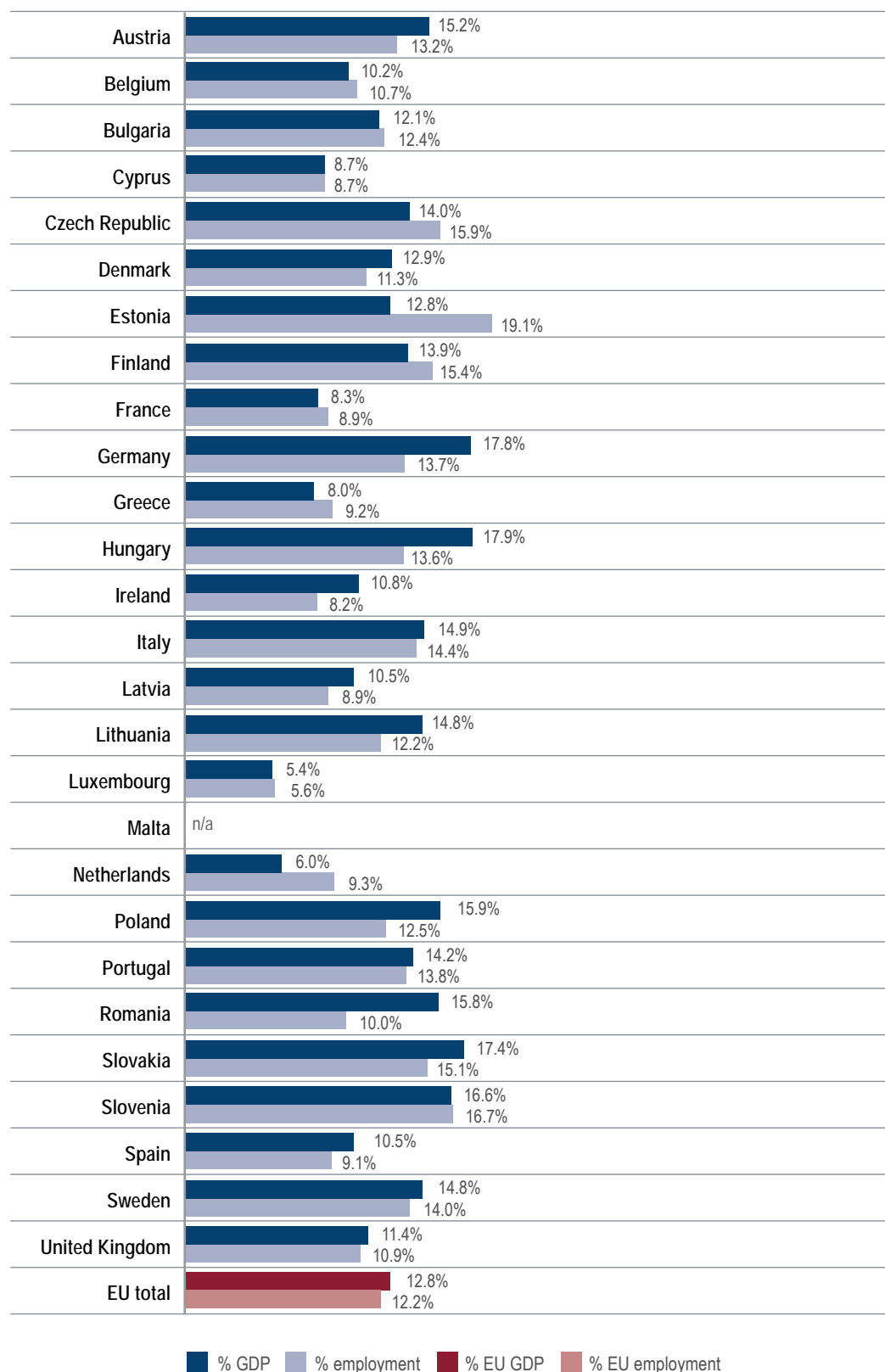
Figure 11: GDP and employment shares in trade mark-intensive industries by Member State, 2010



6.4.3 Design-intensive industries

Design-intensive industries contribute 12.2% of employment and 12.8% of GDP in the EU. Austria, Bulgaria, the Czech Republic, Estonia, Finland, Germany, Hungary, Italy, Poland, Portugal, Slovakia, Slovenia and Sweden all have design-intensive employment shares above the EU average. A similar pattern holds for GDP.

Figure 12: GDP and employment shares in design-intensive industries by Member State, 2010



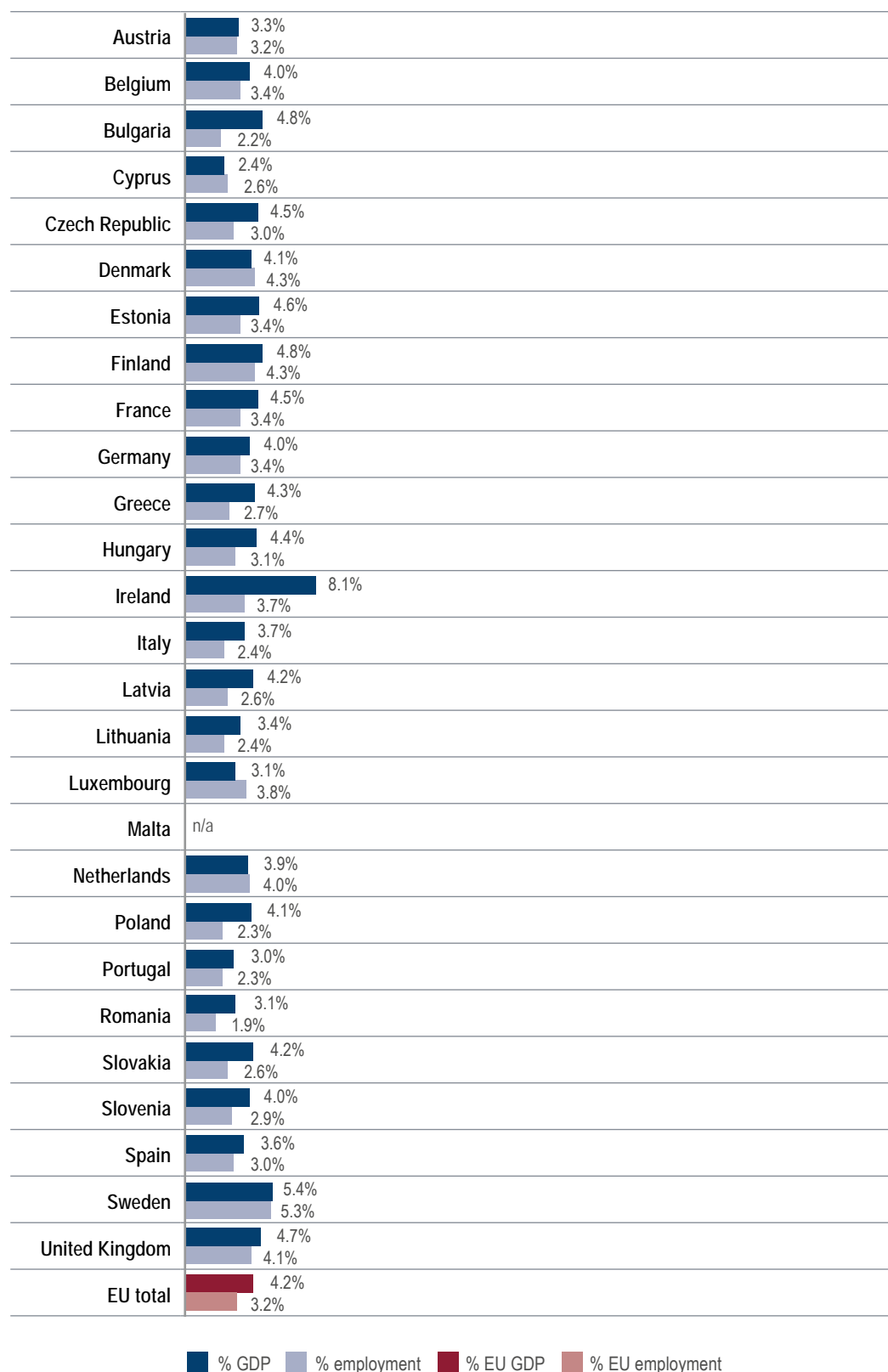
6.4.4 Copyright-intensive industries

Overall employment in copyright-intensive industries in the EU is 7.05 million, or 3.2% of the total, and those industries contribute 4.2% of EU's GDP. Countries with above-average employment in copyright-intensive industries include Sweden, Denmark, Finland, the Netherlands, the UK, Ireland, Estonia, France, Germany and Luxembourg.

Ireland, the UK, Sweden, Finland, Bulgaria, France, the Czech Republic, Greece, Hungary and Estonia all have above-average GDP shares attributable to copyright-intensive industries.

The country with the highest share of employment in the copyright-intensive industries is Sweden. Of all the Member States, Ireland has by far the highest GDP share attributable to copyright-intensive industries.

Figure 13: GDP and employment shares in copyright-intensive industries by Member State, 2010



6.4.5 GI-intensive industries

While the share of GI-intensive industries in either employment or GDP is below 1% in every Member State, and the EU averages are 0.2% and 0.1%, respectively, the four GI-intensive industries employ significant numbers of people in France, Italy, Spain, Portugal, Germany and the United Kingdom. France in particular, with its large wine industry, accounts for more than 1/3 of GI-intensive employment in the EU.

Table 22: GDP and employment shares in GI-intensive industries by Member State, 2010

Country	Share of GDP	Share of total employment
Austria	0.1%	0.1%
Belgium	0.0%	0.0%
Bulgaria	0.1%	0.1%
Cyprus	0.0%	0.1%
Czech Republic	0.0%	0.0%
Denmark	0.0%	0.0%
Estonia	n/a	n/a
Finland	n/a	n/a
France	0.3%	0.5%
Germany	0.1%	0.1%
Greece	0.1%	0.2%
Hungary	0.1%	0.1%
Ireland	0.1%	0.0%
Italy	0.2%	0.3%
Latvia	0.0%	0.0%
Lithuania	n/a	n/a
Luxembourg	0.0%	0.0%
Malta	n/a	n/a
Netherlands	0.0%	0.0%
Poland	n/a	n/a
Portugal	0.2%	0.6%
Romania	0.1%	0.0%
Slovakia	0.1%	0.1%
Slovenia	0.1%	0.0%
Spain	0.1%	0.2%
Sweden	n/a	n/a
United Kingdom	0.2%	0.0%
EU total	0.1%	0.2%

It should also be noted that while their share in the national economies is modest, the GI-intensive industries are heavily concentrated in particular regions of the Member States, where they are an important part of the local economy. GIs are also an important part of the overall food and drink industries in some Member States, as shown in table 23.

As noted above, the estimates of value added and employment in GI-intensive industries were calculated using the shares of the relevant industries that produce the GI products. This is in contrast to the estimates for the other four IP rights, which are predicated on the assumption that IPR intensity is a fundamental characteristic of an industry, irrespective of its geographical location.

Table 23: GI products value added in relation to food and drink value added, 2010

Country	Share of GI in food and drink industry value added
Austria	3.85%
Belgium	0.11%
Bulgaria	1.97%
Cyprus	1.06%
Czech Republic	0.51%
Denmark	0.51%
France	14.83%
Germany	3.50%
Greece	6.47%
Hungary	4.74%
Ireland	1.35%
Italy	9.77%
Lithuania	0.56%
Luxembourg	5.01%
Netherlands	0.17%
Portugal	9.83%
Romania	3.58%
Slovenia	6.85%
Slovakia	4.15%
Spain	6.29%
UK	9.69%
EU total	6.78%

Some Member States had no registered GIs as at 2010

A clear pattern emerges from this table. Especially in France, but also in some of the other Mediterranean/southern European countries (Portugal, Italy, Greece and Spain), the proportion of GI sales in overall food and drink sales is high, perhaps a reflection of the protection strategy adopted by the relevant industry bodies. The high share of GIs in the UK is mainly due to the importance of the Scottish whisky industry and the fact that its products fetch high prices and generate high value added.

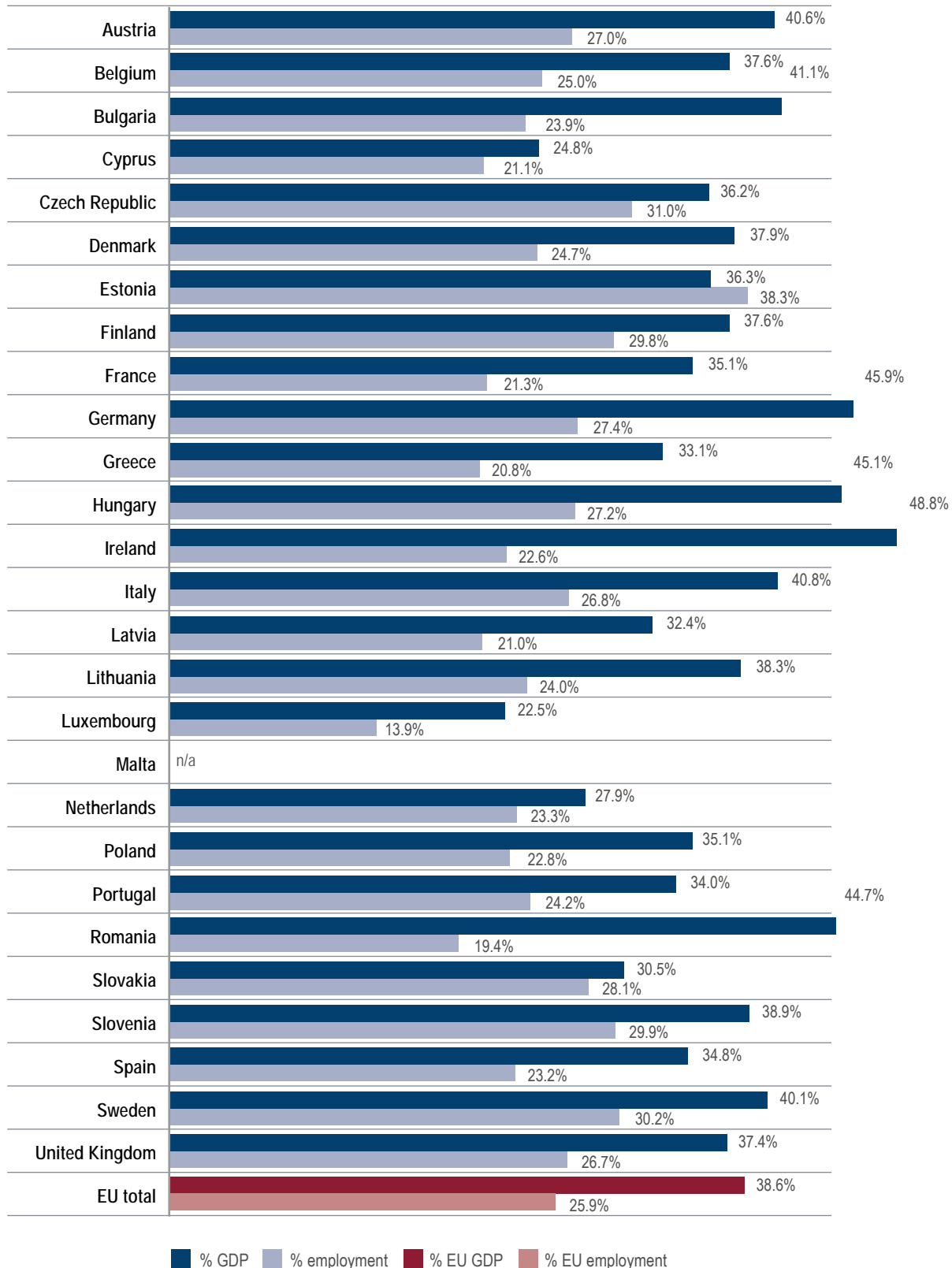
As noted above, GIs are becoming increasingly important in international trade as well, following the signing of additional agreements between the EU and non-EU countries. A future study will examine in more detail the impact of GIs on regional economies in the countries where they play a major role, as well as the interplay between GIs and other IP rights, especially trade marks.

6.4.6 All IPR-intensive industries

If all five IP rights are combined and the overlaps eliminated, the overall contributions of IPR-intensive industries to the economies of the Member States are as shown below.⁶⁷ At EU level, IPR-intensive industries contribute 25.9% of employment and 38.6% to GDP. They account for an above-average share of employment in Austria, the Czech Republic, Estonia, Finland, Germany, Hungary, Italy, Slovakia, Slovenia, Sweden and the UK. In terms of GDP, Austria, Bulgaria, Germany, Hungary, Ireland, Italy, Romania, Slovenia and Sweden have shares above the EU average.

⁶⁷ The figures for the individual countries do not necessarily add up exactly to the EU totals. Minor discrepancies may arise from the different reporting methods used for Eurostat statistics at Member State level and EU level. As noted above, the EU-level statistics are generally more complete and therefore more reliable.

Figure 14: GDP and employment shares in all IPR-intensive industries by Member State, 2010



07 / Additional analysis

It is particularly important to bear in mind that the shares in GDP and employment shown in this report do not necessarily reflect the degree to which a country's economy is innovative. For example, a country may be a good location for patent-intensive manufacturing industries due to low costs, a favourable business climate or the availability of natural resources. That country may then have a high share of employment in patent-intensive industries even though the manufacturing firms that built the factories and created the jobs in its territory have their headquarters and carry out their research and development (as opposed to production) elsewhere.

As discussed in this concluding chapter, analysing the impact of the IPR at this, more granular, level is an important area for future research. Accordingly, what follows is an initial analysis of the *origins* of the IP rights whose contribution to the economies of the EU and its Member States is the subject of this report.

7.1 Origins of IPR within the EU

So far, this report has examined where the jobs and economic activity in IPR-intensive industries are created. As already noted, this is not necessarily a reflection of the relative "IP-creating power" of the Member States. In the Internal Market, companies may have their headquarters in one country, create their IPR in another country and manufacture the resulting products in yet another. In particular, decisions as to where to site production facilities depend on many factors, including the cost and availability of labour with the necessary skills, the cost and availability of land, raw materials and other resources, the business environment and tax regime in the various countries, and so on.

In this chapter, two basic questions are explored:

- Which EU Member States create the IPR analysed in this report?
- What proportion of jobs in IPR-intensive industries in each Member State is created by companies from other Member States?

This and the next section seek to provide some initial answers to these two questions.

Using the data contained in the matched database, it is possible to explore where the trade marks, designs and patents filed at OHIM and the EPO originate (as indicated by the nationality of the owner). The tables in this section show the number of patents, trade marks and designs originating in each Member State in the matched database described in Chapter 4. It should be noted that in order to provide a complete picture of the IPR-generating activities in each country, successful filings

(that is, filings that resulted in grants) from companies in all industries are included in these tables. Therefore, the figures are not directly comparable with those in the previous chapters of this report, which analysed only the IPR-intensive industries.

Table 24: IP rights by country of origin (all industries), 2004-2008

Country	PAT	PAT rank	TM	TM rank	DES	DES rank	EMPL ('000)	TM per 1000 employees	PAT per 1000 employees	DES per 1000 employees
Austria	2,143	7	15,821	7	7,411	7	4,088	3.87	0.52	1.81
Belgium	2,009	8	7,783	11	4,223	10	4,452	1.75	0.45	0.95
Bulgaria	5	26	518	22	94	23	3,222	0.16	0.00	0.03
Cyprus	38	21	450	23	19	26	387	1.16	0.10	0.05
Czech Republic	126	14	3,175	16	1,361	14	4,941	0.64	0.03	0.28
Denmark	1,448	10	9,454	9	5,381	8	2,776	3.40	0.52	1.94
Estonia	13	23	544	21	86	24	608	0.90	0.02	0.14
Finland	1,660	9	7,463	12	2,627	12	2,479	3.01	0.67	1.06
France	14,590	2	42,607	5	20,020	3	25,740	1.66	0.57	0.78
Germany	44,078	1	132,607	1	72,059	1	38,583	3.44	1.14	1.87
Greece	42	20	1,181	18	142	20	4,486	0.26	0.01	0.03
Hungary	109	15	1,099	20	371	17	3,814	0.29	0.03	0.10
Ireland	435	12	5,078	13	1,104	15	1,982	2.56	0.22	0.56
Italy	7,260	3	52,699	4	44,618	2	23,101	2.28	0.31	1.93
Latvia	17	22	233	26	131	22	1,016	0.23	0.02	0.13
Lithuania	5	27	334	25	61	25	1,427	0.23	0.00	0.04
Luxembourg	357	13	3,545	15	676	16	213	16.60	1.67	3.17
Malta	58	18	223	27	11	27	162	1.38	0.36	0.07
Netherlands	5,496	4	22,609	6	7,918	6	8,520	2.65	0.65	0.93
Poland	107	16	8,469	10	4,214	11	15,876	0.53	0.01	0.27
Portugal	67	17	5,055	14	2,386	13	5,077	1.00	0.01	0.47
Romania	7	24	1,395	17	136	21	9,284	0.15	0.00	0.01
Slovakia	5	25	407	24	220	19	2,373	0.17	0.00	0.09
Slovenia	50	19	1,177	19	227	18	981	1.20	0.05	0.23
Spain	1,221	11	57,347	3	18,936	4	19,201	2.99	0.06	0.99
Sweden	3,983	6	12,305	8	5,192	9	4,539	2.71	0.88	1.14
UK	5,046	5	71,388	2	16,349	5	29,076	2.46	0.17	0.56
EU total	90,372		464,964		215,973		218,401	2.13	0.41	0.99

In absolute terms, Germany ranks first for patents, trade marks and designs. The other top spots are occupied by the UK, France, Spain and Italy. There is some variation among the Member States; for example, while Spain is in the top 5 for trade marks and designs, it is only in 11th place for patents. The group of the largest economies is followed by a group of smaller northern European countries, including the Netherlands, Austria, Denmark and Sweden. The highest placed among the 12 countries that joined the EU in 2004 or 2007 is Poland, which is also the largest of these countries.

Of course, all other things being equal, large countries will tend to have more IP rights filings. Therefore, the table also shows the number of patents, trade marks and designs per 1000 employees. This is the measure of IPR intensity employed throughout this report. The overall EU average is 2.13 CTMs, 0.41 PCT patents and 0.99 RCDs per 1000 employees. Viewed in this light, the countries above the EU average in terms of IPR creation per employee are Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, the Netherlands, Spain, Sweden and the UK.

7.2 Job creation in the Internal Market

Chapter 6 of this report showed that many of the new Member States have a relatively high proportion of employment and GDP in IPR-intensive industries. The preceding section, however, has shown that the IP rights being applied for at OHIM and at the EPO for the most part originate in the EU15 Member States. Thus, it appears that while many companies continue to develop their IPR at home, the resulting production is often located in other Member States, particularly those that joined the EU in 2004 or 2007. Indeed, cross-border job creation can be considered a positive manifestation of the Internal Market.

This pattern of job creation in the Internal Market is further illustrated by examining the extent to which jobs in each Member State are created by companies based in other Member States or indeed outside the EU.

Data on foreign ownership in each Member State (with the exception of Belgium and Greece) is available from Eurostat's Foreign Affiliates Statistics (FATS).⁶⁸ In table 25, this information has been combined with the matched database in order to determine how many jobs in IPR-intensive industries in each Member State have been created by companies from abroad.

68 For a detailed explanation, see: http://epp.eurostat.ec.europa.eu/statistics_explained/index.php/Foreign-controlled_enterprises.

Table 25: Jobs in the EU 27 Member States attributed to foreign companies (IPR-intensive industries)

Receiving Member State	Jobs attributed to companies based in		Total employment in IPR-intensive industries	Share other EU	Share non-EU	Share total non-domestic
	Other EU Member States	Non-EU countries				
Czech Republic	394,519	178,144	1,589,210	24.8%	11.2%	36.0%
Slovakia	169,271	46,179	620,637	27.3%	7.4%	34.7%
Hungary	242,702	126,800	1,110,781	21.8%	11.4%	33.3%
Romania	421,251	158,139	1,792,613	23.5%	8.8%	32.3%
Luxembourg	8,164	6,922	49,306	16.6%	14.0%	30.6%
Ireland	40,385	80,435	450,623	9.0%	17.8%	26.8%
Sweden	178,178	149,682	1,360,881	13.1%	11.0%	24.1%
Austria	176,017	84,345	1,095,224	16.1%	7.7%	23.8%
UK	575,648	1,066,292	7,787,115	7.4%	13.7%	21.1%
Latvia	32,326	11,575	212,813	15.2%	5.4%	20.6%
Poland	566,583	153,341	3,609,914	15.7%	4.2%	19.9%
Netherlands	216,090	173,457	2,026,667	10.7%	8.6%	19.2%
France	610,339	454,939	5,742,850	10.6%	7.9%	18.5%
Denmark	82,339	47,383	712,349	11.6%	6.7%	18.2%
Bulgaria	111,508	43,668	883,350	12.6%	4.9%	17.6%
Lithuania	39,650	16,880	342,268	11.6%	4.9%	16.5%
Finland	64,272	53,100	747,822	8.6%	7.1%	15.7%
Estonia	25,262	7,056	226,395	11.2%	3.1%	14.3%
Germany	727,958	750,663	11,089,918	6.6%	6.8%	13.3%
Spain	410,458	176,253	4,560,004	9.0%	3.9%	12.9%
Portugal	100,755	32,324	1,217,408	8.3%	2.7%	10.9%
Italy	338,201	286,608	6,688,391	5.1%	4.3%	9.3%
Slovenia	18,005	7,996	293,567	6.1%	2.7%	8.9%
Malta	1,645	194	37,111	4.4%	0.5%	5.0%
Cyprus	506	1,050	82,690	0.6%	1.3%	1.9%
Belgium	n/a	n/a	1,117,041	n/a	n/a	na
Greece	n/a	n/a	999,928	n/a	n/a	na

The countries in this table are ordered according to the total share of jobs in IPR-intensive industries generated by companies based elsewhere. Thus, 36% of all IPR-intensive employment in the Czech Republic is in non-Czech owned firms; of those jobs, 25% are in firms based in other EU countries, while 11% are in firms headquartered outside the EU. Other new Member States in the upper half of the table include Slovakia, Hungary, Romania, Latvia and Poland.

The highest share of jobs in IPR-intensive industries generated by companies from outside the EU is to be found in Ireland, at almost 18%. Other countries with a high share of IPR-intensive jobs in non-EU-based companies are the UK, Luxembourg, Sweden, the Czech Republic and Hungary.

There are thus significant flows of job creation between EU Member States, and also to some degree between the EU and non-EU countries. However, to provide some perspective, even for the country with the highest share of non-domestic companies in IPR-intensive industries, the Czech Republic, the proportion of jobs in non-Czech firms is 36%, so that almost two thirds of such jobs are still generated by Czech companies. In the largest economies in the EU, the vast majority of jobs in IPR-intensive industries are generated domestically: 79% in the UK, 81% in France, 87% in Germany and Spain, and 91% in Italy.

Table 26 shows the cross-border flows of jobs within the Internal Market from a different perspective, namely by looking at where the approximately 5 million jobs created in EU Member States by companies from other Member States originate. Thus, German companies create almost 1.5 million jobs in other Member States, or about 28% of the total. French companies create almost 800 000 jobs elsewhere in the EU, and so on. The top of the list is dominated by the large Member States, although Dutch and Swedish companies also create significant numbers of jobs in other Member States.

Table 26:
Jobs attributed to companies from EU Member States in other Member States

Member State	Jobs created in the rest of EU by companies based in the Member State	Share of all EU cross-border jobs
Germany	1,470,456	28.2%
France	784,237	15.0%
Netherlands	612,804	11.7%
United Kingdom	573,779	11.0%
Sweden	285,622	5.5%
Italy	261,504	5.0%
Austria	219,403	4.2%
Luxembourg	216,804	4.2%
Belgium	160,444	3.1%
Denmark	149,433	2.9%
Finland	132,408	2.5%
Spain	108,861	2.1%
Ireland	96,618	1.9%
Cyprus	71,848	1.4%
Greece	45,201	0.9%
Czech Republic	16,619	0.3%
Poland	14,372	0.3%
Hungary	13,137	0.3%
Portugal	10,982	0.2%
Estonia	7,372	0.1%
Slovakia	6,068	0.1%
Slovenia	4,348	0.1%
Malta	3,918	0.1%
Lithuania	3,360	0.1%
Romania	2,038	0.0%
Latvia	1,809	0.0%
Bulgaria	1,273	0.0%
EU total	5,221,213	100.0%

08 / Appendix:

List of all 321 IPR-intensive industries

Table 27: List of all IPR-intensive industries

NACE code	NACE description	Trade mark	Patent	Design	Copy-right	GI
06.10	Extraction of crude petroleum	•	•			
06.20	Extraction of natural gas		•			
07.29	Mining of other non-ferrous metal ores		•			
08.11	Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate	•				
08.91	Mining of chemical and fertiliser minerals	•				
08.93	Extraction of salt	•				
08.99	Other mining and quarrying n.e.c.	•				
09.10	Support activities for petroleum and natural gas extraction	•	•			
10.13	Production of meat and poultry meat products	•				
10.20	Processing and preserving of fish, crustaceans and molluscs	•				
10.32	Manufacture of fruit and vegetable juice	•		•		
10.39	Other processing and preserving of fruit and vegetables	•				
10.41	Manufacture of oils and fats	•	•			
10.42	Manufacture of margarine and similar edible fats	•				
10.51	Operation of dairies and cheese making	•				•
10.52	Manufacture of ice cream	•		•		
10.61	Manufacture of grain mill products	•				
10.62	Manufacture of starches and starch products	•				
10.72	Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes	•				
10.73	Manufacture of macaroni, noodles, couscous and similar farinaceous products	•		•		
10.81	Manufacture of sugar	•				
10.82	Manufacture of cocoa, chocolate and sugar confectionery	•		•		
10.83	Processing of tea and coffee	•	•	•		
10.84	Manufacture of condiments and seasonings	•		•		
10.86	Manufacture of homogenised food preparations and dietetic food	•				
10.89	Manufacture of other food products n.e.c.	•	•			

NACE code	NACE description	Trade mark	Patent	Design	Copy-right	GI
10.91	Manufacture of prepared feeds for farm animals	•				
10.92	Manufacture of prepared pet foods	•		•		
11.01	Distilling, rectifying and blending of spirits	•		•		•
11.02	Manufacture of wine from grape	•				•
11.03	Manufacture of cider and other fruit wines	•		•		
11.04	Manufacture of other non-distilled fermented beverages	•		•		
11.05	Manufacture of beer	•				•
11.06	Manufacture of malt	•				
11.07	Manufacture of soft drinks; production of mineral waters and other bottled waters	•		•		
12.00	Manufacture of tobacco products	•	•	•		
13.10	Preparation and spinning of textile fibres	•				
13.20	Weaving of textiles	•		•		
13.30	Finishing of textiles	•		•		
13.91	Manufacture of knitted and crocheted fabrics	•		•		
13.92	Manufacture of made-up textile articles, except apparel	•		•		
13.93	Manufacture of carpets and rugs	•		•		
13.94	Manufacture of cordage, rope, twine and netting	•	•	•		
13.95	Manufacture of non-wovens and articles made from non-wovens, except apparel	•	•	•		
13.96	Manufacture of other technical and industrial textiles			•		
13.99	Manufacture of other textiles n.e.c.	•	•	•		
14.11	Manufacture of leather clothes	•	•	•		
14.12	Manufacture of workwear	•		•		
14.13	Manufacture of other outerwear	•		•		
14.14	Manufacture of underwear	•		•		
14.19	Manufacture of other wearing apparel and accessories	•		•		
14.20	Manufacture of articles of fur	•		•		
14.31	Manufacture of knitted and crocheted hosiery	•		•		
14.39	Manufacture of other knitted and crocheted apparel	•		•		
15.12	Manufacture of luggage, handbags and the like, saddlery and harness	•		•		
15.20	Manufacture of footwear	•		•		
16.21	Manufacture of veneer sheets and wood-based panels	•		•		
16.22	Manufacture of assembled parquet floors	•		•		
16.23	Manufacture of other builders' carpentry and joinery			•		
16.29	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	•		•		
17.11	Manufacture of pulp	•				
17.12	Manufacture of paper and paperboard	•	•	•		
17.22	Manufacture of household and sanitary goods and of toilet requisites	•	•	•		
17.23	Manufacture of paper stationery	•		•		
17.24	Manufacture of wallpaper	•		•		

NACE code	NACE description	Trade mark	Patent	Design	Copy-right	GI
17.29	Manufacture of other articles of paper and paperboard	•	•	•		
18.11	Printing of newspapers	•				
18.13	Pre-press and pre-media services			•		
18.20	Reproduction of recorded media	•				
19.20	Manufacture of refined petroleum products	•				
20.11	Manufacture of industrial gases	•	•			
20.12	Manufacture of dyes and pigments	•	•			
20.13	Manufacture of other inorganic basic chemicals	•	•			
20.14	Manufacture of other organic basic chemicals	•	•			
20.15	Manufacture of fertilisers and nitrogen compounds	•				
20.16	Manufacture of plastics in primary forms	•	•	•		
20.17	Manufacture of synthetic rubber in primary forms	•				
20.20	Manufacture of pesticides and other agrochemical products	•	•	•		
20.30	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	•	•	•		
20.41	Manufacture of soap and detergents, cleaning and polishing preparations	•	•	•		
20.42	Manufacture of perfumes and toilet preparations	•	•	•		
20.51	Manufacture of explosives	•	•			
20.52	Manufacture of glues	•	•			
20.53	Manufacture of essential oils	•	•			
20.59	Manufacture of other chemical products n.e.c.	•	•	•		
20.60	Manufacture of man-made fibres	•	•			
21.10	Manufacture of basic pharmaceutical products	•	•	•		
21.20	Manufacture of pharmaceutical preparations	•	•			
22.11	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	•	•	•		
22.19	Manufacture of other rubber products	•	•	•		
22.21	Manufacture of plastic plates, sheets, tubes and profiles	•	•	•		
22.22	Manufacture of plastic packing goods	•	•	•		
22.23	Manufacture of builders' ware of plastic	•	•	•		
22.29	Manufacture of other plastic products	•	•	•		
23.11	Manufacture of flat glass	•	•	•		
23.13	Manufacture of hollow glass	•		•		
23.14	Manufacture of glass fibres	•	•	•		
23.19	Manufacture and processing of other glass, including technical glassware	•	•	•		
23.20	Manufacture of refractory products	•				
23.31	Manufacture of ceramic tiles and flags	•		•		
23.32	Manufacture of bricks, tiles and construction products, in baked clay	•		•		
23.41	Manufacture of ceramic household and ornamental articles	•		•		
23.42	Manufacture of ceramic sanitary fixtures	•		•		
23.43	Manufacture of ceramic insulators and insulating fittings	•	•			

NACE code	NACE description	Trade mark	Patent	Design	Copy-right	GI
23.44	Manufacture of other technical ceramic products	●	●			
23.49	Manufacture of other ceramic products	●		●		
23.62	Manufacture of plaster products for construction purposes	●	●			
23.64	Manufacture of mortars	●				
23.65	Manufacture of fibre cement	●	●	●		
23.69	Manufacture of other articles of concrete, plaster and cement	●		●		
23.70	Cutting, shaping and finishing of stone			●		
23.91	Production of abrasive products	●	●	●		
23.99	Manufacture of other non-metallic mineral products n.e.c.	●	●	●		
24.32	Cold rolling of narrow strip	●				
24.33	Cold forming or folding	●				
24.34	Cold drawing of wire	●	●			
24.41	Precious metals production	●	●	●		
24.42	Aluminium production		●	●		
24.45	Other non-ferrous metal production	●	●	●		
24.46	Processing of nuclear fuel		●			
24.52	Casting of steel	●				
25.12	Manufacture of doors and windows of metal			●		
25.21	Manufacture of central heating radiators and boilers	●		●		
25.30	Manufacture of steam generators, except central heating hot water boilers	●	●			
25.40	Manufacture of weapons and ammunition	●	●			
25.50	Forging, pressing, stamping and roll-forming of metal; powder metallurgy		●			
25.71	Manufacture of cutlery	●	●	●		
25.72	Manufacture of locks and hinges	●	●	●		
25.73	Manufacture of tools	●	●	●		
25.91	Manufacture of steel drums and similar containers		●			
25.92	Manufacture of light metal packaging	●	●	●		
25.93	Manufacture of wire products, chain and springs	●	●	●		
25.94	Manufacture of fasteners and screw machine products	●	●	●		
25.99	Manufacture of other fabricated metal products n.e.c.	●	●	●		
26.11	Manufacture of electronic components	●	●	●		
26.12	Manufacture of loaded electronic boards		●			
26.20	Manufacture of computers and peripheral equipment	●	●	●		
26.30	Manufacture of communication equipment	●	●	●		
26.40	Manufacture of consumer electronics	●	●	●		
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	●	●	●		
26.52	Manufacture of watches and clocks	●	●	●		
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	●	●	●		
26.70	Manufacture of optical instruments and photographic equipment	●	●	●		

NACE code	NACE description	Trade mark	Patent	Design	Copy-right	GI
26.80	Manufacture of magnetic and optical media	●	●	●		
27.11	Manufacture of electric motors, generators and transformers		●			
27.12	Manufacture of electricity distribution and control apparatus		●	●		
27.20	Manufacture of batteries and accumulators	●	●	●		
27.31	Manufacture of fibre optic cables		●			
27.32	Manufacture of other electronic and electric wires and cables	●	●	●		
27.33	Manufacture of wiring devices		●	●		
27.40	Manufacture of electric lighting equipment	●	●	●		
27.51	Manufacture of electric domestic appliances	●	●	●		
27.52	Manufacture of non-electric domestic appliances	●		●		
27.90	Manufacture of other electrical equipment	●	●	●		
28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines		●			
28.12	Manufacture of fluid power equipment		●			
28.13	Manufacture of other pumps and compressors	●	●	●		
28.14	Manufacture of other taps and valves	●	●	●		
28.15	Manufacture of bearings, gears, gearing and driving elements	●	●			
28.21	Manufacture of ovens, furnaces and furnace burners	●	●	●		
28.22	Manufacture of lifting and handling equipment	●	●			
28.23	Manufacture of office machinery and equipment (except computers and peripheral equipment)	●	●			
28.24	Manufacture of power-driven hand tools	●	●	●		
28.25	Manufacture of non-domestic cooling and ventilation equipment	●	●	●		
28.29	Manufacture of other general-purpose machinery n.e.c.	●	●	●		
28.30	Manufacture of agricultural and forestry machinery	●	●	●		
28.41	Manufacture of metal forming machinery	●	●			
28.49	Manufacture of other machine tools	●	●			
28.91	Manufacture of machinery for metallurgy	●	●	●		
28.92	Manufacture of machinery for mining, quarrying and construction	●	●			
28.93	Manufacture of machinery for food, beverage and tobacco processing	●	●	●		
28.94	Manufacture of machinery for textile, apparel and leather production		●	●		
28.95	Manufacture of machinery for paper and paperboard production	●	●			
28.96	Manufacture of plastics and rubber machinery		●			
28.99	Manufacture of other special-purpose machinery n.e.c.	●	●	●		
29.10	Manufacture of motor vehicles	●	●	●		
29.20	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers		●	●		
29.31	Manufacture of electrical and electronic equipment for motor vehicles		●			
29.32	Manufacture of other parts and accessories for motor vehicles		●	●		
30.12	Building of pleasure and sporting boats	●				
30.20	Manufacture of railway locomotives and rolling stock		●	●		
30.30	Manufacture of air and spacecraft and related machinery		●			
30.40	Manufacture of military fighting vehicles	●	●			

NACE code	NACE description	Trade mark	Patent	Design	Copy-right	GI
30.91	Manufacture of motorcycles	●	●	●		
30.92	Manufacture of bicycles and invalid carriages	●	●	●		
30.99	Manufacture of other transport equipment n.e.c.	●	●	●		
31.01	Manufacture of office and shop furniture	●		●		
31.02	Manufacture of kitchen furniture			●		
31.03	Manufacture of mattresses	●	●	●		
31.09	Manufacture of other furniture			●		
32.11	Striking of coins			●		
32.12	Manufacture of jewellery and related articles	●		●		
32.13	Manufacture of imitation jewellery and related articles	●		●		
32.20	Manufacture of musical instruments	●		●		
32.30	Manufacture of sports goods	●	●	●		
32.40	Manufacture of games and toys	●	●	●		
32.50	Manufacture of medical and dental instruments and supplies	●	●	●		
32.91	Manufacture of brooms and brushes	●	●	●		
32.99	Other manufacturing n.e.c.	●	●	●		
33.19	Repair of other equipment	●	●			
33.20	Installation of industrial machinery and equipment		●			
41.10	Development of building projects	●				
45.31	Wholesale trade of motor vehicle parts and accessories	●	●			
45.40	Sale, maintenance and repair of motorcycles and related parts and accessories	●				
46.11	Agents involved in the sale of agricultural raw materials, live animals, textile raw materials and semi-finished goods	●				
46.12	Agents involved in the sale of fuels, ores, metals and industrial chemicals	●	●			
46.13	Agents involved in the sale of timber and building materials	●		●		
46.14	Agents involved in the sale of machinery, industrial equipment, ships and aircraft	●	●	●		
46.15	Agents involved in the sale of furniture, household goods, hardware and ironmongery	●	●	●		
46.16	Agents involved in the sale of textiles, clothing, fur, footwear and leather goods	●				
46.17	Agents involved in the sale of food, beverages and tobacco	●				
46.18	Agents specialised in the sale of other particular products	●		●		
46.19	Agents involved in the sale of a variety of goods	●				
46.21	Wholesale of grain, unmanufactured tobacco, seeds and animal feeds	●				
46.22	Wholesale of flowers and plants	●				
46.24	Wholesale of hides, skins and leather	●				
46.31	Wholesale of fruit and vegetables	●				
46.32	Wholesale of meat and meat products	●				
46.33	Wholesale of dairy products, eggs and edible oils and fats	●				
46.34	Wholesale of beverages	●				

NACE code	NACE description	Trade mark	Patent	Design	Copy-right	GI
46.36	Wholesale of sugar and chocolate and sugar confectionery	●		●		
46.37	Wholesale of coffee, tea, cocoa and spices	●				
46.38	Wholesale of other food, including fish, crustaceans and molluscs	●				
46.39	Non-specialised wholesale of food, beverages and tobacco	●				
46.41	Wholesale of textiles	●		●		
46.42	Wholesale of clothing and footwear	●		●		
46.43	Wholesale of electrical household appliances	●	●	●		
46.44	Wholesale of china and glassware and cleaning materials	●		●		
46.45	Wholesale of perfume and cosmetics	●		●		
46.46	Wholesale of pharmaceutical goods	●	●			
46.47	Wholesale of furniture, carpets and lighting equipment	●		●		
46.48	Wholesale of watches and jewellery	●		●		
46.49	Wholesale of other household goods	●		●		
46.51	Wholesale of computers, computer peripheral equipment and software	●				
46.52	Wholesale of electronic and telecommunications equipment and parts	●		●		
46.62	Wholesale of machine tools	●	●			
46.63	Wholesale of mining, construction and civil engineering machinery			●		
46.64	Wholesale of machinery for the textile industry and of sewing and knitting machines	●				
46.65	Wholesale of office furniture	●		●		
46.69	Wholesale of other machinery and equipment	●	●	●		
46.71	Wholesale of solid, liquid and gaseous fuels and related products	●				
46.72	Wholesale of metals and metal ores	●		●		
46.74	Wholesale of hardware, plumbing and heating equipment and supplies	●		●		
46.75	Wholesale of chemical products	●	●			
46.76	Wholesale of other intermediate products	●		●		
46.90	Non-specialised wholesale trade	●		●		
47.19	Other retail sale in non-specialised stores	●				
47.25	Retail sale of beverages in specialised stores	●				
47.41	Retail sale of computers, peripheral units and software in specialised stores	●				
47.51	Retail sale of textiles in specialised stores	●				
47.59	Retail sale of furniture, lighting equipment and other household articles in specialised stores			●		
47.65	Retail sale of games and toys in specialised stores	●		●		
47.74	Retail sale of medical and orthopaedic goods in specialised stores	●				
47.75	Retail sale of cosmetic and toilet articles in specialised stores	●				
47.77	Retail sale of watches and jewellery in specialised stores			●		
47.91	Retail sale via mail order houses or via Internet	●		●		
47.99	Other retail sale not in stores, stalls or markets	●				
50.10	Sea and coastal passenger water transport	●				
50.20	Sea and coastal freight water transport	●				

NACE code	NACE description	Trade mark	Patent	Design	Copy-right	GI
51.10	Passenger air transport	●				
51.20	Freight air transport and space transport	●				
55.90	Other accommodation			●		
58.11	Book publishing	●			●	
58.12	Publishing of directories and mailing lists	●			●	
58.13	Publishing of newspapers				●	
58.14	Publishing of journals and periodicals	●			●	
58.19	Other publishing activities	●			●	
58.21	Publishing of computer games	●			●	
58.29	Other software publishing	●	●		●	
59.11	Motion picture, video and television programme production activities	●			●	
59.12	Motion picture, video and television programme post-production activities	●			●	
59.13	Motion picture, video and television programme distribution activities	●			●	
59.14	Motion picture projection activities				●	
59.20	Sound recording and music publishing activities	●		●	●	
60.10	Radio broadcasting	●			●	
60.20	Television programming and broadcasting activities	●			●	
61.20	Wireless telecommunications activities	●	●		●	
61.30	Satellite telecommunications activities	●	●			
61.90	Other telecommunications activities	●	●	●		
62.01	Computer programming activities	●			●	
62.02	Computer consultancy activities	●			●	
62.03	Computer facilities management activities	●			●	
62.09	Other information technology and computer service activities	●			●	
63.11	Data processing, hosting and related activities	●				
63.12	Web portals	●			●	
63.91	News agency activities	●			●	
63.99	Other information service activities n.e.c.	●			●	
66.00	Activities auxiliary to financial services and insurance activities	●				
68.10	Buying and selling of own real estate	●		●		
68.20	Rental and operating of own or leased real estate	●				
70.21	Public relations and communication activities	●		●	●	
70.22	Business and other management consultancy activities	●				
71.12	Engineering activities and related technical consultancy		●			
71.20	Technical testing and analysis		●			
72.11	Research and experimental development on biotechnology	●	●	●		
72.19	Other research and experimental development on natural sciences and engineering	●	●	●		
72.20	Research and experimental development on social sciences and humanities	●	●			
73.11	Advertising agencies	●		●	●	
73.12	Media representation	●			●	

NACE code	NACE description	Trade mark	Patent	Design	Copy-right	GI
73.20	Market research and public opinion polling	•				
74.10	Specialised design activities	•		•	•	
74.20	Photographic activities				•	
74.30	Translation and interpretation activities				•	
74.90	Other professional, scientific and technical activities n.e.c.	•	•	•		
77.12	Rental and leasing of trucks	•				
77.33	Rental and leasing of office machinery and equipment (including computers)	•				
77.35	Rental and leasing of air transport equipment	•				
77.39	Rental and leasing of other machinery, equipment and tangible goods n.e.c.	•				
77.40	Leasing of intellectual property and similar products, except copyrighted works	•	•	•		
79.11	Travel agency activities	•				
79.12	Tour operator activities	•				
82.11	Combined office administrative service activities	•				
82.30	Organisation of conventions and trade shows	•				
90.01	Performing arts				•	
90.02	Support activities to performing arts				•	
90.03	Artistic creation				•	
91.01	Library and archives activities				•	
92.00	Gambling and betting activities	•				
93.00	Sports activities and amusement and recreation activities excluding 9329 - Other amusement and recreation activities	•				
93.29	Other amusement and recreation activities	•			•	
95.24	Repair of furniture and home furnishings			•		

09 / Appendix: Methodology

9.1 Data matching methodology: detailed description

Intellectual property registers are valuable sources of data for analysis of individual firms, industries or countries. Nevertheless, researchers using such data face many challenges. The most important problems are:

- Lack of harmonised names means that the same business entity may have several separate register accounts.
IP registers tend to have many double or multiple entries for the same applicant, as filers do not always use their existing identification numbers but rather create a new id with the same or slightly changed applicant data on subsequent filings. In these circumstances it is very difficult to tabulate the list of the biggest filers, as the filings of one company could be distributed over many different ids in the IP registers.
- Lack of comprehensive information about the applicants for the IP rights.
The ownership data stored in the IP registers is very limited. Applicants for IP rights file only limited information allowing for subsequent identification of the IP right holder such as name, address and contact details. However, there is no information whatsoever that would allow for IP-related economic research. Not even the basic descriptive statistics needed for a calculation of IPR intensities of industries can be compiled on the basis of IP registers alone.

In recent years, efforts have been made to harmonise names in IP registers (mostly patent registers) and to match it with business register data.⁶⁹ The present study has benefited from the experience and knowledge gathered by researchers and organisations involved in those previous efforts. However, due to its extended geographical reach (27 EU Member States) and IP rights scope (patent, trade marks and designs), the results of previous harmonisation and matching projects could not be directly applied. A new methodology of name harmonisation and data matching had to be developed and implemented.

The algorithms used in the name harmonisation phase were based to a large extent on the KUL Leuven/Eurostat methodology⁷⁰.

69 Examples include: the KUL Leuven/Eurostat methodology for harmonising names in the PATSTAT database, OECD's HAN database, or UK IPO's OFLIP database.

70 Data Production Methods for Harmonised Patent Statistics: Patentee Name Harmonisation, Eurostat 2006.

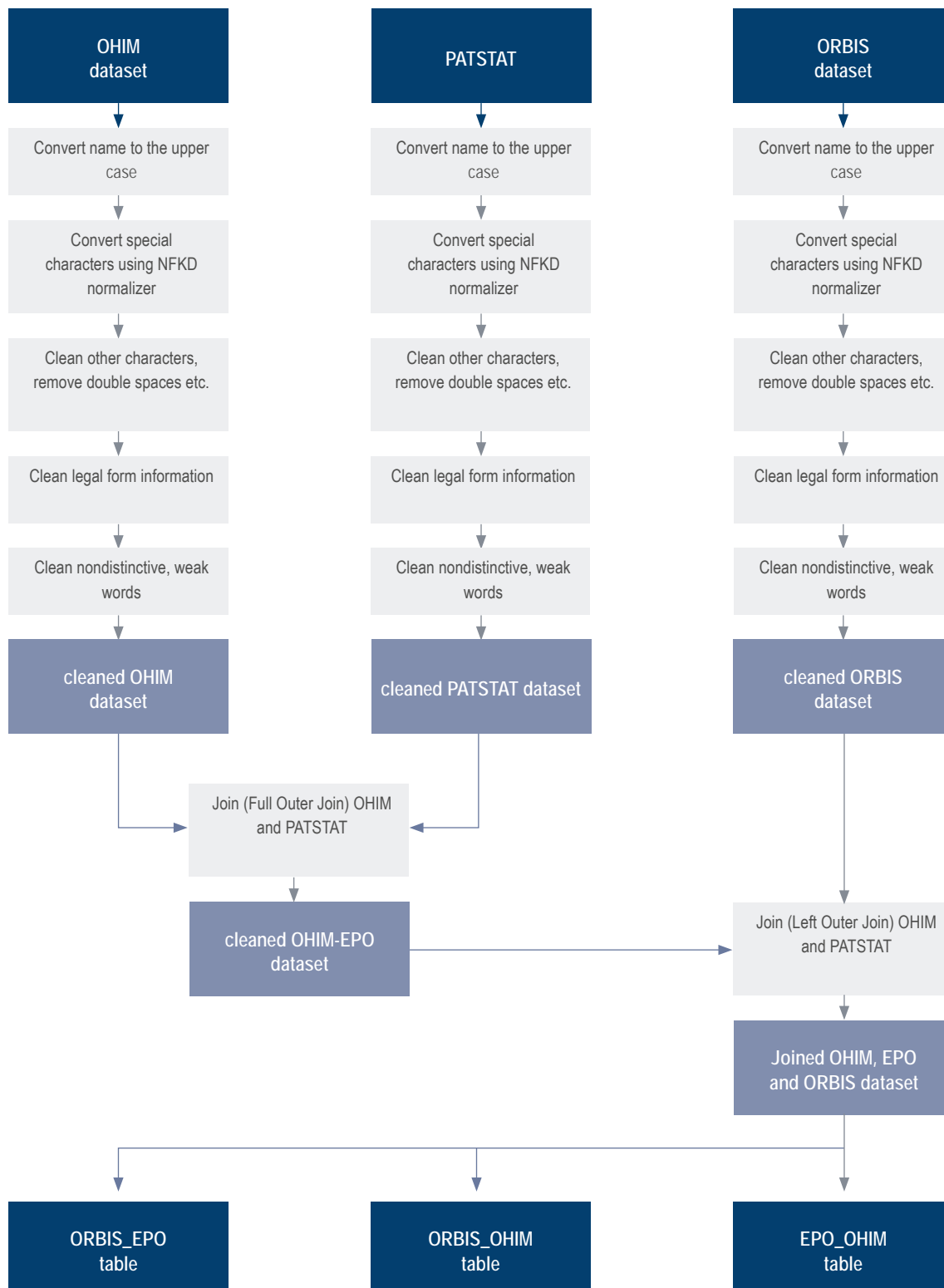
The second phase consisted of matching cleaned and harmonised OHIM and PATSTAT data with the ORBIS database. ORBIS is a source of comprehensive demographic and financial firm data gathered from the national registers. It is commonly used to analyse the economic performance of business entities.⁷¹ The information available in ORBIS is sourced in each country from various information providers which deliver data collected by national or local public institutions to meet legal or administrative requirements. Currently the ORBIS worldwide database contains over 100 million company records. ORBIS Europe, which was used for matching with applicant data in this study, contains more than 20 million company records⁷²

There were several stages to the name harmonisation and matching process carried out to create the matched dataset, as is shown in figure 15.

71 One recent example is the OECD ORBIS database: Pinto Ribeiro, S., S. Menghinello and K.D. Backer, *The OECD ORBIS Database: Responding to the Need for Firm-Level Micro-Data in the OECD*, OECD Statistics Working Papers, 2010/01.

72 <http://www.bvdinfo.com/products/company-information/international/orbis> retrieved 29/5/2013

Figure 15: Outline of harmonisation and matching process



9.1.1 Data pre-processing

The first objective of the data pre-processing was to eliminate problems related to the use of different cases in names (upper, lower or title case). Even though the content of the name string in the various datasets was the same, it would not be treated as such if two different case conventions were used. To deal with this problem, the names of the applicants in the OHIM and EPO datasets were converted to upper case.

By default, IP registers can record applicant names using the national characters of the country of origin. Nevertheless, sometimes applicants or their legal representatives file new applications with the name already converted into its Latin equivalent, without any specific national characters. In such cases, automatic algorithms cannot recognise this Latin form of the name as equivalent to the original one. This problem was dealt with by applying the Normalization Form Compatibility Decomposition (NFKD) Unicode normalisation transformation procedure implemented in Java. This allowed for automatic conversion of all the names into the normalised forms.

In a further pre-processing step all characters other than a-zA-Z0-9&@\$\$+ were replaced with a space, and periods were removed. Leading and trailing whitespaces were also removed, and multiple whitespaces were reduced to one space.

9.1.2 Legal form cleaning

After the initial data pre-processing, proper name cleaning was begun, in order to eliminate all the non-distinctive information that could impede the correct grouping of individual ids and the subsequent matching with the external data source. The key part of the name cleaning was the standardisation and removal of legal form denominations from the name field. Due to the specific challenge of processing owner data from 27 different countries, it was essential to avoid a situation in which character strings that indicate legal forms in some countries but are a distinctive part of the names in others were erroneously deleted. That is why it was decided to deal with legal form denominations on a country-by-country basis. A dictionary was created, containing 480 regular expressions (regex) allowing for identification and removal of legal forms typical in each Member State of the European Union. Regex expressions are a very powerful way to capture in one line several variations of a string describing the same legal form. Thus, with 480 lines of code, it was possible to capture, remove and assign to a separate column the standardised version of almost all legal form denominations used in every Member State of the European Union.

Legal form cleaning was done by filtering only the regex legal form expressions relevant for the given country and looping the names of applicants having their seat in that same country over each regex expression. Once a match was found and the legal form description found in the name field for the applicant, that company record was assigned to the “cleaned dataset” and was not included in the subsequent iterations of the algorithm. Thus, once the relevant legal form had been found within a particular company name, that company was not included in further searching for legal form expressions.

For some countries (BE, DE, PL), a second step of legal form cleaning was added. In the case of Belgium, the purpose was mainly to look for cases where the legal form was indicated in both French and Dutch. Cleaning only one legal form denomination was not effective in those cases

as the same legal form could be indicated in the second official language and still be part of the name field after cleaning. For Germany and Poland, the second cleaning loop was designed to deal with composite legal forms, such as *GMBH CO KG* or *Spółka z ograniczoną odpowiedzialnością spółka komandytowo-akcyjna*, which are composed of two or more legal forms that are also used in the legal context as separate stand-alone legal forms. Within this second loop, the algorithm was designed to check whether the given legal form had already been detected in the name field and if not, the abbreviated denomination of that form was added to the legal form field.

In some countries, legal form descriptions are separated by other words which are distinctive to the companies. In such cases, as a first step before the legal form cleaning, the legal form was standardised as the final part of the string, leaving all other words as an integral part of the normalised name.

The legal form cleaning procedure was conducted on the three datasets (OHIM, EPO and ORBIS) separately.

After completion of this step, there were 81 separate tables (3 tables each for every country, corresponding to the three data sources) containing the normalised name field, without legal form denominations, for each company present in the original OHIM, EPO and ORBIS datasets. Additionally, a new column was added, containing the standardised legal form derived from the information present in the original name field and deleted from the normalised name field during the cleaning process.

9.1.3 Preparation of data for the matching algorithm

Similarly to the legal form cleaning, the direct preparation for matching and the matching phases were carried out on a country-by-country basis. The starting point for each country were the three tables containing the results from the previous step (legal form cleaning).

As a first step, each country was assigned a code specific to that country/language, and non-distinctive words were removed from the normalised names. The list of non-distinctive words was based on a calculation of the presence of words within the firms' names and a thorough, labour-intensive analysis of each data set. This part of the procedure was not wholly automatic, as not all the relatively frequent words were removed from the normalised name field through the automated procedure. By the same token, some words that are relatively less frequent than others were removed from the normalised names because, after analysis of each dataset, it turned out that they were not distinctive.

A substantial number of the applicants in both the OHIM and the EPO datasets are natural persons. It was decided not to filter them out of the respective datasets to allow for matching if there was a corresponding id in ORBIS. However, there is no separate field in PATSTAT for indicating whether or not the applicant is a natural person. In addition, natural persons' names are formatted differently in PATSTAT than in ORBIS. To deal with the problem of different formats for natural persons in PATSTAT and ORBIS, the *person_name* field from the EPO dataset was split into two parts, using a comma as a delimiter. Then the order of the two parts was reversed, making it similar to the ORBIS formatting. Next, a check was performed to match this rearranged field to the OHIM and ORBIS datasets. If a match occurred, the name was converted into the normalised name, identical in the three databases.

In the next step, the *trading as* denominations within each of three datasets were examined. *Trading as* indications are also country/language specific. If the name contained the trading as type of denomination, two additional fields were created, *NormCompany_short* being the part preceding the *trading as* string, and *TradingAs* being the part after the trading as expression. For example, the name “Office for Harmonization in the Internal Market trading as OHIM” would be converted into three fields: the normalised field OFFICE FOR HARMONIZATION IN THE INTERNAL MARKET TRADING AS OHIM; the *NormCompany_short* field OFFICE FOR HARMONIZATION IN THE INTERNAL MARKET; and the *TradingAs* field OHIM.

After creating these two additional fields, a check was carried out to determine whether the companies that could not be matched/grouped on the basis of the normalised name had a match with other ids based on the *NormCompany- NormCompany_short* comparison.

After dealing with *trading as* expressions, all the spaces between the words were removed, forming a normalised name, thus creating one string composed of all the words left from the name after the processing in the previous stages.

The last step in the process of data preparation for the final match consisted of grouping each of the datasets from EPO, OHIM and ORBIS by normalised name. While grouping the records by normalised name, the individual records id numbers, address and legal form information were retained in the concatenated format.

9.1.4 Matching data between OHIM and EPO

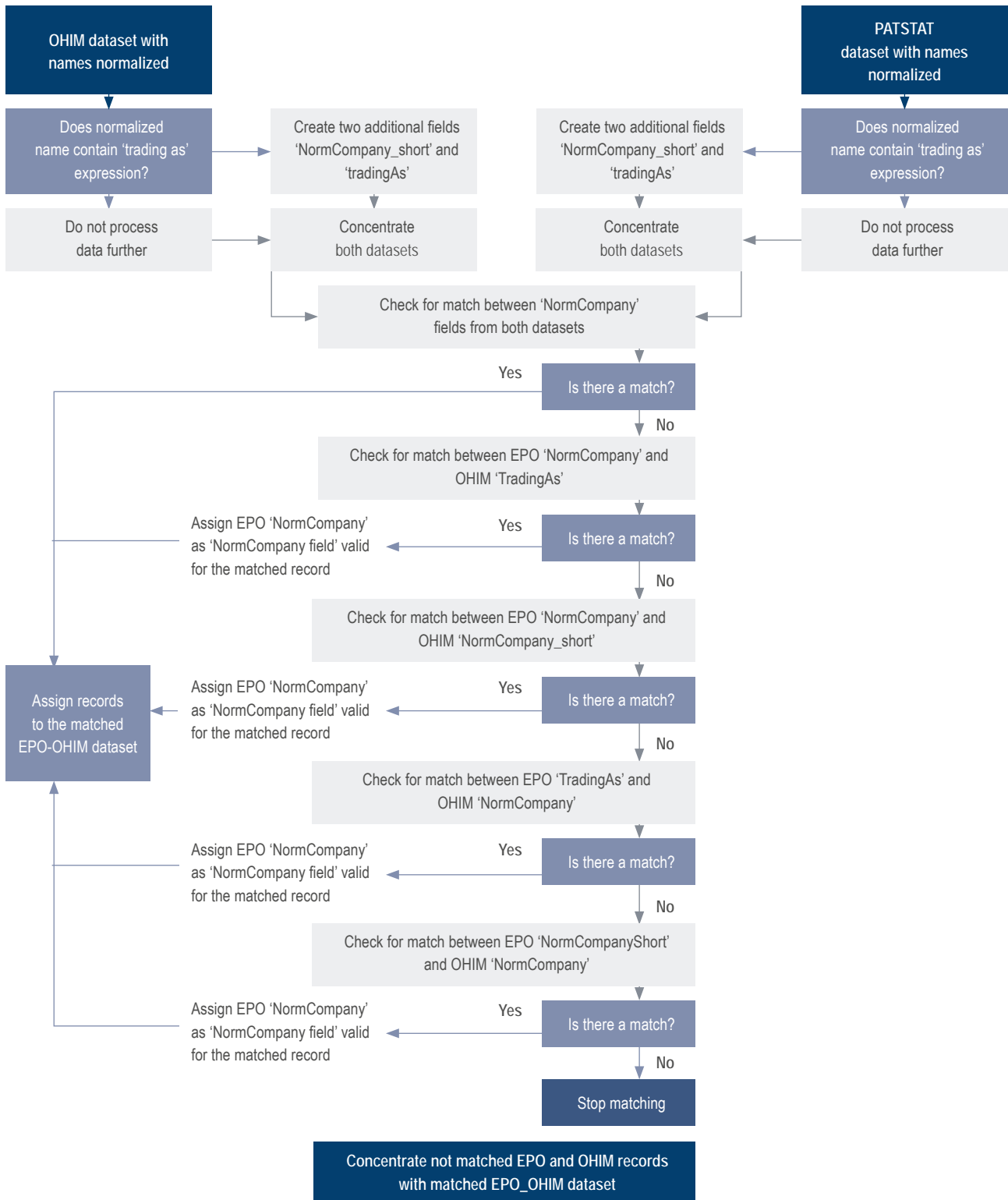
In order to combine OHIM and EPO data, an initial match was attempted using the *NormCompany* names from both datasets. In the next step, all the records for which there was a match were filtered out and assigned to a separate dataset.

In subsequent steps, the records from both datasets that were not matched by *NormCompany* field were processed by successive matching exercises using the EPO *NormCompany* and OHIM *TradingAs* field, followed by a match on the EPO *NormCompany* name and OHIM *NormCompany_short* fields. In each step, if a match was achieved, the matched records were added to the dataset created as the results of the previous steps.

The procedure was repeated for the records not matched at the first stage (by normalised names from both datasets). At this stage, the OHIM *NormCompany* field was matched with the EPO *TradingAs* field and, if there was no match, with the EPO *NormCompany_short* field.

After finalising the matching procedure, the records in the matched OHIM_EPO dataset were assigned the common normalised EPO-OHIM name *NormCompany_OHIM_EPO*. Subsequently, all the records from the original PATSTAT and OHIM tables that had not been matched to each other were added. Similarly, the name of *NormCompany* field for each of those records was converted to *NormCompany_OHIM_EPO* to standardise it over the whole dataset. Figure 16 outlines the procedure for matching the OHIM and PATSTAT datasets.

Figure 16: Matching data between OHIM and EPO



9.1.5 Matching OHIM/EPO dataset with ORBIS

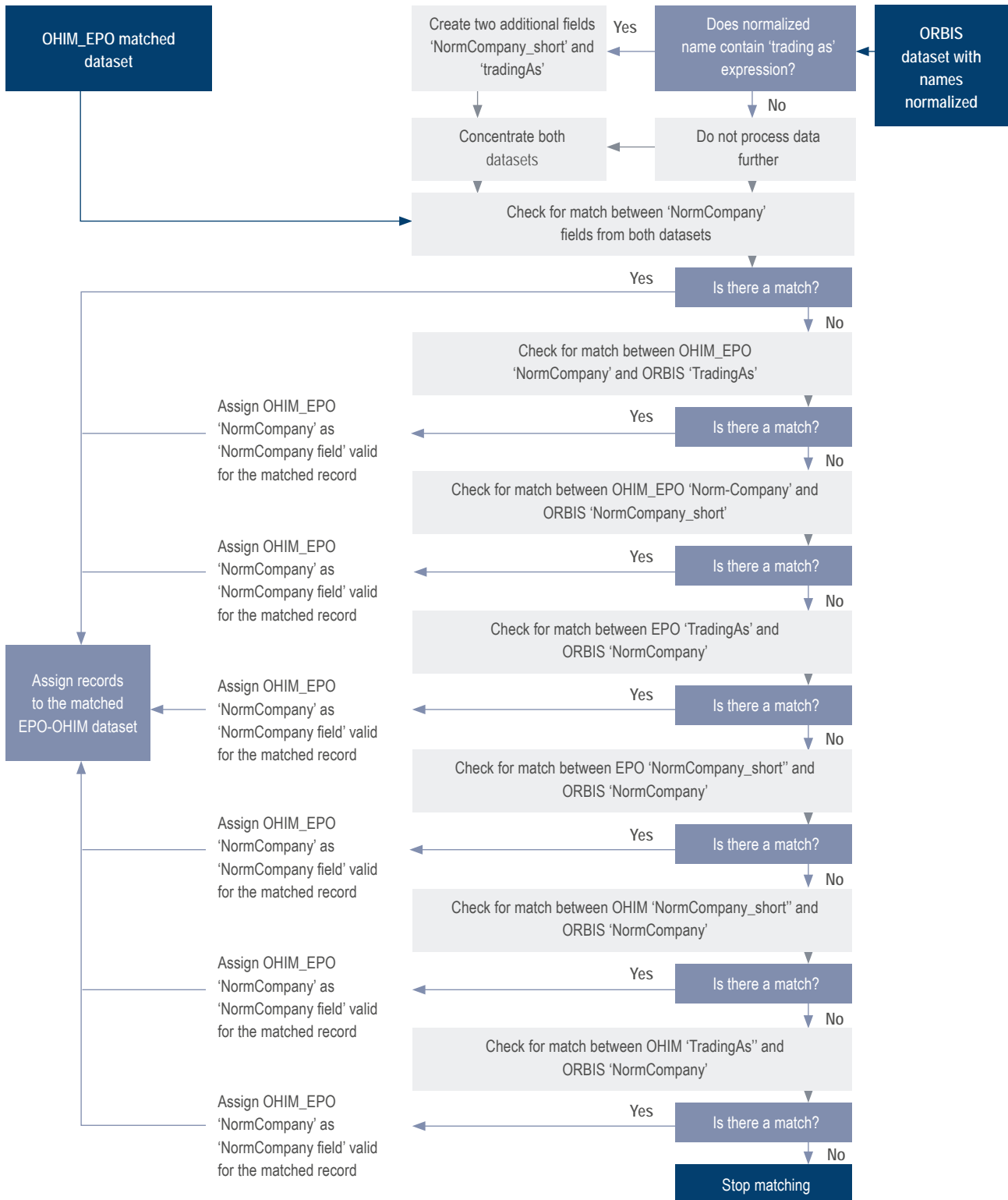
The second step in the matching procedure was to match the OHIM_EPO dataset with ORBIS. In the first iteration, possible matches were checked using *NormCompany_OHIM_EPO* from the OHIM/EPO dataset and *NormCompany* field from ORBIS. All the matches were assigned to a separate dataset and subsequent search iterations were performed for matches using *TradingAs* and *NormCompany_short* fields originally stemming from each of the three datasets. This was done by first taking the *NormCompany_short* field from the ORBIS dataset and checking for matches with the *NormCompany_OHIM_EPO* dataset. In case of a match, the matched records were assigned to a matched dataset. Then, a match between *Trading As* fields with the *NormCompany_OHIM_EPO* dataset was carried out for those records that had not been matched in the preceding stages.

A similar procedure was performed to find matches between the *NormCompany* field from the ORBIS dataset and *TradingAs* based on the EPO *person_name* field, *NormCompany_short* based on the EPO *person_name* field and, finally, *TradingAs* based on the OHIM *owner_name* field and *NormCompany_short* based on the OHIM *owner_name* field.

After completing these matching procedures, the results were concatenated in one table containing all the matched records.

The matching procedure is summarised in figure 17.

Figure 17: Matching OHIM/EPO dataset with ORBIS



9.1.6 Post-match data processing (disambiguation)

After the initial matching phase described in the preceding section, the one-to-one matches (one EPO/OHIM record matched with only one ORBIS record) were filtered out, and one-to-many matches (where one EPO/OHIM record matched several ORBIS records) were selected for further processing. At this stage, additional information (other than the firm name) was used. This information was either available in the original three datasets or had been created in the process of legal form cleaning.

The ORBIS dataset contains a field called DUO (domestic ultimate owner). As a first step, all the companies from the ORBIS dataset were grouped by their normalised name and a check was carried out to establish how many unique DUO numbers corresponded to each group. If there was only one DUO number associated with several ORBIS firms with the same normalised name, then the record associated with that company was taken as a potential match. Before matching those records, the completeness of the DUO company record was compared with that of the other companies in the group, in terms of turnover and employment reported. This was necessary because no information was available on whether the DUO company was consolidating accounts of its subsidiaries. Therefore, the EPO/OHIM record was matched to only one relevant ORBIS record (DUO or subsidiary), namely that with the highest turnover and employment figures within the group.

In the next step, groups of ORBIS records with the same normalised name and the same Bureau van Dijk⁷³ (BvD) id root were identified. Sometimes ORBIS branches or subsidiaries have the same number as the parent company, with additional digits separated from the root number with a hyphen. This hyphen and all digits following the hyphen were stripped off to check whether all the ORBIS companies with the same normalised name had the same root BvD id number. If so, the EPO/OHIM record was linked with the company whose BvD id number was the root number for all ORBIS companies with the same normalised name.

Subsequently, the algorithm checked whether among the ORBIS companies with the same normalised name there was only one company with the same legal form as at least one company in the EPO/OHIM database.

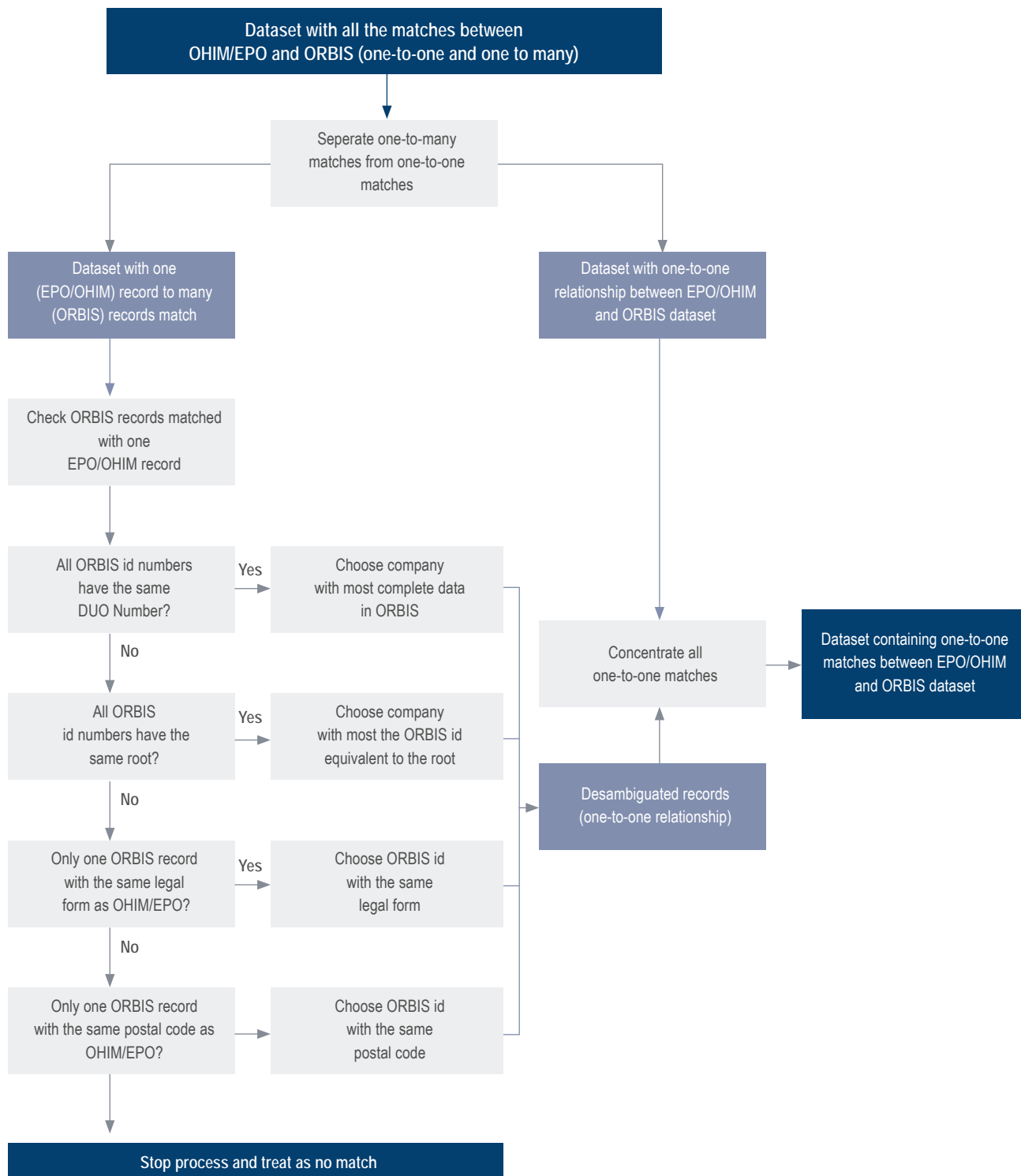
In a final attempt to find a unique match, the postal codes in the EPO-OHIM record were compared with those in the various ORBIS records matched to it. If only one ORBIS record matched the postal code in the EPO-OHIM record, it was added to the matched dataset.

The final stage of the disambiguation process consisted of concatenating the initial matched dataset (one-to-one matches between EPO-OHIM and ORBIS records) with the datasets created during the various stages of the disambiguation process described above. The resulting dataset contained all the records with a one-to-one relationship between EPO-OHIM and ORBIS tables. The matched records which still had one-to-many relationships following the disambiguation process were disregarded.

The disambiguation process is summarised in figure 18.

73 Bureau van Dijk is the provider of the ORBIS database.

Figure 18: Post-match data processing (disambiguation)



9.1.7 Manual matching phase

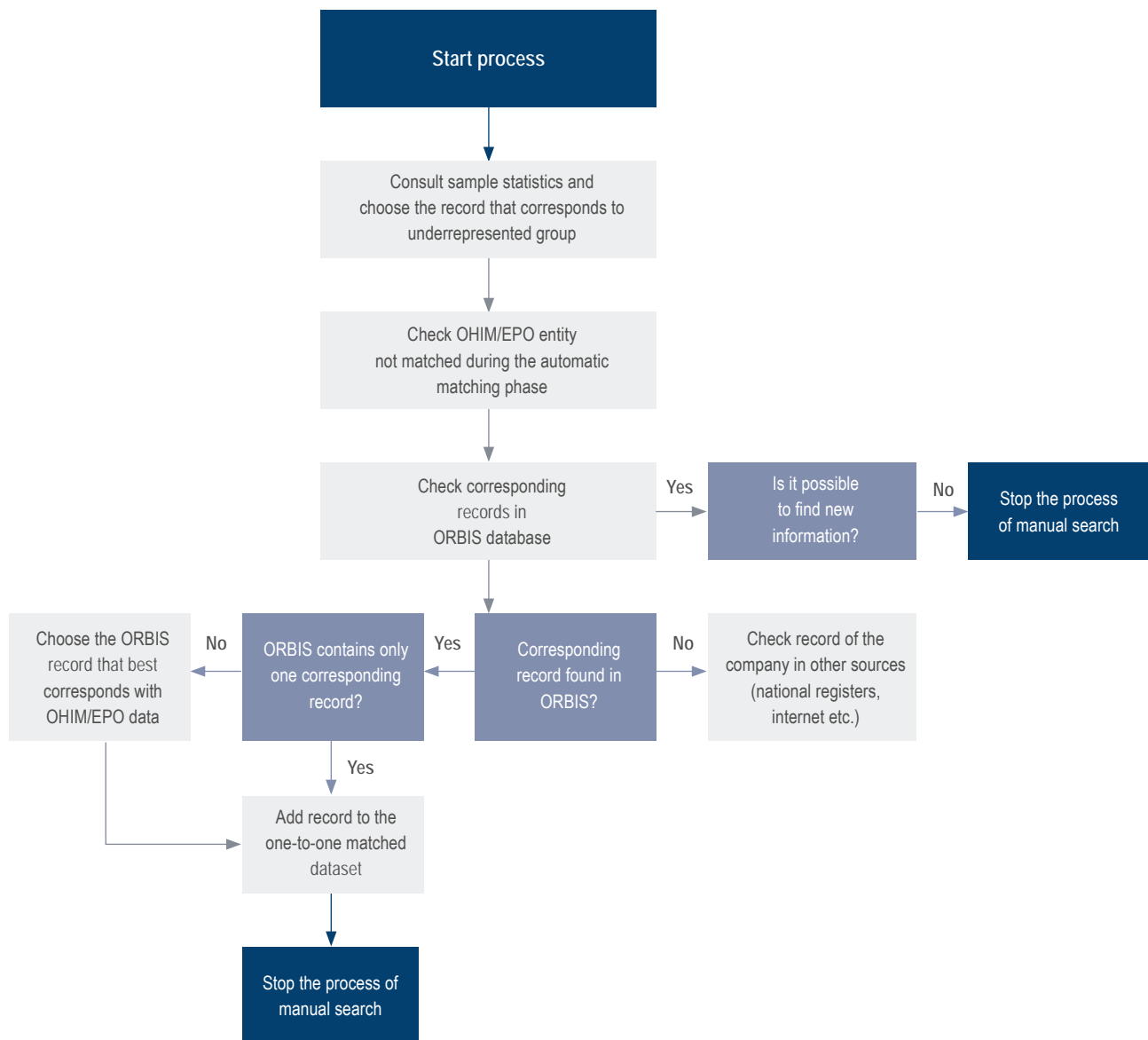
The matching algorithms described up to this point were automated. In order to ensure that the sample of companies in the matched dataset was representative of the overall population of OHIM/EPO applicants, a further manual matching procedure was carried out.

For the manual matching phase, 27 databases were created, containing information on the patent, trade mark and design applicants from each Member State of the European Union. As a basis for the manual matching, the frequency distribution of IP rights among applicants in the matched sample was compared with the distribution in the entire register (OHIM's or EPO's, as applicable). The manual matching process was designed to ensure that the frequency distribution in the sample matched the overall population, and was therefore concentrated on those applicants that were underrepresented in the sample (most often those with a lower number of IP rights). In general, companies with bigger IPR portfolios tend to be large and are, relatively speaking, easier to find in the ORBIS database than smaller companies. This procedure ensured that the bias in the sample created by the automated part of the matching process was reduced as much as possible.

For the manual checking process, applicant information from sources other than ORBIS was used, such as national business registers or company websites, in order to find the reason for the non-match. In some cases, for example, it could be established that the company had recently changed its name. In such cases, this new piece of information was used to query the ORBIS database again. Thus, the normalised name in ORBIS sometimes did not correspond to the normalised name in the OHIM/EPO database.

A simplified outline of the manual search phase is shown in figure 19.

Figure 19: Manual matching phase



9.1.8 Preparation of the final concordance tables

After finalising the disambiguation process and the manual check, various concordance tables were created, serving as a bridge between the data stored in the various data repositories needed for economic analysis of the IP rights.

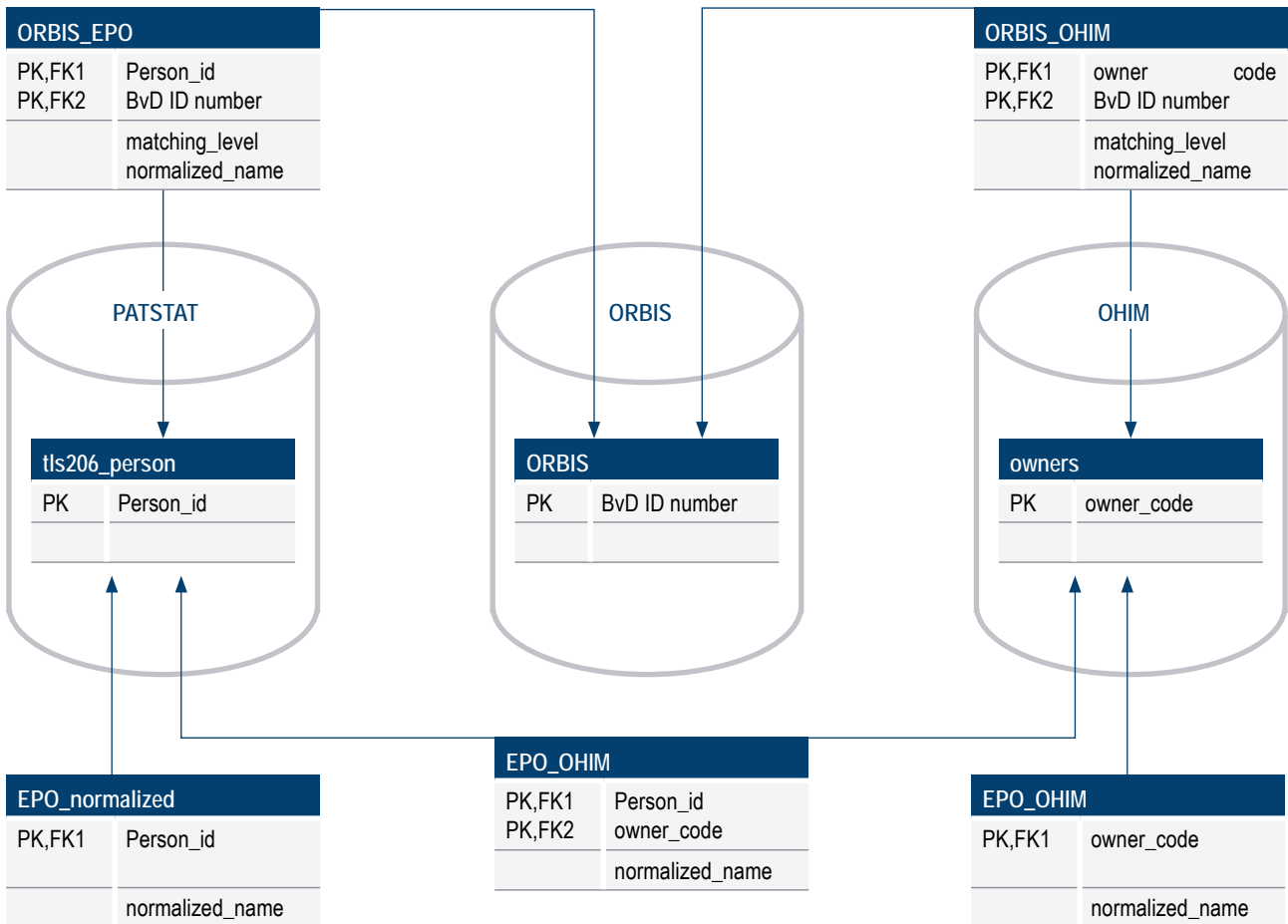
Figure 20 presents a schematic illustration of the final tables compiled on the basis of the matching exercise and their relationships with key tables from the PATSTAT, OHIM and ORBIS data repositories. There are three main concordance tables:

- The **ORBIS-EPO concordance** table: the primary key was the *person_id* number from the *tls206_person* table of PATSTAT and the *BvD id* number from the ORBIS dataset. This table was used to link the patent information in PATSTAT with the demographic and financial data on the European companies in the ORBIS dataset.

- The **ORBIS-OHIM concordance** table: the primary key was the *owner_code* from the *dim_owner* table of OHIM's datawarehouse and the *BvD id* number from the ORBIS dataset. This table was used to link trade mark and design information in the OHIM register with demographic and financial data on the European companies in the ORBIS dataset.

- The **EPO-OHIM concordance** table: the primary key was the *person_id* number from the *tls206_person* table of PATSTAT and the *owner_code* from the *dim_owner* table of OHIM's datawarehouse. This table was used to link the patent information in PATSTAT directly with the trade mark and design information in the OHIM register. It contained both the applicants matched with the ORBIS dataset and those that were not matched to ORBIS but appeared in both IP rights repositories (PATSTAT and OHIM register).

Figure 20: Preparation of the final concordance tables



9.1.9 Adjustments to absolute intensity calculations

Once the EPO/OHIM/ORBIS database had been matched with Eurostat industry statistics from SBS—a step necessary to calculate absolute intensity—it became apparent that two issues needed to be solved: the problem of head offices and the problem of NACE codes at different levels of aggregation. This section explains how these issues manifested themselves and how they were addressed for patents, trade marks and designs.

Redistribution of patents from *head offices*

One problem identified during the initial calculations was the presence of some general, non-specific industry codes, namely 7010 *Activities of head offices*, 6420 *Activities of holding companies* and 8299 *Other business support service activities n.e.c.*⁷⁴ In terms of absolute patent intensity, those industries were ranked second, third and 27th, respectively. This phenomenon reflects the common business practice of concentrating patent portfolios at head offices, which also handle all the relevant filing and registering procedures.

This practice could potentially have distorted the industry intensity analysis if some industries were more prone than others to leave maintenance of their patent portfolio to the holding/head office companies. Such industries would be underrepresented in the general classification.

To deal with this problem, the more specific industry codes associated with codes 7010, 6420 and 8299 were analysed in detail as follows:

1. In the PATSTAT-ORBIS concordance table, patent applicants associated with NACE codes 7010, 6420 and 8299 (9550 applicant ids) were identified (referred to below as *head office*). The firms thus identified correspond to the whole population of patent applicants, not only those that filed patent applications between 2004 and 2008.
2. For each country the information associated with the *head office* was checked in ORBIS in the following manner:
 - a) First, a search was carried out to determine if the *head office* had a DUO (domestic ultimate owner) status for other companies present in the ORBIS dataset for that country (*subsidiary companies*).
 - If so, the ORBIS information for *head office* was matched with that of the subsidiary companies, previously filtering out the information on the subsidiary companies with NACE codes equal to 6420, 7010 or 8299. Also, all the NACE codes not in the original ranking were eliminated from the dataset. This procedure was designed to prevent the addition of new industries to the patent-intensity ranking only because they were in the same business group as the head office that had filed the patent application.

74 n.e.c. is a common abbreviation in national account statistics, meaning “not elsewhere classified”.

- In the next step, the dataset was grouped by the *head office* BvD id number, counting the number of unique industry codes associated with the DUO company and assigning to each *subsidiary company* linked with the *head office* a weight of 1 divided by the number of firms linked with the given head office. Subsequently, the *industry factor* was computed by multiplying the number of firms representing each industry by the weight calculated in the previous step.
- b) In cases where the check in (a) yielded no results, a second check was carried out to determine whether the *head office* had a DUO number meaning that it was a subsidiary company linked with other firms (*sisters*) by a shared DUO code.
- If so, information regarding all the companies linked with *head office* by the same DUO code was extracted, previously filtering out the information on the other companies from the same group with NACE codes equal to 6420, 7010 and 8299, and eliminating from the dataset all the NACE codes not present in the original ranking. As before, this procedure was designed to prevent the addition of new industries to the patent-intensity ranking only because they were in the same business group as the head office that had filed the patent application.
 - Similarly, the dataset was grouped by the BvD id number of the *head office*, counting the number of unique industry codes linked by the same DUO number (being a part of the same group or holding). In the next step, the dataset was grouped by the head office BvD id number, counting the number of unique industry codes associated with the DUO company and assigning to each *subsidiary company* linked with the *head office* a weight of 1 divided by the number of firms linked with the given *head office*. Subsequently, the *industry factor* was computed by multiplying the number of firms representing each industry by the weight calculated in the previous step.

As a result of the procedures described in points (a) and (b) above, more specific industry codes than the initial 6420, 7010 and 8299 were found for 5434 of a total 7449 unique patents ids initially associated with *head offices*. For those *head offices* for which more specific industrial codes could not be found (2015 unique patent ids), the granted patents were redistributed among all other classes in proportion to the weight of the given class in the analysed sample.

Redistribution of trade marks from *head offices*

As in the case of patents, one problem identified during the initial calculations for trade marks was the presence of some general, non-specific industries' codes, namely 7010 *Activities of head offices*, 6420 *Activities of holding companies* and 8299 *Other business support service activities n.e.c.* Those industries ranked highly in terms of the overall number of trade marks, with 7010 coming first, 6420 second and 8299 third. Thus, it appears that the tendency to centralise IP management is even more pronounced for trade marks than for patents.

This practice could potentially have distorted the industry-intensity analysis if some industries were more prone than others to leave maintenance of their trade mark portfolio to the holding company/ head office, as those industries would then be underrepresented in the general classification. This problem also arose in connection with patents but was particularly acute for trade marks, since *head offices* account for more than 10% of all the trade mark classes in the ranking.

In order to avoid this potential distortion, the problem was dealt with in exactly the same manner as described in the previous section. As a result, more specific industry codes were found for 9,552 trade marks (29,658 trade mark classes) of a total of 15,516 trade marks (49,133 trade mark classes) initially associated with the *head offices*. For those *head offices* for which more specific industrial codes could not be found (19,475 trade mark classes), the trade marks were redistributed among all other NACE classes in proportion to the weight of the given class in the analysed sample.

Redistribution of design rights from *head offices*

Like patents and trade marks, designs were also affected, albeit less severely, by the problem of the general, non-specific industries' codes, namely 7010 *Activities of head offices*, 6420 *Activities of holding companies* and 8299 *Other business support service activities n.e.c.* In terms of the overall number of designs, these three industries (collectively termed *head offices*) ranked 7th, 6th and 22nd, respectively. However, in order to avoid any potential distortions of the analysis, designs were treated in the same way as patents and trade marks in respect of those three industries.

As a result, more specific industry codes were found for 7,879 of a total of 12,618 designs initially associated with the *head offices*. For those *head offices* for which more specific industrial codes could not be found 4,739 designs, the designs were redistributed among all other NICE classes in proportion to the weight of the given class in the analysed sample.

NACE codes at different levels of aggregation

In some cases, ORBIS assigns to a firm the NACE code at a higher level of aggregation (3-digit group or 2-digit division) when in the NACE classification those codes could be disaggregated into a lower level of analysis (class). For computational reasons, ORBIS adds one or two zeros to such group or division codes in order to create 4-digit classes in all records. These classes are referred to as *synthetic classes* below.

Another source of *synthetic classes* in the ranking was the use of the concordance table for retrieving NACE information (at a division, i.e. 2-digit, level) whenever ORBIS did not contain one.

Overall those *synthetic classes* accounted for almost 6000 patents. Disregarding patents linked with *synthetic classes* could have resulted in bias in the analysis. To avoid that, it was decided to deal with this problem by redistributing the patents associated with *synthetic classes* among the classes within the division or group, as applicable. Whenever the *synthetic class* was associated with a true division code, the patents were redistributed among all NACE classes below the division code in proportion to the weight of the given class within the division. Whenever the *synthetic class* was associated with the group code, the patents were assigned to all NACE classes below the group in proportion to the weight of the given class within the group. This problem also arose for trade marks and designs, affecting 13,813 trade marks and 8,262 designs, and it was solved in the same way as for patents, by redistributing the affected trade marks and designs among the NACE classes within the same group or division, as applicable.

As a result of these additional calculations, the final absolute patent-intensity ranking includes 501 NACE industry classes, the final absolute trade mark-intensity ranking includes 596 NACE industry classes, while the final absolute design-intensity ranking includes 527 NACE industry classes (at the 4-digit level).

9.2 Patent-intensive industries

Table 28

NACE code	NACE description	Patents/1000 employees
28.24	Manufacture of power-driven hand tools	109,741
77.40	Leasing of intellectual property and similar products, except copyrighted works	69,232
21.10	Manufacture of basic pharmaceutical products	27,569
20.59	Manufacture of other chemical products n.e.c.	19,080
72.11	Research and experimental development on biotechnology	15,639
26.70	Manufacture of optical instruments and photographic equipment	13,673
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	13,349
27.51	Manufacture of electric domestic appliances	13,119
28.91	Manufacture of machinery for metallurgy	12,333
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	12,260
28.94	Manufacture of machinery for textile, apparel and leather production	9,843
72.19	Other research and experimental development on natural sciences and engineering	9,651
24.45	Other non-ferrous metal production	9,563
26.30	Manufacture of communication equipment	9,354
26.11	Manufacture of electronic components	8,515
06.20	Extraction of natural gas	8,508
30.99	Manufacture of other transport equipment n.e.c.	7,988
20.11	Manufacture of industrial gases	7,769
28.95	Manufacture of machinery for paper and paperboard production	7,584
30.40	Manufacture of military fighting vehicles	7,579
28.99	Manufacture of other special-purpose machinery n.e.c.	7,222
22.11	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	7,040
24.34	Cold drawing of wire	6,807
28.15	Manufacture of bearings, gears, gearing and driving elements	6,662
30.30	Manufacture of air and spacecraft and related machinery	6,461
20.42	Manufacture of perfumes and toilet preparations	5,967
27.90	Manufacture of other electrical equipment	5,736
25.72	Manufacture of locks and hinges	5,716
28.93	Manufacture of machinery for food, beverage and tobacco processing	5,663
23.43	Manufacture of ceramic insulators and insulating fittings	5,284
61.90	Other telecommunications activities	5,005
28.30	Manufacture of agricultural and forestry machinery	4,983
32.30	Manufacture of sports goods	4,760
27.31	Manufacture of fibre optic cables	4,759
20.51	Manufacture of explosives	4,650
20.41	Manufacture of soap and detergents, cleaning and polishing preparations	4,547
28.49	Manufacture of other machine tools	4,493

NACE code	NACE description	Patents/1000 employees
23.11	Manufacture of flat glass	4,415
20.16	Manufacture of plastics in primary forms	4,395
20.13	Manufacture of other inorganic basic chemicals	4,316
28.29	Manufacture of other general-purpose machinery n.e.c.	4,048
29.32	Manufacture of other parts and accessories for motor vehicles	3,782
74.90	Other professional, scientific and technical activities n.e.c.	3,720
21.20	Manufacture of pharmaceutical preparations	3,597
29.10	Manufacture of motor vehicles	3,196
26.40	Manufacture of consumer electronics	3,007
30.92	Manufacture of bicycles and invalid carriages	2,985
26.80	Manufacture of magnetic and optical media	2,961
32.50	Manufacture of medical and dental instruments and supplies	2,874
20.20	Manufacture of pesticides and other agrochemical products	2,855
28.14	Manufacture of other taps and valves	2,853
27.20	Manufacture of batteries and accumulators	2,801
25.71	Manufacture of cutlery	2,729
28.41	Manufacture of metal forming machinery	2,681
30.20	Manufacture of railway locomotives and rolling stock	2,633
28.92	Manufacture of machinery for mining, quarrying and construction	2,610
28.13	Manufacture of other pumps and compressors	2,609
32.99	Other manufacturing n.e.c.	2,481
25.40	Manufacture of weapons and ammunition	2,478
23.19	Manufacture and processing of other glass, including technical glassware	2,466
22.29	Manufacture of other plastic products	2,361
20.14	Manufacture of other organic basic chemicals	2,356
10.89	Manufacture of other food products n.e.c.	2,350
25.93	Manufacture of wire products, chain and springs	2,320
29.31	Manufacture of electrical and electronic equipment for motor vehicles	2,303
28.25	Manufacture of non-domestic cooling and ventilation equipment	2,202
24.41	Precious metals production	2,195
23.99	Manufacture of other non-metallic mineral products n.e.c.	2,153
20.12	Manufacture of dyes and pigments	2,133
25.73	Manufacture of tools	2,108
27.40	Manufacture of electric lighting equipment	2,105
28.22	Manufacture of lifting and handling equipment	2,010
26.20	Manufacture of computers and peripheral equipment	1,923
22.22	Manufacture of plastic packing goods	1,906
58.29	Other software publishing	1,906
24.46	Processing of nuclear fuel	1,838
28.23	Manufacture of office machinery and equipment (except computers and peripheral equipment)	1,824
28.96	Manufacture of plastics and rubber machinery	1,823

NACE code	NACE description	Patents/1000 employees
30.91	Manufacture of motorcycles	1,815
20.60	Manufacture of man-made fibres	1,801
22.19	Manufacture of other rubber products	1,743
23.14	Manufacture of glass fibres	1,707
17.22	Manufacture of household and sanitary goods and of toilet requisites	1,684
13.94	Manufacture of cordage, rope, twine and netting	1,604
10.83	Processing of tea and coffee	1,601
20.52	Manufacture of glues	1,529
46.75	Wholesale of chemical products	1,506
46.69	Wholesale of other machinery and equipment	1,494
13.95	Manufacture of non-wovens and articles made from non-wovens, except apparel	1,484
07.29	Mining of other non-ferrous metal ores	1,475
25.92	Manufacture of light metal packaging	1,460
09.10	Support activities for petroleum and natural gas extraction	1,445
46.46	Wholesale of pharmaceutical goods	1,444
23.44	Manufacture of other technical ceramic products	1,444
26.52	Manufacture of watches and clocks	1,436
27.11	Manufacture of electric motors, generators and transformers	1,424
25.94	Manufacture of fasteners and screw machine products	1,423
06.10	Extraction of crude petroleum	1,381
27.32	Manufacture of other electronic and electric wires and cables	1,332
26.12	Manufacture of loaded electronic boards	1,297
28.12	Manufacture of fluid power equipment	1,287
29.20	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	1,273
22.21	Manufacture of plastic plates, sheets, tubes and profiles	1,241
25.99	Manufacture of other fabricated metal products n.e.c.	1,236
71.20	Technical testing and analysis	1,192
23.91	Production of abrasive products	1,179
71.12	Engineering activities and related technical consultancy	1,178
27.12	Manufacture of electricity distribution and control apparatus	1,158
28.21	Manufacture of ovens, furnaces and furnace burners	1,150
33.20	Installation of industrial machinery and equipment	1,146
14.11	Manufacture of leather clothes	1,128
72.20	Research and experimental development on social sciences and humanities	1,091
25.30	Manufacture of steam generators, except central heating hot water boilers	1,068
32.91	Manufacture of brooms and brushes	1,058
46.14	Agents involved in the sale of machinery, industrial equipment, ships and aircraft	1,042
28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	0,982
61.30	Satellite telecommunications activities	0,956
10.41	Manufacture of oils and fats	0,942
32.40	Manufacture of games and toys	0,922

NACE code	NACE description	Patents/1000 employees
23.65	Manufacture of fibre cement	0,901
17.12	Manufacture of paper and paperboard	0,892
31.03	Manufacture of mattresses	0,858
45.31	Wholesale trade of motor vehicle parts and accessories	0,855
46.43	Wholesale of electrical household appliances	0,846
33.19	Repair of other equipment	0,844
20.30	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	0,826
25.50	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	0,787
20.53	Manufacture of essential oils	0,784
25.91	Manufacture of steel drums and similar containers	0,774
27.33	Manufacture of wiring devices	0,772
13.99	Manufacture of other textiles n.e.c.	0,770
23.62	Manufacture of plaster products for construction purposes	0,752
12.00	Manufacture of tobacco products	0,734
46.12	Agents involved in the sale of fuels, ores, metals and industrial chemicals	0,730
46.62	Wholesale of machine tools	0,711
61.20	Wireless telecommunications activities	0,706
24.42	Aluminium production	0,706
17.29	Manufacture of other articles of paper and paperboard	0,705
22.23	Manufacture of builders' ware of plastic	0,702
46.15	Agents involved in the sale of furniture, household goods, hardware and ironmongery	0,697

9.3 Trade mark-intensive industries

Table 29

NACE code	NACE description	Trademarks/1000 employees
77.40	Leasing of intellectual property and similar products, except copyrighted works	212,215
21.10	Manufacture of basic pharmaceutical products	38,806
11.02	Manufacture of wine from grape	38,782
72.11	Research and experimental development on biotechnology	35,907
20.42	Manufacture of perfumes and toilet preparations	32,397
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	27,076
30.99	Manufacture of other transport equipment n.e.c.	26,633
32.40	Manufacture of games and toys	26,213
32.30	Manufacture of sports goods	25,516
61.90	Other telecommunications activities	25,462
58.21	Publishing of computer games	25,054
11.01	Distilling, rectifying and blending of spirits	24,471
59.13	Motion picture, video and television programme distribution activities	24,353
63.12	Web portals	24,320
17.24	Manufacture of wallpaper	23,418
24.45	Other non-ferrous metal production	22,696
32.99	Other manufacturing n.e.c.	22,540
10.73	Manufacture of macaroni, noodles, couscous and similar farinaceous products	22,170
18.11	Printing of newspapers	21,506
59.20	Sound recording and music publishing activities	21,263
58.29	Other software publishing	20,708
20.59	Manufacture of other chemical products n.e.c.	20,407
10.83	Processing of tea and coffee	19,805
10.86	Manufacture of homogenised food preparations and dietetic food	19,050
26.52	Manufacture of watches and clocks	18,847
20.30	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	17,745
20.20	Manufacture of pesticides and other agrochemical products	17,534
10.92	Manufacture of prepared pet foods	17,197
58.11	Book publishing	17,090
11.03	Manufacture of cider and other fruit wines	16,661
23.49	Manufacture of other ceramic products	16,527
46.45	Wholesale of perfume and cosmetics	16,494
24.41	Precious metals production	16,343
46.42	Wholesale of clothing and footwear	16,070
10.89	Manufacture of other food products n.e.c.	16,070
62.09	Other information technology and computer service activities	15,364
58.12	Publishing of directories and mailing lists	15,207

NACE code	NACE description	Trademarks/1000 employees
20.52	Manufacture of glues	15,202
72.19	Other research and experimental development on natural sciences and engineering	15,001
21.20	Manufacture of pharmaceutical preparations	14,988
82.30	Organisation of conventions and trade shows	14,899
20.41	Manufacture of soap and detergents, cleaning and polishing preparations	14,680
30.91	Manufacture of motorcycles	14,678
20.11	Manufacture of industrial gases	14,628
11.04	Manufacture of other non-distilled fermented beverages	14,466
13.95	Manufacture of non-wovens and articles made from non-wovens, except apparel	14,291
59.11	Motion picture, video and television programme production activities	14,231
27.51	Manufacture of electric domestic appliances	14,120
46.37	Wholesale of coffee, tea, cocoa and spices	13,798
46.48	Wholesale of watches and jewellery	13,644
30.92	Manufacture of bicycles and invalid carriages	13,422
46.43	Wholesale of electrical household appliances	13,117
20.17	Manufacture of synthetic rubber in primary forms	12,973
23.11	Manufacture of flat glass	12,534
68.10	Buying and selling of own real estate	12,305
26.70	Manufacture of optical instruments and photographic equipment	12,297
25.71	Manufacture of cutlery	12,070
10.41	Manufacture of oils and fats	11,835
58.14	Publishing of journals and periodicals	11,791
13.99	Manufacture of other textiles n.e.c.	11,776
60.20	Television programming and broadcasting activities	11,775
14.11	Manufacture of leather clothes	11,748
79.12	Tour operator activities	11,734
74.90	Other professional, scientific and technical activities n.e.c.	11,712
46.41	Wholesale of textiles	11,601
28.91	Manufacture of machinery for metallurgy	11,231
46.49	Wholesale of other household goods	11,147
23.43	Manufacture of ceramic insulators and insulating fittings	10,999
46.34	Wholesale of beverages	10,891
70.21	Public relations and communication activities	10,877
14.19	Manufacture of other wearing apparel and accessories	10,846
09.10	Support activities for petroleum and natural gas extraction	10,812
11.06	Manufacture of malt	10,698
06.10	Extraction of crude petroleum	10,598
10.32	Manufacture of fruit and vegetable juice	10,455
46.24	Wholesale of hides, skins and leather	10,372
46.90	Non-specialised wholesale trade	10,299
19.20	Manufacture of refined petroleum products	10,257

NACE code	NACE description	Trademarks/1000 employees
26.80	Manufacture of magnetic and optical media	10,256
11.05	Manufacture of beer	10,215
31.03	Manufacture of mattresses	10,174
46.46	Wholesale of pharmaceutical goods	10,143
28.14	Manufacture of other taps and valves	10,044
26.20	Manufacture of computers and peripheral equipment	10,040
23.42	Manufacture of ceramic sanitary fixtures	9,964
27.90	Manufacture of other electrical equipment	9,915
46.76	Wholesale of other intermediate products	9,712
46.75	Wholesale of chemical products	9,693
47.91	Retail sale via mail order houses or via Internet	9,664
10.52	Manufacture of ice cream	9,646
32.20	Manufacture of musical instruments	9,617
77.35	Rental and leasing of air transport equipment	9,605
10.81	Manufacture of sugar	9,591
58.19	Other publishing activities	9,214
28.23	Manufacture of office machinery and equipment (except computers and peripheral equipment)	9,033
11.07	Manufacture of soft drinks; production of mineral waters and other bottled waters	8,843
46.38	Wholesale of other food, including fish, crustaceans and molluscs	8,842
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	8,820
14.20	Manufacture of articles of fur	8,813
46.11	Agents involved in the sale of agricultural raw materials, live animals, textile raw materials and semi-finished goods	8,766
10.82	Manufacture of cocoa, chocolate and sugar confectionery	8,728
23.99	Manufacture of other non-metallic mineral products n.e.c.	8,674
62.01	Computer programming activities	8,647
13.94	Manufacture of cordage, rope, twine and netting	8,478
41.10	Development of building projects	8,423
74.10	Specialised design activities	8,364
59.12	Motion picture, video and television programme post-production activities	8,350
08.99	Other mining and quarrying n.e.c.	8,314
28.93	Manufacture of machinery for food, beverage and tobacco processing	8,252
26.11	Manufacture of electronic components	8,234
20.15	Manufacture of fertilisers and nitrogen compounds	8,233
62.03	Computer facilities management activities	8,221
23.64	Manufacture of mortars	8,173
26.30	Manufacture of communication equipment	8,149
32.91	Manufacture of brooms and brushes	8,124
30.12	Building of pleasure and sporting boats	7,961
46.47	Wholesale of furniture, carpets and lighting equipment	7,955
46.14	Agents involved in the sale of machinery, industrial equipment, ships and aircraft	7,951
27.40	Manufacture of electric lighting equipment	7,912

NACE code	NACE description	Trademarks/1000 employees
17.22	Manufacture of household and sanitary goods and of toilet requisites	7,835
28.99	Manufacture of other special-purpose machinery n.e.c.	7,823
10.84	Manufacture of condiments and seasonings	7,803
23.62	Manufacture of plaster products for construction purposes	7,803
28.13	Manufacture of other pumps and compressors	7,796
46.64	Wholesale of machinery for the textile industry and of sewing and knitting machines	7,650
70.22	Business and other management consultancy activities	7,474
77.33	Rental and leasing of office machinery and equipment (including computers)	7,281
46.44	Wholesale of china and glassware and cleaning materials	7,272
17.23	Manufacture of paper stationery	7,264
46.33	Wholesale of dairy products, eggs and edible oils and fats	7,204
23.19	Manufacture and processing of other glass, including technical glassware	7,182
28.24	Manufacture of power-driven hand tools	7,179
13.91	Manufacture of knitted and crocheted fabrics	7,166
24.32	Cold rolling of narrow strip	6,994
20.13	Manufacture of other inorganic basic chemicals	6,980
79.11	Travel agency activities	6,881
25.21	Manufacture of central heating radiators and boilers	6,813
46.36	Wholesale of sugar and chocolate and sugar confectionery	6,768
20.53	Manufacture of essential oils	6,734
15.12	Manufacture of luggage, handbags and the like, saddlery and harness	6,729
32.12	Manufacture of jewellery and related articles	6,709
12.00	Manufacture of tobacco products	6,700
32.50	Manufacture of medical and dental instruments and supplies	6,688
24.52	Casting of steel	6,686
23.69	Manufacture of other articles of concrete, plaster and cement	6,637
46.18	Agents specialised in the sale of other particular products	6,551
23.91	Production of abrasive products	6,531
28.21	Manufacture of ovens, furnaces and furnace burners	6,527
26.40	Manufacture of consumer electronics	6,511
10.51	Operation of dairies and cheese making	6,462
60.10	Radio broadcasting	6,442
10.42	Manufacture of margarine and similar edible fats	6,438
25.72	Manufacture of locks and hinges	6,431
45.31	Wholesale trade of motor vehicle parts and accessories	6,429
28.29	Manufacture of other general-purpose machinery n.e.c.	6,370
23.65	Manufacture of fibre cement	6,353
73.20	Market research and public opinion polling	6,332
63.99	Other information service activities n.e.c.	6,323
32.13	Manufacture of imitation jewellery and related articles	6,312
15.20	Manufacture of footwear	6,292

NACE code	NACE description	Trademarks/1000 employees
10.62	Manufacture of starches and starch products	6,266
72.20	Research and experimental development on social sciences and humanities	6,138
20.16	Manufacture of plastics in primary forms	6,071
46.22	Wholesale of flowers and plants	6,009
25.30	Manufacture of steam generators, except central heating hot water boilers	5,879
46.39	Non-specialised wholesale of food, beverages and tobacco	5,873
46.17	Agents involved in the sale of food, beverages and tobacco	5,867
18.20	Reproduction of recorded media	5,825
22.29	Manufacture of other plastic products	5,810
20.12	Manufacture of dyes and pigments	5,744
46.69	Wholesale of other machinery and equipment	5,637
92.00	Gambling and betting activities	5,624
20.51	Manufacture of explosives	5,615
82.11	Combined office administrative service activities	5,551
10.91	Manufacture of prepared feeds for farm animals	5,541
22.23	Manufacture of builders' ware of plastic	5,526
25.92	Manufacture of light metal packaging	5,507
23.31	Manufacture of ceramic tiles and flags	5,489
20.60	Manufacture of man-made fibres	5,461
13.20	Weaving of textiles	5,447
13.93	Manufacture of carpets and rugs	5,299
28.30	Manufacture of agricultural and forestry machinery	5,271
24.34	Cold drawing of wire	5,235
46.19	Agents involved in the sale of a variety of goods	5,226
46.16	Agents involved in the sale of textiles, clothing, fur, footwear and leather goods	5,171
22.11	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	5,171
25.99	Manufacture of other fabricated metal products n.e.c.	5,153
28.92	Manufacture of machinery for mining, quarrying and construction	5,110
50.20	Sea and coastal freight water transport	5,100
25.73	Manufacture of tools	5,061
23.44	Manufacture of other technical ceramic products	5,057
17.29	Manufacture of other articles of paper and paperboard	5,021
13.10	Preparation and spinning of textile fibres	4,934
23.14	Manufacture of glass fibres	4,869
73.11	Advertising agencies	4,828
16.22	Manufacture of assembled parquet floors	4,814
46.74	Wholesale of hardware, plumbing and heating equipment and supplies	4,808
63.91	News agency activities	4,797
10.39	Other processing and preserving of fruit and vegetables	4,750
61.20	Wireless telecommunications activities	4,680
17.12	Manufacture of paper and paperboard	4,666

NACE code	NACE description	Trademarks/1000 employees
23.20	Manufacture of refractory products	4,626
45.40	Sale, maintenance and repair of motorcycles and related parts and accessories	4,625
10.61	Manufacture of grain mill products	4,625
30.40	Manufacture of military fighting vehicles	4,592
46.15	Agents involved in the sale of furniture, household goods, hardware and ironmongery	4,535
14.13	Manufacture of other outerwear	4,464
14.31	Manufacture of knitted and crocheted hosiery	4,457
28.25	Manufacture of non-domestic cooling and ventilation equipment	4,454
20.14	Manufacture of other organic basic chemicals	4,448
14.12	Manufacture of workwear	4,416
63.11	Data processing, hosting and related activities	4,411
33.19	Repair of other equipment	4,400
46.13	Agents involved in the sale of timber and building materials	4,399
46.31	Wholesale of fruit and vegetables	4,355
08.93	Extraction of salt	4,345
13.92	Manufacture of made-up textile articles, except apparel	4,340
22.21	Manufacture of plastic plates, sheets, tubes and profiles	4,290
46.52	Wholesale of electronic and telecommunications equipment and parts	4,290
47.19	Other retail sale in non-specialised stores	4,251
47.74	Retail sale of medical and orthopaedic goods in specialised stores	4,229
08.91	Mining of chemical and fertiliser minerals	4,223
08.11	Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate	4,216
28.49	Manufacture of other machine tools	4,203
77.39	Rental and leasing of other machinery, equipment and tangible goods n.e.c.	4,203
29.10	Manufacture of motor vehicles	4,161
66.00	Activities auxiliary to financial services and insurance activities	4,150
27.32	Manufacture of other electronic and electric wires and cables	4,149
25.94	Manufacture of fasteners and screw machine products	4,133
61.30	Satellite telecommunications activities	4,117
14.39	Manufacture of other knitted and crocheted apparel	4,036
50.10	Sea and coastal passenger water transport	3,984
46.12	Agents involved in the sale of fuels, ores, metals and industrial chemicals	3,974
24.33	Cold forming or folding	3,962
22.22	Manufacture of plastic packing goods	3,951
28.95	Manufacture of machinery for paper and paperboard production	3,925
31.01	Manufacture of office and shop furniture	3,922
28.41	Manufacture of metal forming machinery	3,921
51.10	Passenger air transport	3,893
27.52	Manufacture of non-electric domestic appliances	3,833
17.11	Manufacture of pulp	3,818
25.93	Manufacture of wire products, chain and springs	3,794

NACE code	NACE description	Trademarks/1000 employees
47.75	Retail sale of cosmetic and toilet articles in specialised stores	3,792
46.21	Wholesale of grain, unmanufactured tobacco, seeds and animal feeds	3,774
46.51	Wholesale of computers, computer peripheral equipment and software	3,749
47.51	Retail sale of textiles in specialised stores	3,742
46.72	Wholesale of metals and metal ores	3,706
27.20	Manufacture of batteries and accumulators	3,705
93.00	Sports activities and amusement and recreation activities ⁷⁵	3,698
46.65	Wholesale of office furniture	3,693
16.21	Manufacture of veneer sheets and wood-based panels	3,669
46.62	Wholesale of machine tools	3,598
23.41	Manufacture of ceramic household and ornamental articles	3,585
46.71	Wholesale of solid, liquid and gaseous fuels and related products	3,541
62.02	Computer consultancy activities	3,525
14.14	Manufacture of underwear	3,522
23.32	Manufacture of bricks, tiles and construction products, in baked clay	3,506
13.30	Finishing of textiles	3,469
10.20	Processing and preserving of fish, crustaceans and molluscs	3,463
47.65	Retail sale of games and toys in specialised stores	3,453
28.15	Manufacture of bearings, gears, gearing and driving elements	3,448
46.32	Wholesale of meat and meat products	3,420
10.72	Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes	3,391
28.22	Manufacture of lifting and handling equipment	3,374
77.12	Rental and leasing of trucks	3,367
23.13	Manufacture of hollow glass	3,362
68.20	Rental and operating of own or leased real estate	3,316
47.41	Retail sale of computers, peripheral units and software in specialised stores	3,313
22.19	Manufacture of other rubber products	3,309
73.12	Media representation	3,266
10.13	Production of meat and poultry meat products	3,254
16.29	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	3,253
47.99	Other retail sale not in stores, stalls or markets	3,242
47.25	Retail sale of beverages in specialised stores	3,232
25.40	Manufacture of weapons and ammunition	3,208
51.20	Freight air transport and space transport	3,194

75 Within this division industry 93.29 (other amusement and recreation activities) was imputed based on data for Italy, Spain and the UK.

9.4 Design-intensive industries

Table 30

NACE code	NACE description	Designs/1000 employees
26.52	Manufacture of watches and clocks	90,676
77.40	Leasing of intellectual property and similar products, except copyrighted works	78,588
25.71	Manufacture of cutlery	70,233
23.41	Manufacture of ceramic household and ornamental articles	66,238
46.48	Wholesale of watches and jewellery	39,797
27.40	Manufacture of electric lighting equipment	39,180
28.24	Manufacture of power-driven hand tools	36,977
14.11	Manufacture of leather clothes	35,517
32.30	Manufacture of sports goods	30,792
27.51	Manufacture of electric domestic appliances	29,072
32.40	Manufacture of games and toys	26,248
28.14	Manufacture of other taps and valves	25,211
23.49	Manufacture of other ceramic products	24,362
32.99	Other manufacturing n.e.c.	23,698
23.42	Manufacture of ceramic sanitary fixtures	23,045
46.47	Wholesale of furniture, carpets and lighting equipment	22,169
30.99	Manufacture of other transport equipment n.e.c.	22,134
25.72	Manufacture of locks and hinges	21,571
46.42	Wholesale of clothing and footwear	19,655
17.22	Manufacture of household and sanitary goods and of toilet requisites	17,085
46.15	Agents involved in the sale of furniture, household goods, hardware and ironmongery	16,678
74.10	Specialised design activities	16,155
31.09	Manufacture of other furniture	15,535
28.93	Manufacture of machinery for food, beverage and tobacco processing	15,496
46.43	Wholesale of electrical household appliances	14,372
15.20	Manufacture of footwear	13,550
20.41	Manufacture of soap and detergents, cleaning and polishing preparations	13,393
32.91	Manufacture of brooms and brushes	13,162
23.69	Manufacture of other articles of concrete, plaster and cement	12,229
17.24	Manufacture of wallpaper	12,200
46.49	Wholesale of other household goods	12,016
15.12	Manufacture of luggage, handbags and the like, saddlery and harness	11,721
25.21	Manufacture of central heating radiators and boilers	11,527
32.12	Manufacture of jewellery and related articles	11,515

NACE code	NACE description	Designs/1000 employees
32.13	Manufacture of imitation jewellery and related articles	11,481
46.44	Wholesale of china and glassware and cleaning materials	11,280
14.14	Manufacture of underwear	10,626
23.65	Manufacture of fibre cement	10,429
26.70	Manufacture of optical instruments and photographic equipment	10,279
13.92	Manufacture of made-up textile articles, except apparel	10,238
25.99	Manufacture of other fabricated metal products n.e.c.	10,008
13.20	Weaving of textiles	9,906
23.19	Manufacture and processing of other glass, including technical glassware	9,893
13.93	Manufacture of carpets and rugs	9,299
22.22	Manufacture of plastic packing goods	8,410
31.01	Manufacture of office and shop furniture	8,385
27.52	Manufacture of non-electric domestic appliances	8,370
46.41	Wholesale of textiles	8,256
13.91	Manufacture of knitted and crocheted fabrics	8,190
31.02	Manufacture of kitchen furniture	7,967
17.12	Manufacture of paper and paperboard	7,944
25.92	Manufacture of light metal packaging	7,934
30.92	Manufacture of bicycles and invalid carriages	7,782
14.12	Manufacture of workwear	7,634
20.42	Manufacture of perfumes and toilet preparations	7,471
22.29	Manufacture of other plastic products	7,345
26.40	Manufacture of consumer electronics	7,179
14.19	Manufacture of other wearing apparel and accessories	7,067
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	6,943
32.20	Manufacture of musical instruments	6,851
13.96	Manufacture of other technical and industrial textiles	6,833
26.30	Manufacture of communication equipment	6,555
27.90	Manufacture of other electrical equipment	6,330
23.31	Manufacture of ceramic tiles and flags	5,826
16.29	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	5,628
46.65	Wholesale of office furniture	5,371
31.03	Manufacture of mattresses	5,113
10.83	Processing of tea and coffee	5,084
22.23	Manufacture of builders' ware of plastic	4,762
17.23	Manufacture of paper stationery	4,616
46.90	Non-specialised wholesale trade	4,532
10.73	Manufacture of macaroni, noodles, couscous and similar farinaceous products	4,514

NACE code	NACE description	Designs/1000 employees
21.10	Manufacture of basic pharmaceutical products	4,508
28.29	Manufacture of other general-purpose machinery n.e.c.	4,508
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	4,460
11.03	Manufacture of cider and other fruit wines	4,402
25.94	Manufacture of fasteners and screw machine products	4,393
47.65	Retail sale of games and toys in specialised stores	4,273
29.20	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	4,154
23.70	Cutting, shaping and finishing of stone	4,131
20.59	Manufacture of other chemical products n.e.c.	4,090
23.99	Manufacture of other non-metallic mineral products n.e.c.	4,024
32.50	Manufacture of medical and dental instruments and supplies	3,994
23.91	Production of abrasive products	3,813
11.01	Distilling, rectifying and blending of spirits	3,805
28.21	Manufacture of ovens, furnaces and furnace burners	3,800
30.91	Manufacture of motorcycles	3,798
25.73	Manufacture of tools	3,756
47.59	Retail sale of furniture, lighting equipment and other household articles in specialised stores	3,687
46.45	Wholesale of perfume and cosmetics	3,557
22.19	Manufacture of other rubber products	3,515
23.11	Manufacture of flat glass	3,463
72.19	Other research and experimental development on natural sciences and engineering	3,423
46.76	Wholesale of other intermediate products	3,364
29.10	Manufacture of motor vehicles	3,330
23.13	Manufacture of hollow glass	3,292
46.69	Wholesale of other machinery and equipment	3,249
26.11	Manufacture of electronic components	3,238
10.32	Manufacture of fruit and vegetable juice	3,219
28.13	Manufacture of other pumps and compressors	3,203
46.74	Wholesale of hardware, plumbing and heating equipment and supplies	3,189
24.45	Other non-ferrous metal production	3,137
14.31	Manufacture of knitted and crocheted hosiery	3,068
28.99	Manufacture of other special-purpose machinery n.e.c.	3,054
17.29	Manufacture of other articles of paper and paperboard	3,012
27.12	Manufacture of electricity distribution and control apparatus	3,000
18.13	Pre-press and pre-media services	2,978
46.72	Wholesale of metals and metal ores	2,964
22.11	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	2,938

NACE code	NACE description	Designs/1000 employees
46.18	Agents specialised in the sale of other particular products	2,882
28.94	Manufacture of machinery for textile, apparel and leather production	2,833
10.82	Manufacture of cocoa, chocolate and sugar confectionery	2,792
16.22	Manufacture of assembled parquet floors	2,783
25.12	Manufacture of doors and windows of metal	2,773
61.90	Other telecommunications activities	2,723
12.00	Manufacture of tobacco products	2,682
22.21	Manufacture of plastic plates, sheets, tubes and profiles	2,648
74.90	Other professional, scientific and technical activities n.e.c.	2,642
26.20	Manufacture of computers and peripheral equipment	2,618
73.11	Advertising agencies	2,600
10.84	Manufacture of condiments and seasonings	2,588
68.10	Buying and selling of own real estate	2,536
11.07	Manufacture of soft drinks; production of mineral waters and other bottled waters	2,523
10.92	Manufacture of prepared pet foods	2,499
16.23	Manufacture of other builders' carpentry and joinery	2,478
24.42	Aluminium production	2,474
46.36	Wholesale of sugar and chocolate and sugar confectionery	2,424
28.30	Manufacture of agricultural and forestry machinery	2,388
13.30	Finishing of textiles	2,309
20.20	Manufacture of pesticides and other agrochemical products	2,303
20.30	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	2,288
46.13	Agents involved in the sale of timber and building materials	2,212
23.32	Manufacture of bricks, tiles and construction products, in baked clay	2,195
72.11	Research and experimental development on biotechnology	2,180
28.91	Manufacture of machinery for metallurgy	2,162
20.16	Manufacture of plastics in primary forms	2,149
16.21	Manufacture of veneer sheets and wood-based panels	2,140
47.77	Retail sale of watches and jewellery in specialised stores	2,135
13.99	Manufacture of other textiles n.e.c.	2,123
26.80	Manufacture of magnetic and optical media	2,095
13.94	Manufacture of cordage, rope, twine and netting	2,093
30.20	Manufacture of railway locomotives and rolling stock	2,086
23.14	Manufacture of glass fibres	2,032
70.21	Public relations and communication activities	2,018
95.24	Repair of furniture and home furnishings	2,017
27.20	Manufacture of batteries and accumulators	1,986

NACE code	NACE description	Designs/1000 employees
27.33	Manufacture of wiring devices	1,982
47.91	Retail sale via mail order houses or via Internet	1,967
55.90	Other accommodation	1,957
28.25	Manufacture of non-domestic cooling and ventilation equipment	1,947
11.04	Manufacture of other non-distilled fermented beverages	1,936
46.63	Wholesale of mining, construction and civil engineering machinery	1,934
27.32	Manufacture of other electronic and electric wires and cables	1,932
14.20	Manufacture of articles of fur	1,841
25.93	Manufacture of wire products, chain and springs	1,836
32.11	Striking of coins	1,831
13.95	Manufacture of non-wovens and articles made from non-wovens, except apparel	1,760
29.32	Manufacture of other parts and accessories for motor vehicles	1,755
14.39	Manufacture of other knitted and crocheted apparel	1,745
46.14	Agents involved in the sale of machinery, industrial equipment, ships and aircraft	1,715
46.52	Wholesale of electronic and telecommunications equipment and parts	1,688
10.52	Manufacture of ice cream	1,681
59.20	Sound recording and music publishing activities	1,653
14.13	Manufacture of other outerwear	1,646
24.41	Precious metals production	1,635

10 / Appendix: Copyright-intensive industries according to the WIPO methodology

As explained in Chapter 5, the copyright-intensive industries presented there were selected on the basis of a USPTO adaptation of a WIPO methodology. This adaptation takes a stricter approach than WIPO towards inclusion of industries as copyright-intensive. In this Appendix, the standard WIPO methodology, as outlined in WIPO (2003), is used instead in order to quantify the impact of using the stricter USPTO interpretation.

WIPO divides the copyright-intensive industries into four main categories:

- Core
- Inter-dependent
- Partial
- Non-dedicated support

10.1 Core copyright industries

The core copyright-intensive industries, as defined by WIPO, are industries that are wholly engaged in creation, production and manufacturing, performance, broadcast, communication and exhibition, or distribution and sales of works and other protected subject matter.

The WIPO definition is broader than that used in the USPTO study in that it does not exclude activities related to distribution. According to WIPO, core copyright industries “as a category would not exist or would be significantly different without copyright in works or other subject matter.” Therefore, all of the value added and employment generated in these industries should be considered to be copyright’s contribution to the economy.

The list below shows all the core copyright-intensive industries identified by WIPO and/or the USPTO. Of the 33 industries used in the USPTO study, 31 are defined as core by both the USPTO and WIPO and are marked *Core_US_WIPO* in the list. Two industries (publishing of directories of mailing lists and public relations and communication activities) are considered copyright-intensive by the USPTO but not by WIPO. They are marked as *Core_US*. Finally, 18 industries are considered core by WIPO but not by the USPTO. Those industries are labelled *Core_WIPO*.

Thus, all in all, 49 industries are defined as core copyright-intensive by WIPO. The analysis in this Appendix quantifies the contribution to GDP and employment of those 49 industries.

Table 31: The list of core copyright-intensive industries according to WIPO and USPTO

NACE code	NACE description	Type
58.11	Book publishing	Core_US_WIPO
58.13	Publishing of newspapers	Core_US_WIPO
58.14	Publishing of journals and periodicals	Core_US_WIPO
58.19	Other publishing activities	Core_US_WIPO
58.21	Publishing of computer games	Core_US_WIPO
58.29	Other software publishing	Core_US_WIPO
59.11	Motion picture, video and television programme production activities	Core_US_WIPO
59.12	Motion picture, video and television programme post-production activities	Core_US_WIPO
59.13	Motion picture, video and television programme distribution activities	Core_US_WIPO
59.14	Motion picture projection activities	Core_US_WIPO
59.20	Sound recording and music publishing activities	Core_US_WIPO
60.10	Radio broadcasting	Core_US_WIPO
60.20	Television programming and broadcasting activities	Core_US_WIPO
61.20	Wireless telecommunications activities	Core_US_WIPO
62.01	Computer programming activities	Core_US_WIPO
62.02	Computer consultancy activities	Core_US_WIPO
62.03	Computer facilities management activities	Core_US_WIPO
62.09	Other information technology and computer service activities	Core_US_WIPO
63.12	Web portals	Core_US_WIPO
63.91	News agency activities	Core_US_WIPO
63.99	Other information service activities n.e.c.	Core_US_WIPO
73.11	Advertising agencies	Core_US_WIPO
73.12	Media representation	Core_US_WIPO
74.10	Specialised design activities	Core_US_WIPO
74.20	Photographic activities	Core_US_WIPO
74.30	Translation and interpretation activities	Core_US_WIPO
90.01	Performing arts	Core_US_WIPO
90.02	Support activities to performing arts	Core_US_WIPO
90.03	Artistic creation	Core_US_WIPO
91.01	Library and archives activities	Core_US_WIPO
93.29	Other amusement and recreation activities	Core_US_WIPO
58.12	Publishing of directories and mailing lists	Core_US
70.21	Public relations and communication activities	Core_US
18.11	Printing of newspapers	Core_WIPO

NACE code	NACE description	Type
18.12	Other printing	Core_WIPO
18.13	Pre-press and pre-media services	Core_WIPO
18.14	Binding and related services	Core_WIPO
18.20	Reproduction of recorded media	Core_WIPO
47.61	Retail sale of books in specialised stores	Core_WIPO
47.62	Retail sale of newspapers and stationery in specialised stores	Core_WIPO
47.63	Retail sale of music and video recordings in specialised stores	Core_WIPO
61.10	Wired telecommunications activities	Core_WIPO
61.30	Satellite telecommunications activities	Core_WIPO
61.90	Other telecommunications activities	Core_WIPO
63.11	Data processing, hosting and related activities	Core_WIPO
79.90	Other reservation service and related activities	Core_WIPO
82.19	Photocopying, document preparation and other specialised office support activities	Core_WIPO
85.52	Cultural education	Core_WIPO
90.04	Operation of arts facilities	Core_WIPO
93.21	Activities of amusement parks and theme parks	Core_WIPO
94.12	Activities of professional membership organisations	Core_WIPO

The data on employment and GDP was obtained from Eurostat's SBS statistics in the same way as for the rest of this study. The industries in divisions 90-94 were the only exception, as they are not reported in SBS, so that information had to be imputed on the basis of national data from the UK, France and Italy.

The contributions to the EU economy of the core copyright-intensive industries as calculated according to the two different approaches are compared in table 32.

Table 32:
Economic contribution of core copyright-intensive industries

Methodology	Number of industries	Employment	GDP (€ million)
Core USPTO (and WIPO)	31	6,946,471	501,194
Core_USPTO (not WIPO)	2	102,933	8,665
Core WIPO (not USPTO)	18	3,022,395	229,375
Total WIPO	49	9,968,866	730,559
Total USPTO	33	7,049,405	509,859

Thus, according to WIPO methodology, the core copyright-intensive industries generate 9.9 million jobs in the EU, i.e. 2.9 million jobs or 41% more than the number calculated using the stricter USPTO methodology. For GDP, the contribution calculated using the WIPO methodology is approximately € 230 billion, or 46%, higher than the value resulting from the USPTO methodology.

10.2 Non-core copyright industries

In addition to the core copyright industries, WIPO also defines three groups of industries whose activity is related to copyright industries to some degree: inter-dependent, partial and non-dedicated support industries. Because these industries are only partly engaged in copyright-related activities, only part of their employment and value added should be considered copyright-intensive. The definitions of the three groups are as follows:

Inter-dependent copyright industries are industries that are engaged in the production, manufacture and sale of equipment whose function is wholly or primarily to facilitate the creation, production or use of works and other protected subject matter.

Partial copyright industries are industries in which some activities are related to works and other protected subject matter and may involve creation, production and manufacturing, performance, broadcast, communication and exhibition or distribution and sales.

Non-dedicated support industries are industries in which some activities are related to facilitating broadcast, communication, distribution or sales of works and other protected subject matter, and whose activities have not been included in the core copyright industries.

In order to capture the fact that only a portion of each non-core industry's activities can be related to copyright, each industry is assigned a factor. This factor is used to scale that industry's employment and value added when tabulating the total contribution of the non-core copyright industries to the economy. The copyright factors assigned to each industry in inter-dependent, partial and non-dedicated support industries have been adopted from a Dutch study "The Economic Contribution of Copyright-Based Industries in the Netherlands"⁷⁶ and a Finnish study "Economic Contribution of Copyright-Based Industries in Finland 2005-2008",⁷⁷ both published in 2011. These studies are considered authoritative by many authors and are available from WIPO.

Table 33 show the inter-dependent industries and the factors assigned to each industry.

76 http://www.wipo.int/export/sites/www/copyright/en/performance/pdf/econ_contribution_cr_nl.pdf

77 http://www.wipo.int/export/sites/www/copyright/en/performance/pdf/econ_contribution_cr_fi.pdf

Table 33: Inter-dependent copyright-intensive industries

NACE code	NACE description	Factor
17.11	Manufacture of pulp	25.0%
17.12	Manufacture of paper and paperboard	25.0%
20.59	Manufacture of other chemical products n.e.c.	25.0%
28.23	Manufacture of office machinery and equipment (except computers and peripheral equipment)	30.0%
26.20	Manufacture of computers and peripheral equipment	30.0%
26.30	Manufacture of communication equipment	30.0%
26.40	Manufacture of consumer electronics	30.0%
26.70	Manufacture of optical instruments and photographic equipment	30.0%
27.31	Manufacture of fibre optic cables	30.0%
32.20	Manufacture of musical instruments	35.0%
46.43	Wholesale of electrical household appliances	19.0%
46.76	Wholesale of other intermediate products	25.0%
46.51	Wholesale of computers, computer peripheral equipment and software	30.0%
46.52	Wholesale of electronic and telecommunications equipment and parts	25.0%
46.66	Wholesale of other office machinery and equipment	30.0%
47.43	Retail sale of audio and video equipment in specialised stores	33.3%
47.41	Retail sale of computers, peripheral units and software in specialised stores	33.3%
47.78	Other retail sale of new goods in specialised stores	33.3%
77.33	Rental and leasing of office machinery and equipment (including computers)	35.0%
77.39	Rental and leasing of other machinery, equipment and tangible goods n.e.c.	20.0%
77.22	Rental of video tapes and disks	20.0%
77.29	Rental and leasing of other personal and household goods	20.0%

Based on the average of these 22 industries' factors, it can be concluded that 28% of their employment and value added can be considered copyright-related.

Table 34 shows the 42 industries classified by WIPO as partially copyright-intensive industries and their factors.

Table 34: Partial copyright-intensive industries

NACE code	NACE_description	Factor
13.91	Manufacture of knitted and crocheted fabrics	0,55%
13.92	Manufacture of knitted and crocheted hosiery	0,55%
13.93	Manufacture of other knitted and crocheted apparel	0,55%
14.11	"Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials"	0.55%
14.12	Manufacture of flat glass	0,55%
14.13	Manufacture of hollow glass	0,55%
14.14	Manufacture and processing of other glass, including technical glassware	0,55%
14.19	Manufacture of cutlery	0,55%
14.31	Manufacture of other fabricated metal products n.e.c.	0,55%
14.39	Retail sale of carpets, rugs, wall and floor coverings in specialised stores	0,55%
15.20	"Retail sale of furniture, lighting equipment and other household articles in specialised stores"	1.90%
16.29	Manufacture of carpets and rugs	1,90%
17.23	Manufacture of paper stationery	1,90%
17.24	Manufacture of wallpaper	1,90%
23.11	Manufacture of made-up textile articles, except apparel	2,70%
23.13	Manufacture of leather clothes	2,70%
23.19	Manufacture of workwear	2,70%
25.71	Manufacture of other outerwear	2,70%
25.99	Manufacture of underwear	2,70%
31.01	Manufacture of other wearing apparel and accessories	2,70%
31.02	Manufacture of footwear	2,70%
31.03	Wholesale of textiles	2,70%
31.09	Wholesale of clothing and footwear	2,70%
32.11	Retail sale of textiles in specialised stores	2,70%
32.12	Retail sale of clothing in specialised stores	2,70%
32.40	Retail sale of footwear and leather goods in specialised stores	2,70%
46.41	Wholesale of china and glassware and cleaning materials	5,00%
46.42	Wholesale of furniture, carpets and lighting equipment	5,00%
46.44	Wholesale of watches and jewellery	5,00%
46.47	Wholesale of other household goods	5,00%
46.48	Manufacture of office and shop furniture	6,70%
46.49	Manufacture of kitchen furniture	6,70%
47.51	Manufacture of mattresses	6,70%
47.53	Manufacture of other furniture	6,70%
47.59	Architectural activities	9,00%

NACE code	NACE description	Factor
47.71	Engineering activities and related technical consultancy	9,00%
47.72	Striking of coins	33,50%
71.11	Manufacture of jewellery and related articles	33,50%
71.12	Activities of other membership organisations n.e.c.	41,00%
91.02	Manufacture of games and toys	46,00%
91.03	Museums activities	50,00%
94.99	Operation of historical sites and buildings and similar visitor attractions	50,00%

Only the portion of these industries' activities which is attributable to copyrighted works and other protected subject material, ranging from 0.55% to 50%, should be included in their employment and value added contributions. For example, museum activities as well as manufacture of games and toys have a significant copyright component, whereas only a very small portion of employment and value added in industries such as the manufacture of carpets or wholesale of furniture is directly related to copyright activities or copyrighted materials.

Finally, the non-dedicated support industries are shown in table 35.

Table 35: Non-dedicated support copyright-intensive industries

NACE code	NACE description	Factor
46.1	Wholesale on a fee or contract basis	6%
46.4	Wholesale of household goods	6%
46.6	Wholesale of other machinery, equipment and supplies	6%
46.9	Non-specialised wholesale trade	6%
47.1	Retail sale in non-specialised stores	6%
47.4	Retail sale of information and communication equipment in specialised stores	6%
47.5	Retail sale of other household equipment in specialised stores	6%
47.7	Retail sale of other goods in specialised stores	6%
47.8	Retail sale via stalls and markets	6%
47.9	Retail trade not in stores, stalls or markets	6%
49.1	Passenger rail transport, interurban	6%
49.2	Freight rail transport	6%
49.3	Other passenger land transport	6%
49.4	Freight transport by road and removal services	6%
50.1	Sea and coastal passenger water transport	6%
50.2	Sea and coastal freight water transport	6%
50.3	Inland passenger water transport	6%
50.4	Inland freight water transport	6%
51.1	Passenger air transport	6%
51.2	Freight air transport and space transport	6%
52.1	Warehousing and storage	6%
52.2	Support activities for transportation	6%
53.1	Postal activities under universal service obligation	6%
53.2	Other postal and courier activities	6%
79.1	Travel agency and tour operator activities	6%
79.9	Other reservation service and related activities	6%

The inclusion of the above industries is attributable to backward linkages, generally business services and delivery modes. For example, it is estimated that 6% of employment and value added in postal and courier services is generated by deliveries of copyrighted materials, such as magazines, manuscripts or audiovisual recordings.

10.3 Total contribution of core and non-core copyright industries

Using data from Eurostat's SBS statistics, and applying the factors for the non-core industries, it is possible to calculate the total contribution of all copyright-related industries, both core and non-core, to the EU economy. This total is shown in table 36.

Table 36:
Contribution to the EU economy of core and non-core copyright-intensive industries

	Employment	Share in total EU employment	GDP (€ million)	Share in total EU GDP
Core	9.968.866	4,6%	730.569	5,9%
Inter-dependent	936.753	0,4%	62.087	0,5%
Partial	1.831.913	0,8%	78.833	0,6%
Non dedicated	1.922.931	0,9%	86.367	0,7%
Total Non Core	4.691.596	2,1%	227.287	1,9%
Grand Total	14.660.462	6,7%	957.856	7,8%
EU total	218.400.733		12.278.744	

In summary, adopting the full WIPO methodology, taking into consideration both core and non-core copyright industries, would roughly double the contribution of copyright-intensive industries to EU employment and increase their contribution to GDP by 85%, compared with the results of the stricter USPTO methodology adopted in this report. The more conservative approach adopted in Chapter 6 was chosen partly for consistency with the treatment of the other IP rights considered in the study, and partly to ensure comparability with the USPTO study. In addition, there is a certain overlap between the contribution of the non-core copyright industries and the indirect employment contributions shown in Chapter 6. Nevertheless, it is instructive to compare the estimates obtained on the basis of these two different approaches.

11 / List of abbreviations

BvD	Bureau van Dijk
CPA	Classification of Products by Activities
CTM	Community Trade Mark
COMEXT	Eurostat reference database for external trade
DG AGRI	Directorate-General for Agriculture and Rural Development
DG MARKT	Directorate-General Internal Market and Services
DUO	Domestic Ultimate Owner
EAA	Economic Accounts for Agriculture
EC	European Commission
EPC	European Patent Convention
EPO	European Patent Office
EU	European Union
FATS	Foreign Affiliate Statistics
GDP	Gross Domestic Product
GI	Geographical Indication
GVA	Gross Value Added
IP	Intellectual Property
IPR	Intellectual Property Right
LFS	Labour Force Survey
NACE	Nomenclature générale des activités économiques dans les Communautés Européennes (Statistical Classification of Economic Activities in the European Community)
NAICS	North American Industry Classification System
OECD	Organisation for Economic Co-operation and Development
OHIM	Office for Harmonization in the Internal Market
PATSTAT	World-wide Patent Statistical Database (EPO)
PDO	Protected Designation of Origin
PGI	Protected Geographical Indication
RCD	Registered Community Design
SBS	Structural Business Statistics
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights
UK IPO	United Kingdom Intellectual Property Office
USPTO	United States Patent and Trademark Office
VA	Value added
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

12 / References

Addor, F., Thumm, N. and Grazioli, A. (2003), *Geographical indications: important issues for industrialized and developing countries*, The IPTS Report No. 74, Joint Research Centre, https://www.ige.ch/fileadmin/user_upload/Juristische_Infos/e/IPTS-74_GIs_English.pdf.

Amara, N., Landry, R., Traore, N. (2008), *Managing the protection of innovations in knowledge-intensive business services*. *Research Policy*, 37 (9): 1530-1547.

Chever, T., Renault, C., Renault, S., Romieu, V. (2012), *Value of production of agricultural products and foodstuffs, wines, aromatised wines and spirits protected by a geographical indication (GI)*, report commissioned by European Commission, DG Agriculture and Rural Development, October 2012, http://ec.europa.eu/agriculture/external-studies/value-gi_en.htm.

Directive 2001/29/EC of the European Parliament and of the Council of 22 May 2001 on the harmonisation of certain aspects of copyright and related rights in the information society, <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32001L0029:EN:NOT>.

Economides, N.S. (1988), *The economics of trademarks*. *Trademark Rep.* (78): 523-533.

Ernst, H., (2001), *Patent applications and subsequent changes of performance: evidence from time-series cross-section analyses on the firm level*, *Research Policy* 30 (2001), 143-157.

European Commission (2010), *Europe 2020: A strategy for smart, sustainable and inclusive growth*, Communication from the Commission, 3.3.2010, http://ec.europa.eu/europe2020/europe-2020-in-a-nutshell/index_en.htm.

Eurostat (2006), *Data Production Methods for Harmonised Patent Statistics: Patentee Name Harmonisation*, http://epp.eurostat.ec.europa.eu/portal/page/portal/product_details/publication?p_product_code=KS-AV-06-002.

Eurostat (2008), *Eurostat Manual of Supply, Use and Input-Output Tables*, http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-07-013/EN/KS-RA-07-013-EN.PDF.

Eurostat (2008), *NACE Rev. 2: Statistical classification of economic activities in the European Community*, http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-RA-07-015/EN/KS-RA-07-015-EN.PDF.

Eurostat (2010), *NACE Rev. 2 – US NAICS 2007 Correspondence Table at Two-Digit Level*, http://ec.europa.eu/eurostat/ramon/miscellaneous/index.cfm?TargetUrl=DSP_NACE_2_US_NAICS_2007.

Fink, C. and Smarzynska, B. (2002), *Trademarks, Geographical Indications and Developing Countries, in Development, Trade and the WTO: A Handbook*, eds. B. Hoekman, A. Mattoo and P. English, The World Bank. http://www-wds.worldbank.org/servlet/WDSContentServer/WDSP/IB/2004/08/19/000160016_20040819140633/Rendered/INDEX/297990018213149971x.txt.

Greenhalgh C. and Rogers M. (2010), *Innovation, Intellectual Property, and Economic Growth*, Princeton University Press, 2010.

Greenhalgh C., Rogers M., Schautschick P., Sena V. (2011), *Trade Mark Incentives*, study for UK IPO, July 2011, <http://www.ipo.gov.uk/ipresearch-tmincentives-full-201107.pdf>.

Handke, C. (2011), *The Economic Effects of Copyright – The Empirical Evidence So Far*. Report for the National Academies of the Sciences, Washington DC. http://sites.nationalacademies.org/pga/step/PGA_063399.

Landes, W., Posner, R. (2003), *The Economic Structure of Intellectual Property Law*. Harvard University Press, Cambridge, MA

Menell, P., Scotchmer, S. (2007), *Intellectual Property Law*, in Polinsky, M.A., Shavell, S. (eds.) *Handbook of Law and Economics*, Elsevier.

Munari, F., Santoni, S. (2010), *Exploiting complementarities in IPR mechanisms: the joint use of patents, trademarks and designs by SMEs*, Paper presented at the Strategic Management Society Annual Conference, Rome, IT, September 9-12, 2010.

Munari, F. (2012), *Literature Review of the Economics and Management of IPRs: patents, trade marks and designs*, unpublished manuscript.

Pinto Ribeiro, S., Menghinello, S. and Backer, K.D. (2010), *The OECD ORBIS Database: Responding to the Need for Firm-Level Micro-Data in the OECD*, OECD Statistics Working Papers, 2010/01, http://www.oecd-ilibrary.org/economics/the-oecd-orbis-database_5kmhds8mzj8w-en.

Rockett, K. (2010), *Property rights and invention*, in Hall, B.H., Rosenberg, N. (Eds.) *Handbook of The Economics of Innovation*, Vol. 1, Elsevier.

Schmoch, U. (2003), *Linking Technology Areas to Industrial Sectors: Final Report to the European Commission, DG Research*, ftp://ftp.cordis.lu/pub/indicators/docs/ind_report_isi_ost_spru.pdf.

Schwiebacher, F. (2010), *How companies use different forms of IPR protection: are patents and trademarks complements or substitutes?*, Paper presented at the DRUID-DIME Academy, Aalborg, Denmark, January 21-23, 2010.

USPTO (2012), *Intellectual Property and the U.S. Economy: Industries in Focus*, March 2012, http://www.uspto.gov/news/publications/IP_Report_March_2012.pdf.

WIPO (2003), *Guide on Surveying the Economic Contribution of the Copyright-Based Industries*, http://www.wipo.int/export/sites/www/freepublications/en/copyright/893/wipo_pub_893.pdf.

Published and edited by EPO and OHIM
Munich, Germany, and Alicante, Spain
www.epo.org
www.oami.europa.eu
Design: Graphic Design, Munich
Printing: Universal, Munich

