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Intellectual property rights intensive industries and economic performance in the European Union

Industry-Level Analysis Report, October 2016
Second edition

A joint project between the European Patent Office and the European Union Intellectual Property Office

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01 / Foreword

Innovation is a key focus of “Europe 2020”, the ten year growth strategy adopted by the European Union with a view to creating a more competitive economy with higher employment. Achieving this goal 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 throughout the economy.

Europe already has a long tradition in this area: member states of both the EU and the European Patent Organisation have played a major role in shaping a modern and balanced system of IPR which not only guarantees innovators their due reward but also stimulates a competitive market. In today’s world of increasingly globalised markets and the knowledge economy, it is vital to ensure that this system remains an effective means of implementing new innovation policies. To assist us in that task, it is essential that all those involved have access to accurate facts and figures. Only then can we ensure that debate on IP’s role in supporting innovation and creativity is based on sound evidence.

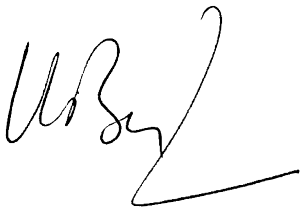
In response to this clear need, the European Union Intellectual Property Office (EUIPO) and the European Patent Office (EPO) joined forces in 2013 to carry out a study that quantified the contribution made by IPR-intensive industries to the EU economy. The findings revealed that such industries accounted for 39% of the EU’s economic output and 26% of employment during the period 2008-2010, attesting to the value of IP to the European economy.

To give this exercise enduring value, both the EUIPO and the EPO are committed to ensuring that the most recent figures and findings are available to all those who need to understand the importance of IPR for Europe. This present study is the first update since the original report and covers the period 2011-2013. There are some significant new features which provide a substantially improved overview of the situation of IPR-intensive industries in Europe. Firstly, the scope has been widened to take account of new developments such as the accession of Croatia in 2013 and to include another IP right, plant varieties, in the analysis. Secondly, the report reflects the contemporary focus of policymakers in Europe and beyond, with a new chapter on the economic importance of climate change mitigation technologies (CCMTs).

In this updated study IPR-intensive industries have once again been found to be integral to GDP, employment and trade. Furthermore, the results indicate that the contribution of these industries to the European economy has grown since the first study. In addition, IPR-intensive industries appear to have coped better with the severe economic crisis than the economy as a whole.

These are significant findings that serve to underline further the contribution of IPR-intensive industries to Europe's prosperity and competitiveness. It is our hope that, equipped with this updated study, all readers can draw on the information it contains to ensure the continuing strength of not just our IP system but also the European economy, in which it has been found to play such a vital part.

António Campinos
Executive Director, EUIPO



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02 / About this study

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 patent system.

The present report, drawn up as a joint project between the EUIPO and the EPO, and benefiting from input from other IP offices, European Commission services and international organisations, is the second major study resulting from this collaboration, following a first study published by the two Offices in 2013.[2] It aims to provide an updated, 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.

The study covers a broad range of IP rights[3] — trade marks, patents, designs, copyright, geographical indications (GIs) and plant variety rights (PVRs) — 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 IP awareness among Europe's citizens.

The 2013 study covered the period 2008-2010. The present study considers the more recent period 2011-2013. In order to ensure comparability between the two studies, the methodology used in 2013 has been retained. However, a number of improvements have been made as regards the underlying data and the methodology. In particular, data for Croatia is now included; a sixth IP right, PVRs, has been included in the analysis; and the definition of copyright-intensive industries has been brought more closely into line with the widely accepted WIPO classification.

Moreover, given the increasing focus of policymakers and business leaders in Europe and beyond on developing technologies to deal with climate change, a chapter on the economic importance of climate change mitigation technologies (CCMTs) has been added. In this chapter, the economic weight of industries engaged in development of those technologies is analysed in greater detail, based on data on patent filings at the EPO.

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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. OHIM was renamed the European Union Intellectual Property Office (EUIPO) following the entry into force of Regulation (EU) 2015/2424 on 23 March 2016. Except in bibliographical references, its new name is used throughout this report.

2 OHIM/EPO: „Intellectual property rights intensive industries: contribution to economic performance and employment in the European Union", September 2013.

3 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 other types of knowledge, such as trade secrets or business methods. In this study, „IPR" is used to refer to the six rights included in the analysis: patents, trade marks, registered designs, copyright, geographical indications and plant variety rights.

03 / Executive Summary

3.1 Main findings

- IPR-intensive industries generated 27.8% of all jobs in the EU during the period 2011-2013. On average over this period, 60 million Europeans were employed by IPR-intensive industries. In addition, another 22 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 82.2 million (38.1%).

- Over the same period, IPR-intensive industries generated more than 42% of total economic activity (GDP) in the EU, worth € 5.7 trillion. They also accounted for most of the EU's trade with the rest of the world and generated a trade surplus, thus helping to keep the EU's external trade in balance.

- IPR-intensive industries pay significantly higher wages than other industries, with a wage premium of 46% over other industries. This is consistent with the fact that the value added per worker is higher in IPR-intensive industries than elsewhere in the economy.

- IPR-intensive industries have proved most resilient to the economic crisis. Comparing the results of this study with those of the 2013 study reveals that the relative contribution of these industries to the EU economy slightly increased between the two periods 2008-2010 (2013 study) and 2011-2013 (2016 study).

- The detailed analysis of the economic weight of industries engaged in the development of climate change mitigation technologies (CCMTs) shows that they account for 1.2% of employment and 2.1% of economic output in the EU. They generated a substantial trade surplus for the EU and, despite a small drop in employment, were able to increase their GDP contribution between the two periods 2008-2010 and 2011-2013.

3.2 IPR-intensive industries in the EU economy

IPR-intensive industries are defined [4] as those having an above-average use of IPR per employee, as compared with other IPR-using industries. As is shown in Chapters 6 and 7, these industries are concentrated in manufacturing, technology and business services sectors.

It should be emphasised, however, that most industries use IP rights to some extent. By focusing only on the IPR-intensive industries, this study depicts only the part of the European economy to which IP rights contribute most.[5]

The contribution of IPR-intensive industries to the two principal economic indicators, employment and output, is summarised in tables 1 and 2 below.[6]

IPR-intensive industries are shown to have generated 27.8% of all jobs in the EU during the period 2011-2013, with 21% in trade mark-intensive industries, 12% in design-intensive industries, 10% in patent-intensive industries, and smaller proportions in copyright-intensive, GI-intensive and PVR-intensive industries.[7] On average over this period, 60 million Europeans were employed by IPR-intensive industries, out of a total employment figure of approximately 216 million. In addition, another 22 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 82.2 million (38.1%).

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 EU 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 1, which shows a breakdown by direct and indirect employment.

4 See Chapter 5 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 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 for the years 2011-2013.

7 The total contribution of IPR-intensive industries is less than the sum of the individual contributions of trade mark-intensive, patent-intensive, design-intensive, copyright-intensive, PVR-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.

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

Table 1:
Direct and indirect contribution of IPR-intensive industries to employment, 2011-2013 average

IPR-intensive industries	Employment (direct)	Share of total employment (direct)	Employment (direct+indirect)	Share of total employment (direct+indirect)
Trade-mark-intensive	45,789,224	21.2%	65,486,334	30.3%
Design-intensive	25,662,683	11.9%	38,673,508	17.9%
Patent-intensive	22,268,215	10.3%	36,021,154	16.7%
Copyright-intensive	11,630,753	5.4%	15,240,509	7.1%
GI-intensive	n/a	n/a	399,815	0.2%
PVR-intensive	1,018,754	0.5%	1,220,410	0.6%
All IPR-intensive	**60,032,200**	**27.8%**	**82,214,925**	**38.1%**
Total EU employment			215,808,033	

Note: due to overlapping use of IP rights, the sum of the figures for the individual IPR exceeds the total figure for IPR-intensive industries.

Besides employment, IPR-intensive industries contribute to economic output, as measured by gross domestic product (GDP). Overall, more than 42% of EU GDP is generated in IPR-intensive industries, with trade mark-intensive industries accounting for 36%, design-intensive industries for 13%, patent intensive industries for 15%, copyright-intensive industries for 7% and GI-intensive and PVR-intensive industries for smaller proportions. Chapter 7 provides a more detailed breakdown of these industries' contributions to the national economies of the EU Member States.

Table 2:
Contribution of IPR-intensive industries to GDP, 2011-2013 average

IPR-intensive industries	Value Added / GDP (€ million)	Share of total EU GDP
Trade-mark-intensive	4,812,310	35.9%
Design-intensive	1,788,811	13.4%
Patent-intensive	2,035,478	15.2%
Copyright-intensive	914,612	6.8%
GI-intensive	18,109	0.1%
PVR-intensive	51,710	0.4%
All IPR-intensive	**5,664,168**	**42.3%**
Total EU GDP	13,387,988	

Note: due to overlapping use of IP rights, the sum of the figures for the individual IPR exceeds the total figure for IPR-intensive industries.

Comparing the results of this study with those of the 2013 study reveals that the contribution of IPR-intensive industries to the EU economy was slightly higher in the 2011-2013 period than in the 2008-2010 period. However, the comparison is complicated by the fact that the European System of National and Regional Accounts (ESA) used by Eurostat was updated between these two

periods.[9] This update had the effect of increasing the contribution to GDP of IPR-intensive industries. In addition, the definition of copyright-intensive industries has been changed to more fully reflect the WIPO methodology, which also increases the contribution of IPR-intensive industries. In table 3, the 2008-2010 figures have been re-calculated using the new ESA 2010 and the new definition of the copyright-intensive industries so as to illustrate the impact of these changes.

Table 3: Comparison of the main results: 2013 study vs. 2016 study

Contribution of IPR-intensive industries	2013 study (original)	2013 study (new ESA 2010, new copyright definition, PVRs)	2016 study
Employment (direct)	25.9%	27.6%	27.8%
GDP	38.6%	42.1%	42.3%
Imports	88.3%	not calculated	85.5%
Exports	90.4%	not calculated	93.2%

The first column contains the results reported in the 2013 study for the period 2008-2010. The second column re-calculates the 2013 results for the same period, taking into account the new national accounting definitions, the WIPO methodology for copyright and the inclusion of PVRs. The third column presents the results of the present study (for the period 2011-2013) and is therefore directly comparable to the second column.

Thus, even after the effects of the statistical revisions have been taken into account, the contribution of IPR-intensive industries increased between the two periods 2008-2010 (2013 study) and 2011-2013 (2016 study).

There are also indications that during the economic crisis, employment in IPR intensive industries held up significantly better than overall employment. Total employment in the EU declined from 219.6 million in 2008-2010 to 215.8 million in 2011-2013, a fall of 1.7%, while employment in IPR-intensive industries fell from 60.6 million to 60.0 million, or by 1%. In relative terms, the decline in IPR-intensive employment was considerably smaller than the decline in overall employment

Given that 42.3% of GDP (value added) in the economy and 27.8% 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 interesting to examine whether this higher value added is reflected in the relative wages in the IPR intensive industries.

Wages in IPR-intensive industries are indeed higher than in non-IPR intensive industries. Table 4 shows that the average weekly wage in IPR-intensive industries is € 776, compared with € 530 in non-IPR-intensive industries – a difference of 46%. This “wage premium” is 31% in GI-intensive industries, 38% in design-intensive industries, 48% in trade mark-intensive industries, 64% in copyright-intensive industries and 69% in patent-intensive industries.

9 http://ec.europa.eu/eurostat/documents/737960/738004/ESA2010-FAQ.pdf/fea21e81-a2cb-421a-8b9e-41aae7d02a14.

Table 4:
Average personnel costs in IPR-intensive industries, 2013

IPR-intensive industries	Average personnel cost (€ per week)	Premium (compared to non-IP intensive industries)
Trade-mark-intensive	783	48%
Design-intensive	732	38%
Patent-intensive	895	69%
Copyright-intensive	871	64%
GI-intensive	692	31%
PVR-intensive*	n/a	n/a
All IPR-intensive	**776**	**46%**
Non-IPR-intensive	**530**	
All industries (included in SBS**)	629	

*Not calculated because of lack of wage statistics for agriculture
**Structural Business Statistics published by Eurostat

Compared to the situation in 2010 (as reported in the 2013 study), the wage premium has increased overall, from 41% to 46%, reflecting increases in the wage premiums for patent-intensive, trade mark-intensive and design-intensive industries.

The role played by IPR-intensive industries in the EU's external trade is also 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 trade 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, 86% of EU imports consist of products of IPR-intensive industries. However, an even higher share of EU exports, 93%, is accounted for by IPR-intensive industries.

The EU as a whole had an overall trade deficit in 2013 of approximately € 42 billion, or 0.3% of GDP. In contrast, it had a trade surplus of € 96 billion with the rest of the world in IPR-intensive industries. This is a marked improvement on the situation three years earlier, as reported in the 2013 study. In 2010, the EU had a trade deficit in IPR-intensive industries of € 126 billion.

Table 5 summarises trade in IPR-intensive industries, based on data from 2013.[12]

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 As in the case of the employment and GDP calculations, the figures for the individual 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. However, the study methodology ensures that there is no double-counting of industry contributions.

Table 5:
EU external trade in IPR-intensive industries, 2013

IPR-intensive industries	Exports (€ million)	Imports (€ million)	Net exports (€ million)
Trade-mark-intensive	1,275,472	1,261,002	14,470
Design-intensive	945,084	701,752	243,332
Patent-intensive	1,231,966	1,157,909	74,057
Copyright-intensive	119,554	102,389	17,165
GI-intensive	12,923	1,335	11,588
PVR-intensive	5,065	5,369	-304
Total IPR-intensive	**1,605,516**	**1,509,099**	**96,417**
Non-IPR-intensive	117,561	256,048	-138,487
Total EU Trade	1,723,077	1,765,147	-42,069

Note: due to overlapping use of IP rights, the sum of the figures for the individual IPR exceeds the total figure for IPR-intensive industries.

The improvement in the EU's trade balance is explained by a 27% increase in exports between 2010 and 2013, while imports increased by only 15% during the same period. For IPR-intensive industries, exports increased by 30%, while imports increased by 11%. The design-intensive industries show the highest increase in net exports and are the industries with the highest trade surplus.

A closer look at the activity of IPR-intensive industries within the EU Single Market reveals a division of labour between EU Member States. Countries like Austria, Belgium, Denmark, Finland, France, Germany, Italy, Luxembourg, Malta, the Netherlands and Sweden are above the EU average in terms of IPR creation per employee. IPR-intensive industries in other EU Member States, such as Hungary, Romania, the Czech Republic, Slovakia and Ireland have a high proportion of jobs that are attributed to companies based in other countries. As shown in table 6, overall, 20.5% of EU jobs in IPR-intensive industries are generated in subsidiaries of foreign companies, a majority of which originate from another EU country. This proportion is even higher in trade mark, design and patent-intensive industries.

Table 6:
Share of employment in IPR-intensive industries attributed to foreign companies, 2011-2013, EU average

IPR-intensive industries	EU share	Non-EU share	Total non-domestic share
Trade-mark-intensive	11.6%	8.9%	20.5%
Design-intensive	13.2%	9.4%	22.7%
Patent-intensive	14.4%	11.5%	25.8%
All IPR-intensive	**11.8%**	**8.7%**	**20.5%**

Note: a "foreign" company is a company whose headquarters are located in another country.

Finally, patent data have been used to identify industries that are active in climate change mitigation technologies (CCMTs), which are of particular importance for the EU economy. Overall, 5.9% of the total European patents considered were related to CCMTs during the period 2004-2008, and this share had increased to more than 9% by 2013. Industries that are intensive in CCMT account for 1.2% of employment and 2.1% of economic output in the EU. Their performance between the two periods 2008-2010 (2013 study) and 2011-2013 (2016 study) far exceeded the overall economic performance of European industries. CCMT-intensive industries were able to increase their GDP contribution with only a small drop in employment in the 2011-2013 period. This group of industries also plays an important role in the EU's external trade. In 2013, they generated a substantial trade surplus of more than € 102 billion for the EU. These figures are a subset of the patent-intensive industries and thus already included in the overall figures in the previous tables.

3.3 Methodology and data

The basic methodology of this study is the same as that used in the 2013 study. Nevertheless, to make this report self-contained, a large part of it, specifically Chapter 5 and Appendix 11, 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 28 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 wide 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 5.

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

In order to determine which industries are IPR-intensive, the register databases of the EUIPO, the EPO and the CPVO were matched with the commercial database ORBIS.[13] The resulting matched database contains data on approximately 240,000 companies, including the number of EU trade marks, registered Community designs, patents and CPVRs applied for by each company and subsequently granted, along with the industry classification and various financial and economic variables for each one, providing a set of data that can be used in future, more detailed studies.

Using this database, the number of trade marks, designs, patents and PVRs 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, no account being taken of 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 per employee were included as well.[14]

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 the country-level contributions of IPR-incentive industries alone. In the above example, the higher contribution of patent–intensive industries in country B is the result of decisions on where to site the production of vehicles, but the underlying R&D could have been performed in country A or indeed another country altogether.

To shed some light on this issue, Chapter 8 shows in which countries the patents, trade marks, designs and PVRs 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.

For copyright-intensive industries, the WIPO methodology was applied more fully than it was in the body of the 2013 study. In order to achieve comparability with an earlier study published by the United States Patent and Trademark Office (USPTO), only a subset of industries considered by WIPO to be copyright-intensive was included in that previous study (results based on the full WIPO methodology were provided in an annex). In contrast, in the present study, the WIPO classification is applied more fully, so that in addition to the industries classified by WIPO as “core copyright industries”, a number of “partially dedicated” industries are also included, namely those for which at least 20%

13 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. It thus includes data on all companies, whether listed on a stock exchange or not (as would typically be the case for SMEs).

14 This assumption was maintained for the sake of comparability with the 2013 study. However, the issue of national versus EU-level rights could be addressed in future studies to examine whether the inclusion of national rights would yield different results.

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

of their value added can be attributed to copyright-related activities.[16] The net effect is that the number of copyright-intensive industries has increased by 46 (from 33 in the 2013 study to 79 now), while the total number of IPR-intensive industries has increased by 21, from 321 in the previous study to 342 in this one. The methodology for copyright-intensive industries is explained fully in section 5.6.

Similarly, due to the particular nature of GIs and PVRs and the unavailability of disaggregated statistical data at a European level, these two IP rights had to be analysed using bespoke methodologies, which are described in sections 5.7 and 5.8, respectively.

16 The total value added in these industries is scaled using WIPO's factors so as to exclude non-copyright-related activities.

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List of abbreviations

BvD	Bureau van Dijk
CCMT	Climate change mitigation technology
CPA	Classification of Products by Activities
CPVO	Community Plant Variety Office
CPVR	Community plant variety right
COMEXT	Eurostat reference database for external trade
DG AGRI	Directorate-General for Agriculture and Rural Development
DG GROW	Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs
DG MARKT	Directorate-General Internal Market and Services
DUO	Domestic ultimate owner
EAA	Economic Accounts for Agriculture
EPC	European Patent Convention
EPO	European Patent Office
EU	European Union
EUIPO	European Union Intellectual Property Office
FATS	Foreign affiliates 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 (EUIPO as of 23/3/2016)
PATSTAT	Worldwide Patent Statistical Database (EPO)
PDO	Protected designation of origin
PGI	Protected geographical indication

PVR	Plant variety right
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

Country codes:

AT	Austria
BE	Belgium
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
DK	Denmark
EE	Estonia
EL	Greece
ES	Spain
FI	Finland
FR	France
HR	Croatia
HU	Hungary
IE	Ireland
IT	Italy
LT	Lithuania
LU	Luxembourg
LV	Latvia
MT	Malta
NL	Netherlands
PL	Poland
PT	Portugal
RO	Romania
SE	Sweden
SI	Slovenia
SK	Slovakia
UK	United Kingdom

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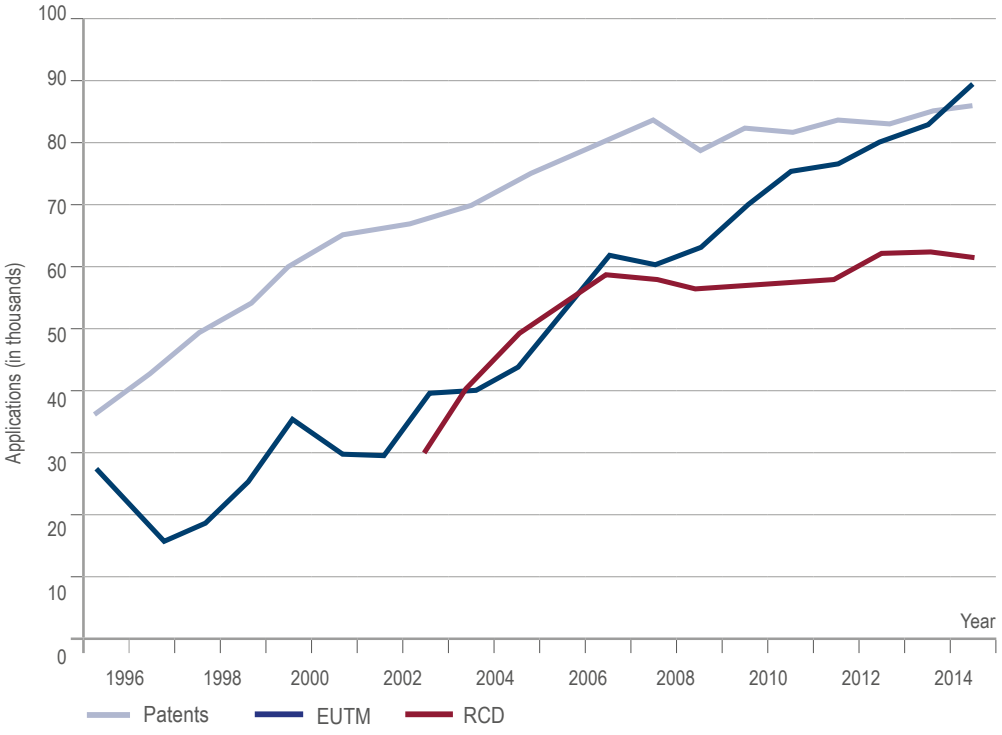
04 / Introduction

Intellectual Property (IP) plays an 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.[17] Most policymakers recognise that future growth and prosperity in Europe (and other regions) depend on knowledge-intensive industries.

As shown in figure 1,[18] 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. 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.

Figure 1:
Number of EPC patents, EUTM and RCD applications filed by EU applicants between 1996 and 2015



17 See, for example, Schwiebacher (2010).

18 In figure 1, EPC stands for European Patent Convention, while EUTM and RCD are abbreviations for European Union trade mark and registered Community design, respectively.

Until recently, 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.

Like the 2013 study, this 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.[19] 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, geographical indications (GIs) and plant variety rights (PVRs). 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 of the EU and of each Member State.

This study quantifies the collective contribution of IPR-intensive industries to the economy. However, 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. 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.

A report published by the EUIPO in 2015 presented 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.[20]

This report is structured as follows: the remainder of the introduction provides a brief overview of the IP rights covered by the analysis and their economic function. In Chapter 5, the methodology of the study, including compilation of the data and its analytical treatment, is explained. In Chapters 6 and 7, the results of the industry-level analyses are presented for each of the six

19 The 2013 study is available at: https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/IPContributionStudy/full_report/joint_report_epo_ohim.pdf. 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.

20 „Intellectual property rights and firm performance in Europe: an economic analysis." Available at: https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/IPContributionStudy/phase2/OHIM_study_report_en.pdf.

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 Chapter 8, the origin of the IP rights underlying this study is examined, and the concluding Chapter 9 presents an additional analysis of industries patenting inventions in climate change mitigation technologies.

4.1 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 six forms of IPR studied in this report — patents, trade marks, registered designs, copyright, GIs and PVRs — 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.

4.1.1 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).

In Europe, inventors can apply for patent protection in the individual European states via the national patent systems and/or seek regional protection through a centralised procedure at the European Patent Office (EPO). A European patent granted by the EPO offers patent protection in up to 42 countries. Once the ratification of the Agreement on the Unified Patent Court is sufficiently far advanced, the "unitary patent" will be a European patent with unitary effect for most of the territory of the European Union.

There are two main ways in which patent rights promote the progress of technology, innovation and social welfare.[21] 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 function"). 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 function" describes the second main way in which patents can promote innovation, 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. The combination of disclosure and legal exclusivity also enables contractual arrangements (such as licences) for the exploitation of patented inventions.

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.

4.1.2 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).

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21 There is a rich body of economic literature dedicated to patents (see e.g. Hall & Harhoff, 2012 for a recent overview). This literature discusses the economic functions performed by patents and assesses their actual impact on the economy. It also explores the various ways in which patents are used across sectors and countries, and the economic impact of the legal design of patent systems.

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 consistent quality that the consumer associates with that brand.

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.

4.1.3 Overview of designs

Design[23] 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".

4.1.4 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)* for authors of visual arts such as sculpture, paintings or photography
- *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 all 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 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 related-rights 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 and other rights holders (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.

4.1.5 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.[25]

4.1.6 Overview of plant variety rights

A **plant variety right ("PVR")** is an intellectual property right, like a patent, but designed for plant varieties of which material is produced and commercialised.

The Community plant variety rights ("CPVR") system, set up in 1995, provides a centralised procedure for protecting new varieties of plants in the European Union. Under the CPVR system, a unitary right to exploit a plant variety can be acquired throughout the whole territory of the EU via a single application to the Community Plant Variety Office (CPVO).

The CPVR system exists alongside the national systems. However, it is not possible for the owner of a plant variety to exploit simultaneously a CPVR and a national right or patent granted in relation to that variety. Where a CPVR is granted in relation to a variety for which a national right or patent has already been granted, the national right or patent is rendered ineffective for the duration of the CPVR.

25 See EUIPO: "Infringement of Protected Geographical Indications for Wine, Spirits, Agricultural Products and Foodstuffs in the European Union", 2016. Available at: https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/Geographical_indications_report/geographical_indications_report_en.pdf.

The legal basis for the CPVR system is Council Regulation (EC) No 2100/94 on Community plant variety rights (the basic regulation). Once granted, the duration of a CPVR is 25 years, or 30 years in the case of potato, vine and tree varieties. These periods may be extended by legislation for a further 5 years in relation to specific genera or species. The effect of a CPVR is that certain specified activities in relation to variety constituents or the harvested material of the newly protected variety require the prior authorisation of the right-holder. Such authorisation may be granted subject to conditions and limitations.

The rights-holder can bring civil proceedings against any person infringing a CPVR.

The economic rationale for PVRs is similar to that for patents: to incentivise innovation while at the same time promoting the diffusion of knowledge across the economy.

4.2 Summary of the six IP rights

The main characteristics of patents, trade marks, registered designs, copyright, GIs and PVRs are summarised in table 7.

Table 7:
Main characteristics of IP rights

IP right	Patents	Designs	Trade marks	Copyright	Geographical Indications	Plant variety rights
Subject matter	Inventions (solutions to technical problems)	Appearance 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	Plant varieties
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	Distinctness, uniformity, stability and novelty; commercial use
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	Examination by the national authority (depending on the country), then by the European Commission	Examination by examination authority chosen by the CPVO, followed by grant
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 to the public, 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	Exclusive right to commercialise the protected plant variety
Duration	Typically 20 years from filing, subject to payment of annual renewal fees	For registered designs, the maximum-term is 25 years. In the case of registered Community designs, 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	For most plant varieties, 25 years; 30 years for vine, trees and potatoes, subject to payment of annual fees

05 / Methodology of the study

The purpose of the present study is to examine the economic characteristics of IPR-intensive industries. As in the 2013 study, the methodology used for this study follows that applied in the USPTO study (2012) as closely as possible, in order to achieve maximum comparability of the respective study results. However, this study covers 28 countries and is based on data from three separate IP offices (the EUIPO, the EPO and the CPVO), so the methodology by necessity has some distinct features. Furthermore, some improvements were made to this methodology as regards copyright. A final difference is that this study covers six IP rights, one more than in the previous study. Nevertheless, the *principles* behind the methodologies of the studies are the same: first, determine which industries use IPRs more than others;[26] 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.

Apart from the addition of CPVRs and the change in the definition of copyright-intensive industries to more fully reflect the WIPO methodology, the IPR-intensive industries were identified in this study in exactly the same way as in the 2013 study. Indeed, for trade marks, designs and patents, the sectors that were identified as IPR-intensive in 2013 are considered to be IPR-intensive in 2016. This is justified by the fact that IPR-intensity is a structural characteristic of an industry and is therefore unlikely to have changed in the space of just a few years. Most of this chapter is thus a repetition of the corresponding chapter in the 2013 report.

The basic unit of analysis in this study is the *industry*, as defined in the NACE classification used by Eurostat.[27] 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.

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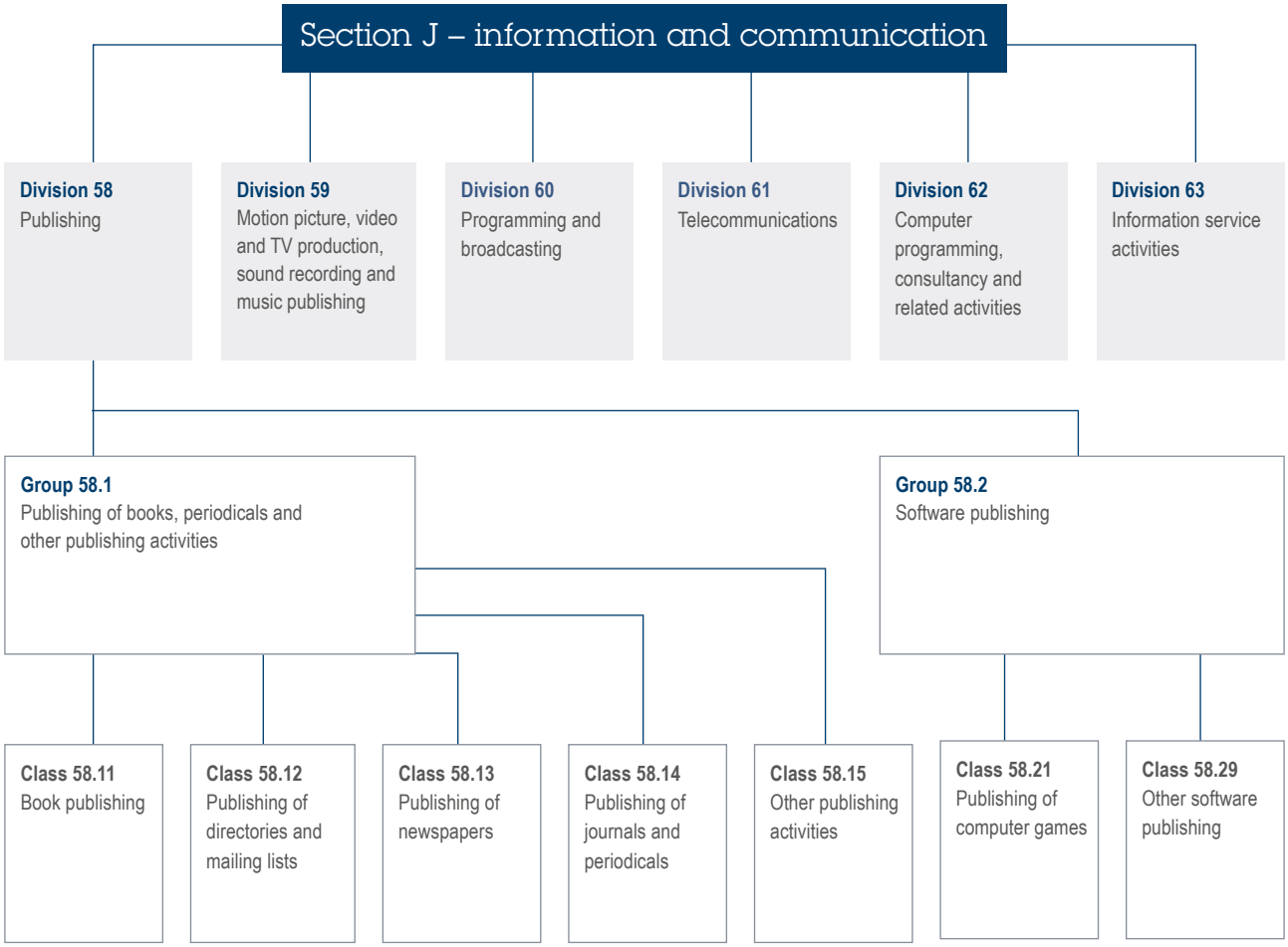
26 This approach does not take into account the distribution of IPR use within the sector. In other words, an industry may be classified as IPR-intensive even if only a minority of firms in that industry use IPRs very intensively while the rest use them very little. One way to examine the breadth of IPR use within an industry would be to use data from sources such as the Community Innovation Survey carried out across the EU. This refinement could be considered for future editions of this study.

27 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, Section J – Information and Communication



The list of industries that are intensive in their use of copyright and GIs is pre-determined, as explained in sections 5.6 and 5.7. However, for patents, trade marks, designs and PVRs, IPR intensity is determined by examining the volume of IP rights obtained by all industries at EUIPO, EPO and CPVO 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 5.2. How the data was used is explained in more depth in sections 5.3 for patents, 5.4 for trade marks and 5.5 for designs. Section 5.8 explains the methodology used for PVRs.

5.1 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:

- EUIPO's register of EU 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.
- CPVO's Register of Community Plant Variety Rights.
- ORBIS, a commercial database containing industry classification and other information for more than 20 million European companies. Together with the EUIPO 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 and PVR-intensive sectors.
- Eurostat crop statistics, used to determine the area under cultivation of plants protected by PVRs.
- 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 affiliates statistics (FATS), used to calculate the number of jobs in IPR-intensive industries created by companies based outside each Member State.
- E-Bacchus/E-Spirits-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 5.7.1.

The IP rights chosen for the analysis were patents, trade marks, designs and PVRs applied for at the EPO, the EUIPO and the CPVO during the period 2004-2008 and subsequently granted.[28] This time period was chosen partly to ensure comparability with the USPTO (2012) 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. The time period was retained in the present study in order to ensure comparability with the 2013 study. In any event, the IPR intensity of an industry is a structural feature which is unlikely to have changed in the space of three years.

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.[29] 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.

The contribution made to the economy by the IPR-intensive industries identified according to the methodology described in this chapter was analysed using economic data for the period 2011-2013, thus updating the earlier study, which used economic data for 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 EUIPO, EPO and CPVO data had to be matched to ORBIS, but only patents, trade marks, designs and PVRs 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.[30] 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 7.

28 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 the matching exercise were extracted from the underlying databases).

29 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.

30 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.

5.1.1 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 EU28 level.

- **Confidentiality:** it may be that only one company is active in a particular industry in a Member State (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 industries:** for 16 IPR-intensive industries, no data at all is reported in SBS.[31]

In some cases where SBS data was not available, data from another Eurostat data series, National Accounts employment, was used instead. This series uses a slightly different definition than SBS but the impact on the results is minimal.[32]

In the case of the remaining 14 IPR-intensive industries for which Eurostat does not collect data, the employment data was obtained from the national statistics offices of France, Germany, Spain and the United Kingdom. A ratio of employment in each of the industries to total employment in corresponding divisions (85 and 90 to 94) was calculated for these four 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 14 industries in total employment of those six divisions in the EU is the same as in total of France, Germany, Spain and the UK.

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31 These industries are all classes included in divisions 01 *Crop and animal production, hunting and related service activities,* 66 *Activities auxiliary to financial services and insurance activities*, 85 *Education, 90 Creative, arts and entertainment activities,* 91 *Libraries, archives, museums and other cultural activities,* 92 *Gambling and betting activities,* 93 *Sports activities and amusement and recreation activities* and 94 *Activities of membership organisations*.

32 Specifically, SBS data was missing for two 2-digit industries: 01 C*rop and animal production, hunting and related service activities* and 66 *Activities auxiliary to financial services and insurance activities*. For those two industries, employment data was obtained from National Accounts.

All in all, for the EU as a whole, SBS data was available for 326 of the 342 IPR-intensive industries, while data for the remaining 16 industries was completed by imputation based on Member State data, as described above.[33]

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 tables[34] because it was not available in COMEXT. This was the case for the following NACE divisions, which contain 25 relevant NACE classes:

- 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, 62 and 63 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, division 73 includes one non-copyright intensive industry, 73.20 *Market research and public opinion polling*. While including this industry slightly overstates the trade share of copyright-intensive industries, it has no impact on the overall share of IPR-intensive industries, because the industry in question is 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 110 additional 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 IPR intensive industries, trade data was available.

33 In theory, 9,128 data points (employment or value added for 327 industries for 28 Member States) were needed at the level of the Member State. However, about one tenth of the total data needed at country level were missing from the published Eurostat statistics at 4-digit level and was estimated based on 2-digit data in SBS. The imputed data is only significant in the cases of the Czech Republic, Malta and the Netherlands.

34 http://ec.europa.eu/eurostat/web/esa-supply-use-input-tables/data/database.

5.2 Data matching for patents, trade marks and designs

In order to determine which industries are IPR-intensive, the EUIPO and CPVO registers 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.[35] The second part, the actual matching of databases, was based on an original methodology developed by the project team. The firms in all 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 EUIPO and EPO owners are found in ORBIS. There are various reasons why not all patent, EUTM 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 the EUIPO and the 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 EUTMs, 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.[36] 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.

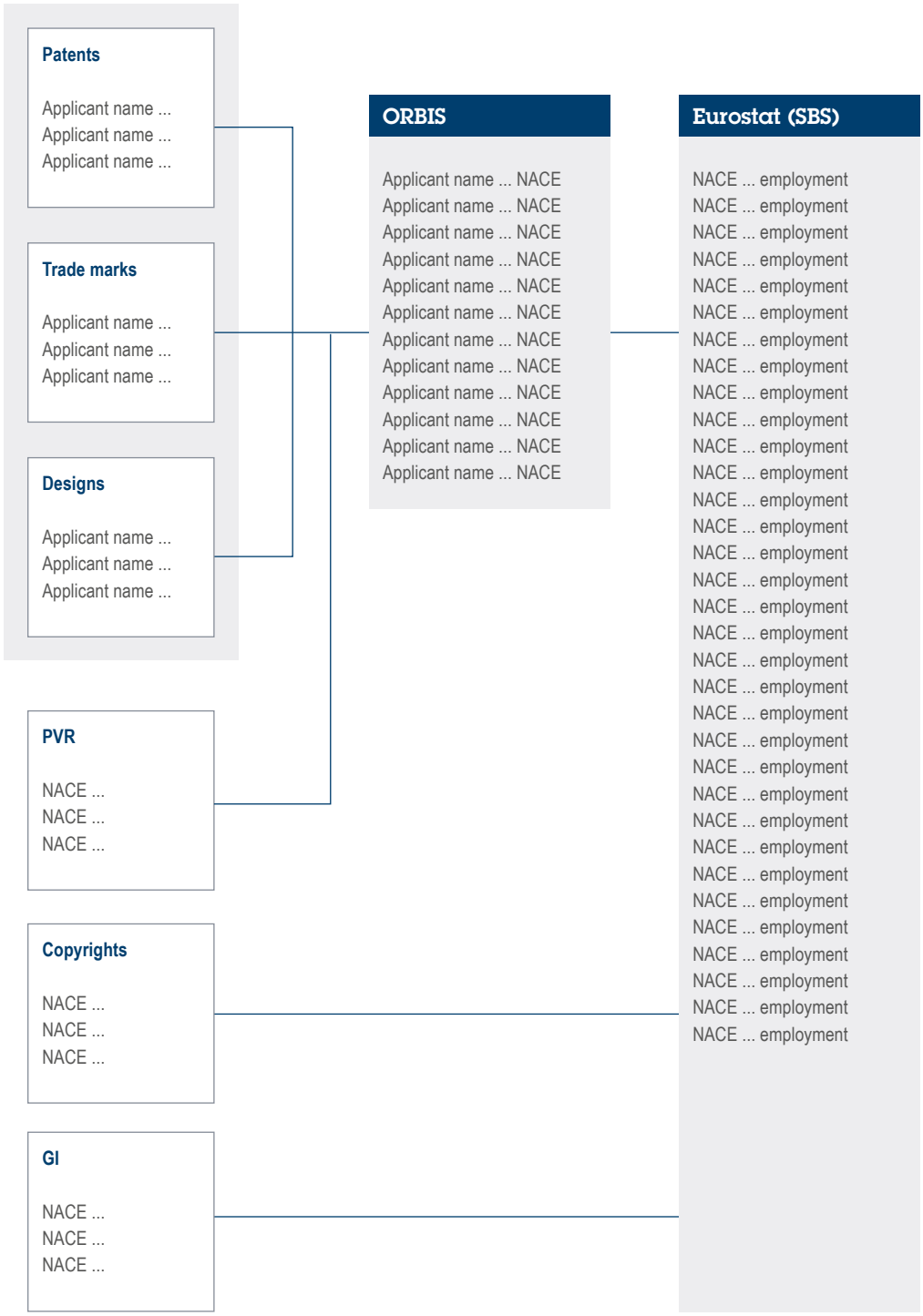
The end result of this was a matched database containing data for almost 240,000 companies (ORBIS ids) with the number of EUTMs, RCDs and patents applied for by each company. Following the matching, the data was filtered to include only those applications filed during the period 2004-2008 and subsequently 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.[37]

35 For a detailed description of this step, see sections 11.1.1 - 11.1.3 in the Appendix.

36 „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.

37 Although ORBIS is the best available data source for extracting information on companies‘ industrial activity, IP management practices and the nature of a company‘s business activity can sometimes distort information on the industrial application of IPR. That will be the case, for example, if a company is active in several industries and protects the IPR relevant to each industry in which it is active. In ORBIS, each company/branch can be associated with only one principal industry, so all its IPR will be linked with the NACE code for that principal industry. Similarly, if a company is active in both manufacturing and wholesale trade but wholesale trade is indicated as its principal industry in ORBIS, its IPR will count as related to wholesale trade although they may in fact relate to manufacturing only.

Figure 3:
Simplified illustration of the data-matching process



5.3 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 patents protected under the European Patent Convention (EPC) 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 *head offices*, i.e. the presence of general, non-specific industry codes in the ORBIS data, such as 70.10 *Activities of head offices and* 64.20 *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 11.1.9.

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).

5.3.1 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 published 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 5.2.

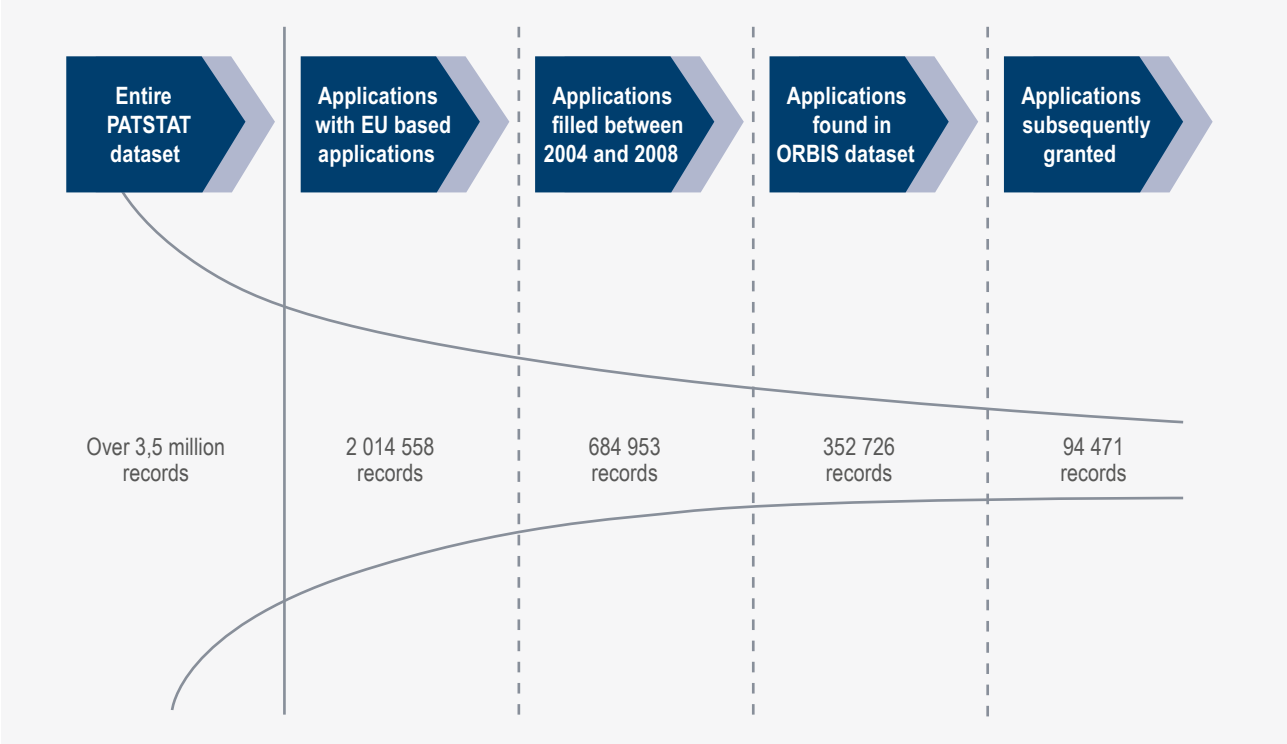
   The PATSTAT-ORBIS concordance table is comprised of records that were:
   - ➔ matched automatically with the respective ORBIS id based on the normalised names (matching level 1);
   - ➔ matched manually with the respective ORBIS id (matching level 2 and 3);
   - ➔ matched manually with the NACE industry 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 table[38] (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 ¼ 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.

The effect of the filtering steps described above is summarised in figure 4.

Figure 4:
Overview of the filtering steps of the patent dataset



38 Linking Technology Areas to Industrial Sectors. Final Report to the European Commission, DG Research, by Ulrich Schmoch et al.

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.

5.3.2 Relative intensity

Relative patent intensity is defined as the number of granted 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 1 000 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 5.3.1.

As a first step, employment data at EU level for each industry was extracted from the SBS Eurostat table for the years 2008-2010.[39] 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).*[40] 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

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

40 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.

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.

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.[41] 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.

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

5.4 Identification of trade mark-intensive industries

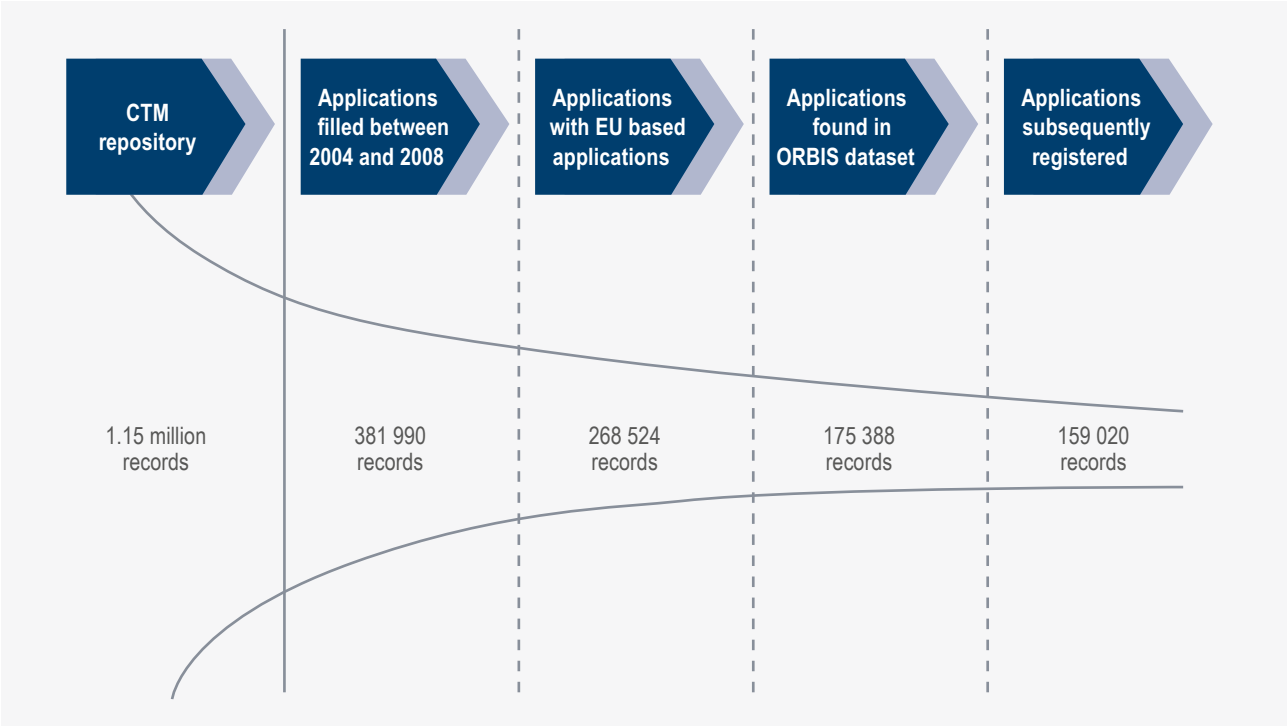
5.4.1 Absolute intensity

1. The starting point for the calculation of absolute trade mark intensities was EUIPO's data warehouse, which contains data on all the EUTM applications[42] filed directly with EUIPO 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 EUIPO-ORBIS concordance table prepared during the matching procedure described in section 5.2 (see also step 4 in section 5.3.1).
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 5.3.1.
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 EUIPO 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.

42 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 EUTM covers approximately 3 NICE classes.

The effect of the filtering steps described above is summarised in figure 5.

Figure 5:
Overview of the filtering steps of the trade mark dataset



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.

5.4.2 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 5.4.1.

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 5.3.2. 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 5.3.2.

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 5.3.2, 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)*.

5.5 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 5.4.

5.5.1 Absolute intensity

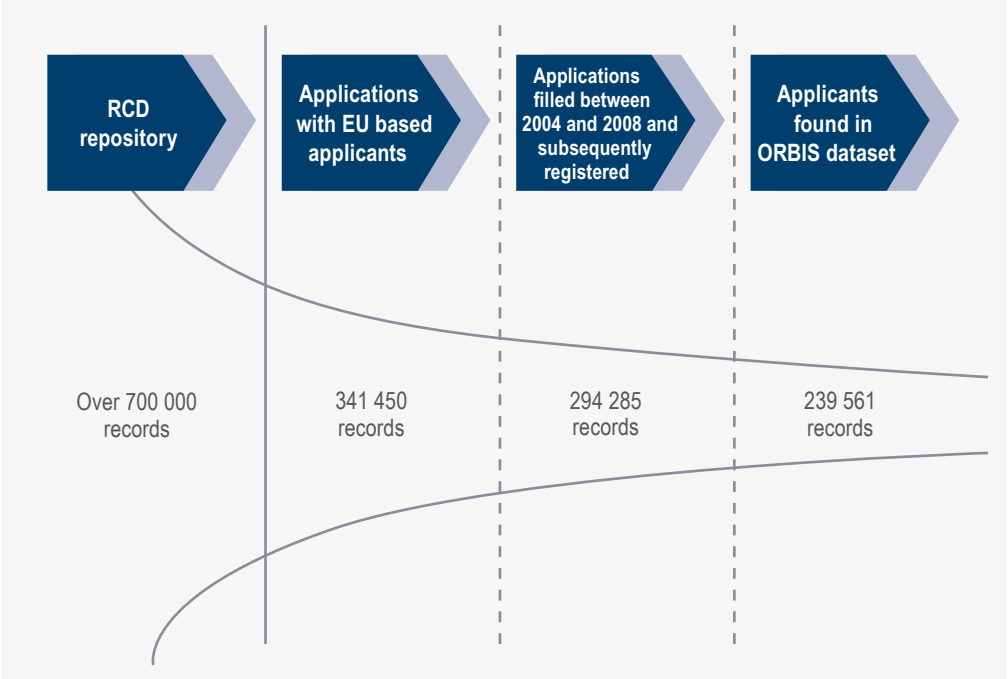
1. The starting point for the calculation of absolute design intensities was EUIPO's data warehouse. This database contains data on the all RCD applications[43] filed directly with EUIPO and contained almost 700,000 records at the end of January 2013.
2. As for patents and trade marks, the dataset was 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.

43 The EUIPO 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.

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 EUIPO-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 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 the same protocol as described for patents in step 6 of section 5.3.1. 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.

The effect of the filtering steps described above is summarised in figure 6.

Figure 6:
Overview of the filtering steps of the design dataset



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.

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).

5.5.2 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 5.3.1, 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 5.3.2, 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.

5.6 Identification of copyright-intensive industries

IPR intensity (number of rights per 1 000 employees) cannot be calculated for copyright in the same way as for trade marks, patents and designs, 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 approach taken to overcome this difficulty was to adapt 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.[44]

The WIPO guidelines group industries into four categories according to the degree to which their activity depends on copyright: core copyright industries, interdependent 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

44 This methodology is referred to in the following as the „WIPO methodology".

- Visual and graphic Arts
- Advertising services
- Copyright collecting societies

Some examples of interdependent 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.

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.

The following industries identified by WIPO are included in this study:

- Core copyright industries
- Interdependent copyright industries
- Partial copyright industries with factors above 20%

Interdependent 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, but whose activities have not been included in the core copyright industries.

Non-dedicated support industries have been excluded from this study, as all of them have a factor of 6%. Appendix 12 shows the complete list of the copyright-intensive industries and the associated factors.

EU-level employment and GVA data for the copyright-intensive industries was obtained from Eurostat's SBS dataset. However, for 12 industries, it has no data on either employment or value added. These industries include 85.52 *Cultural education*, 90.01 *Performing arts*, 90.02 *Support activities to performing arts*, 90.03 *Artistic creation*, 90.04 *Operation of arts facilities* 91.01 *Library and recreation activities*, 91.02 *Museums activities*, 91.03 *Operation of historical sites and buildings and similar visitors attractions*, 93.21 *Activities of amusement parks and theme parks*, 93.29 *Other amusement and recreation activities*, 94.12 *Activities of professional membership organisations* and 94.99 *Activities of other membership organisations n.e.c.* In order to include these activities in the study, data for those sectors was obtained from the national statistics offices of France, Germany,

Spain and the United Kingdom.[45] By comparing the employment and value added for the sectors in question in those four countries to total employment and value added in the relevant divisions in the EU, 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.

5.7 Identification of GI-intensive industries

Geographical indications 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.[46] 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 6, 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.

There are approximately 3,400 registered GIs in the EU, defined in four separate regulations:

- 56.4% related to wines[47]
- 31.3% related to agricultural products and foodstuffs[48]
- 12.2% related to spirits[49]
- 0.1% related to aromatised wines[50]

45 Attempts were made to obtain such data from other Member States, but many national statistical offices do not have this data.
46 For example, about 25% of German beer sales are protected by GI, while virtually no Belgian beer uses this IP right.
47 Reg. (EC) No 1308/2013.
48 Reg. (EC) No 1151/2012.
49 Reg. (EC) No 110/2008.
50 Reg. (EC) No 251/2014.

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)"*,[51] 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 8. 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.[52]

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

52 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 8:
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%
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 grape* 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.[53]

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

5.7.1 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 6.

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 2013, the EU only recognised 19 GIs (Protected Designations of Origin) from outside the EU, the most significant of which were Napa Valley wine from California, Vale dos Vinhedos wine from Brazil, Darjeeling tea from India and Café de Colombia. However, in addition to the third-country GIs protected through direct registration, the EU has bilateral agreements with a number of countries which provide protection essentially equivalent to GIs for more than 1,600 products. 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 these countries, tequila from Mexico and coffee from Colombia are significant in terms of import volumes.[54]

Hence, "GI imports" are defined as imports from third countries of any wine, spirits, aromatised wine, agricultural products and foodstuffs which are protected in the EU either by direct registration of a GI or as consequence of bilateral or multilateral international agreements.

The COMEXT database provides information on wine imports by country of origin, but does not distinguish between wines protected as GIs and those that are not. However, wine export statistics from Chile indicate that 72% 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 13 countries with which the EU has relevant agreements were therefore multiplied by 0.72. Imports of other products from relevant countries (e.g. tequila from Mexico, pisco from Peru or cheese from Switzerland) were added to the result to arrive at an overall estimate of GI imports into the EU.

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."

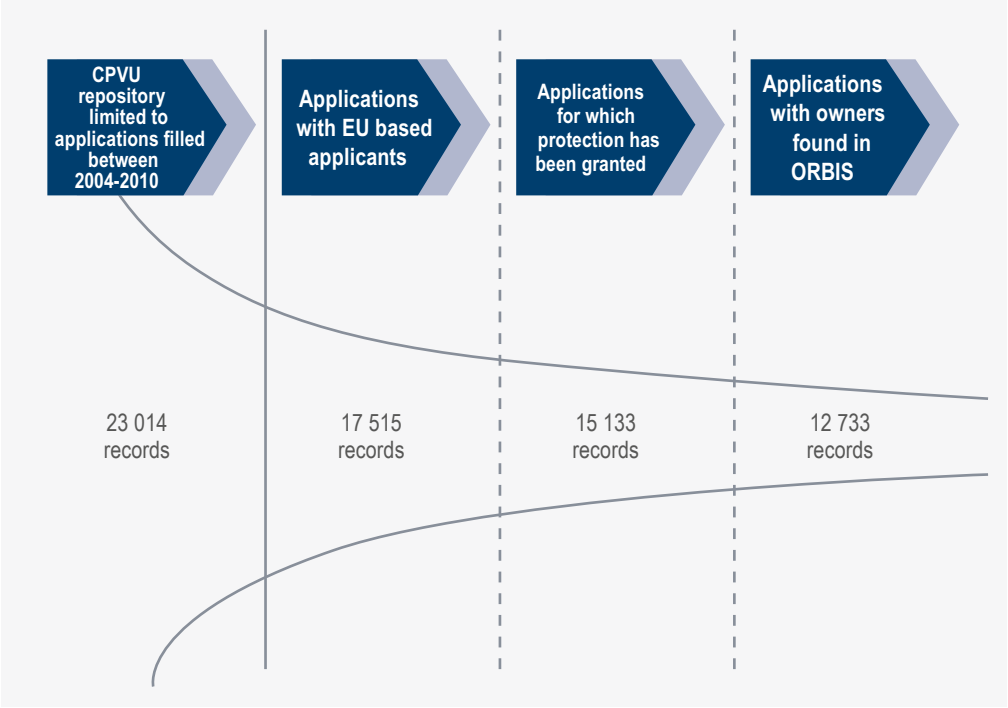
5.8 Identification of PVR-intensive industries

For the identification of PVR-intensive industries, this study relies on register data from the CPVO. This data contains 23,014 applications covering the period 2004-2012. The applicants came from 58 countries. As was the case for patents, only successful applications, i.e. those for which the CPVR was granted, filed by applicants with their seat in one of the Member States of the EU were considered. There were 15,133 such applications.

As for patents, trade marks and designs, the CPVO data was matched with the ORBIS database in order to identify the industries in which the applicants were active. The matching was successful for 12,733 applications.

The effect of the filtering steps described above is summarised in figure 7.

Figure 7:
Overview of the filtering steps of the PVR dataset



Altogether, 69 NACE codes are represented in the list of applicants. Table 9 shows the industries with the greatest number of filings during the period 2004-2008, along with the number of countries from which the filings in each NACE code originated.

Table 9:
Filings at the CPVO, 2004-2008

NACE code	NACE description	Filings	Countries
01.19	Growing of other non-perennial crops	1,207	9
01.11	Growing of cereals (except rice), leguminous crops and oil seeds	775	8
01.30	Plant propagation	716	8
46.21	Wholesale of grain, unmanufactured tobacco, seeds and animal feeds	600	8
01.13	Growing of vegetables and melons, roots and tubers	600	8
77.40	Leasing of intellectual property and similar products, except copyrighted works	574	3
46.22	Wholesale of flowers and plants	549	7
72.19	Other research and experimental development on natural sciences and engineering	386	11
72.11	Research and experimental development on biotechnology	286	2
01.61	Support activities for crop production	150	4
47.76	Retail sale of flowers, plants, seeds, fertilisers, pet animals and pet food in specialised stores	102	4
46.11	Agents involved in the sale of agricultural raw materials, live animals, textile raw materials and semi-finished goods	101	2
01.64	Seed processing for propagation	98	6
01.50	Mixed farming	39	3
46.31	Wholesale of fruit and vegetables	30	6
81.30	Landscape service activities	16	3
74.90	Other professional, scientific and technical activities n.e.c.	13	4

As shown in table 9, agricultural and horticultural sectors are major users of CPVRs. Since the employment data available for those sectors from Eurostat is not sufficiently detailed, an alternative approach to determining CPVR-intensity for those sectors had to be developed. In order to determine which sub-sectors of agriculture rely more than others on PVRs, the mean value of CPVR applications per 1,000 ha covered by each crop was computed. The result of this calculation is shown in table 10.

Table 10:
Top 20 crops with highest number of PVR applications per 1,000 ha

Crop	CPVR applications per 1,000 ha	Above the mean?
Flowers and ornamental plants	72.70	Y
Blueberries	20.21	Y
Aromatic, medicinal and culinary plants	3.66	Y
Lettuces	3.16	Y
Cucumbers	1.61	N
Endives	1.54	N
Leeks	1.05	N
Peppers (capsicum)	0.96	N
Hemp	0.94	N
Apricots	0.90	N
Strawberries	0.85	N
Peaches and nectarines	0.69	N
Radishes	0.69	N
Celery	0.68	N
Cabbages	0.50	N
Sweet lupins	0.49	N
Linseed (oilflax)	0.39	N
Raspberries	0.31	N
Spinach	0.29	N
Tomatoes	0.28	N

Subsequently, the crops with the highest intensity of CPVR usage per 1,000 ha were linked with agriculture sectors as defined by Regulation (EC) No 1242/2008 establishing a Community typology for agricultural holdings. The Regulation classifies agricultural holdings in 22 types based on the crop specialisation. Since the crops with above average intensity of CPVR applications per 1,000 ha correspond mainly to horticulture, it is assumed that this sector is the most PVR-intensive part of agriculture. Specifically, specialist horticulture, as defined by Regulation (EC) No 1242/2008, includes:

- ➔ Specialist vegetables
- ➔ Specialist flowers and ornamentals
- ➔ Mixed horticulture

Other horticulture includes:

- ➔ Specialist mushrooms
- ➔ Specialist nurseries
- ➔ Various horticulture

06 / IPR-intensive industries at EU level

This chapter presents the main results of the analysis described in Chapter 5: the identification of IPR-intensive industries at EU level, separately for each of the six 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.

6.1 Patent-intensive industries

All in all, out of 615 NACE classes, 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 1,000 employees that exceeds the overall average of 0.69.

Table 11 shows the 20 most patent-intensive industries. The full list of patent-intensive industries is shown in Appendix 11.2.

Table 11:
The 20 most patent-intensive industries*

NACE code	NACE description	Patents/ 1000 employees
28.24	Manufacture of power-driven hand tools	109.74
77.40	Leasing of intellectual property and similar products, except copyrighted works	69.23
21.10	Manufacture of basic pharmaceutical products	27.57
20.59	Manufacture of other chemical products n.e.c.	19.08
72.11	Research and experimental development on biotechnology	15.64
26.70	Manufacture of optical instruments and photographic equipment	13.67
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	13.35
27.51	Manufacture of electric domestic appliances	13.12
28.91	Manufacture of machinery for metallurgy	12.33
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	12.26
28.94	Manufacture of machinery for textile, apparel and leather production	9.84
72.19	Other research and experimental development on natural sciences and engineering	9.65
24.45	Other non-ferrous metal production	9.56
26.30	Manufacture of communication equipment	9.35
26.11	Manufacture of electronic components	8.51
06.20	Extraction of natural gas	8.51
30.99	Manufacture of other transport equipment n.e.c.	7.99
20.11	Manufacture of industrial gases	7.77
28.95	Manufacture of machinery for paper and paperboard production	7.58
30.40	Manufacture of military fighting vehicles	7.58

* based on patent applications filed between 2004 and 2008 and subsequently granted.

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 77.40[55], 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.

55 The official Eurostat definition of class 77.40 is as follows: *this class includes the activities of allowing others to use intellectual property products and similar products for which a royalty payment or licensing fee is paid to the owner of the product (i.e. the asset holder). The leasing of these products can take various forms, such as permission for reproduction, use in subsequent processes or products, operating businesses under a franchise etc. The current owners may or may not have created these products. This class includes:*
- leasing of intellectual property products (except copyrighted works, such as books or software)
- receiving royalties or licensing fees for the use of: patented entities, trademarks or service marks, brand names, mineral exploration and evaluation, and franchise agreements.
The group of companies associated with this class includes both standalone companies without any economic links to other companies and branches whose main activity consists of managing the IP portfolio of their parent companies.

6.2 Trade mark-intensive industries

All in all, out of 615 NACE classes, 501 industries use trade marks, of which 277 are trade mark-intensive, i.e. have an average number of trade mark classes per 1,000 employees that exceeds the overall average of 3.16.

Table 12 shows the 20 most trade mark-intensive industries. The full list of trade mark-intensive industries is shown in Appendix 11.3.

Table 12:
The 20 most trade mark-intensive industries*

NACE code	NACE description	Trade marks/ 1000 employees
77.40	Leasing of intellectual property and similar products, except copyrighted works	212.22
21.10	Manufacture of basic pharmaceutical products	38.81
11.02	Manufacture of wine from grape	38.78
72.11	Research and experimental development on biotechnology	35.91
20.42	Manufacture of perfumes and toilet preparations	32.40
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	27.08
30.99	Manufacture of other transport equipment n.e.c.	26.63
32.40	Manufacture of games and toys	26.21
32.30	Manufacture of sports goods	25.52
61.90	Other telecommunications activities	25.46
58.21	Publishing of computer games	25.05
11.01	Distilling, rectifying and blending of spirits	24.47
59.13	Motion picture, video and television programme distribution activities	24.35
63.12	Web portals	24.32
17.24	Manufacture of wallpaper	23.42
24.45	Other non-ferrous metal production	22.70
32.99	Other manufacturing n.e.c.	22.54
10.73	Manufacture of macaroni, noodles, couscous and similar farinaceous products	22.17
18.11	Printing of newspapers	21.51
59.20	Sound recording and music publishing activities	21.26

* based on trade mark applications filed between 2004 and 2008 and subsequently granted.

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).

6.3 Design-intensive industries

All in all, out of 615 NACE classes, 470 industries use designs, and 165 of them are design-intensive, i.e. have an average number of designs per 1,000 employees that exceeds the overall average of 1.61.

Table 13 shows the 20 most design-intensive industries. The full list of design-intensive industries is shown in Appendix 11.4.

Table 13: The 20 most design-intensive industries*

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

* based on design registrations filed between 2004 and 2008 and subsequently granted.

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 77.40 is also one of the most design-intensive industries.

6.4 Copyright-intensive industries

Tables 14 and 15 list the copyright-intensive industries included in this study, after being identified as described in section 5.6. In table 15, the "type" column indicates whether the industry is core, interdependent or partial according to the WIPO classification. The "factor" column shows the percentage of each sector's activity considered to be related to copyright.

Table 14: Core copyright-intensive industries

NACE code	NACE description
58.11	Book publishing
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
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
63.12	Web portals
63.91	News agency activities
63.99	Other information service activities n.e.c.
73.11	Advertising agencies
73.12	Media representation
74.10	Specialised design activities
74.20	Photographic activities
74.30	Translation and interpretation activities
90.01	Performing arts
90.02	Support activities to performing arts
90.03	Artistic creation
91.01	Library and archives activities
93.29	Other amusement and recreation activities
18.11	Printing of newspapers
18.12	Other printing

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

Table 15:
Interdependent and partial copyright-intensive industries

NACE code	NACE description	Type	Factor
17.11	Manufacture of pulp	Interdependent	25.0%
17.12	Manufacture of paper and paperboard	Interdependent	25.0%
20.59	Manufacture of other chemical products n.e.c.	Interdependent	25.0%
28.23	Manufacture of office machinery and equipment (except computers and peripheral equipment)	Interdependent	30.0%
26.20	Manufacture of computers and peripheral equipment	Interdependent	30.0%
26.30	Manufacture of communication equipment	Interdependent	30.0%
26.40	Manufacture of consumer electronics	Interdependent	30.0%
26.70	Manufacture of optical instruments and photographic equipment	Interdependent	30.0%
27.31	Manufacture of fibre optic cables	Interdependent	30.0%
32.20	Manufacture of musical instruments	Interdependent	35.0%
46.43	Wholesale of electrical household appliances	Interdependent	19.0%
46.76	Wholesale of other intermediate products	Interdependent	25.0%
46.51	Wholesale of computers, computer peripheral equipment and software	Interdependent	30.0%
46.52	Wholesale of electronic and telecommunications equipment and parts	Interdependent	25.0%
46.66	Wholesale of other office machinery and equipment	Interdependent	30.0%
47.43	Retail sale of audio and video equipment in specialised stores	Interdependent	33.3%
47.41	Retail sale of computers, peripheral units and software in specialised stores	Interdependent	33.3%
47.78	Other retail sale of new goods in specialised stores	Interdependent	33.3%
77.33	Rental and leasing of office machinery and equipment (including computers)	Interdependent	35.0%
77.39	Rental and leasing of other machinery, equipment and tangible goods n.e.c.	Interdependent	20.0%
77.22	Rental of video tapes and disks	Interdependent	20.0%
77.29	Rental and leasing of other personal and household goods	Interdependent	20.0%
32.11	Striking of coins	Partial	33.5%
32.12	Manufacture of jewellery and related articles	Partial	33.5%
32.40	Manufacture of games and toys	Partial	41.0%
91.02	Museums activities	Partial	46.0%
91.03	Operation of historical sites and buildings and similar visitor attractions	Partial	50.0%
94.99	Activities of other membership organisation n.e.c.	Partial	50.0%

6.5 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 16:
GI-intensive industries, 2011-2013 average

NACE code	NACE description	Total employment
10.51	Operation of dairies and cheese making	322,933
11.01	Distilling, rectifying and blending of spirits	54,400
11.02	Manufacture of wine from grape (including part of 01.21 *Growing of grapes)*	104,667
11.05	Manufacture of beer	122,667

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.

Table 16 also shows total employment at EU level to indicate the overall size of each industry. However, as explained in section 5.7, because of the special nature of GIs, only part of that employment is defined as GI-intensive.

6.6 PVR-intensive industries

The final list of the PVR-intensive industries, identified as described in section 5.8, is shown in table 17.

Table 17:
PVR-intensive industries*

NACE code	NACE description	PVR/1000 employees
00.00	Horticulture	n/a
46.11	Agents involved in the sale of agricultural raw materials, live animals, textile raw materials and semi-finished goods	2.37
46.21	Wholesale of grain, unmanufactured tobacco, seeds and animal feeds	2.22
46.22	Wholesale of flowers and plants	4.51
72.11	Research and experimental development on biotechnology	6.20
77.40	Leasing of intellectual property and similar products, except copyrighted works	29.03

* based on registrations filed between 2004 and 2012 and subsequently granted

6.7 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, 06.10 *Extraction of crude petroleum* makes intensive use of both trade marks and patents, while 10.32 *Manufacture of fruit and vegetable juice* is an intensive user of both trade marks and designs. Some industries, for example 10.83 *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 43 in Appendix 10 summarises the preceding sections by listing all 342 IPR-intensive industries and indicating the IP rights used intensively by each industry. The overlaps are shown in table 18.

Table 18:
Overlapping use of IP rights

IP right	Number of industries intensive in the IPRs
TM	62
PAT	15
DES	11
CR	28
PVR	1
TM + PVR	3
TM, PAT, CR	4
TM + PAT	33
TM + GI	3
TM, DES, PAT, PVR	2
TM, DES, PAT, CR	9
TM, DES, PAT	69
TM, DES, GI	1
TM, DES, CR	8
TM + DES	56
TM + CR	27
PAT + CR	1
DES + PAT	7
DES + CR	2

Trade marks are used intensively by most of the industries (277 out of 342). Patents tend to be used more intensively in the manufacturing sector. Sixty-nine industries are intensive in patents, trade marks and designs. Other significant overlaps are between trade marks and designs (56 industries), between trade marks and patents (33 industries) and between trade marks and copyright (27 industries).

Conversely, some industries use only one of the analysed IP rights intensively. Thus, 62 industries are only trade mark-intensive, 15 are only patent-intensive, 11 are only design-intensive and 28 are only copyright-intensive. Three of the four GI-intensive industries also make intensive use of trade marks, and one of them is also design-intensive. One industry is exclusively PVR-intensive.

It is worthwhile examining 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. The 62 industries that are exclusively trade mark-intensive do not differ significantly from the larger group of 215 trade mark-intensive industries that also use another IP right intensively.

The 15 industries that are exclusively patent-intensive are concentrated in manufacturing, energy and technical services. Examples of such industries include 06.20 (extraction of natural gas), 27.11 (manufacture of electronic motors, generators and transformers) and 71.20 (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 11 exclusively design-intensive industries are concentrated in manufacturing and services, including, for example, 31.02 *Manufacture of kitchen furniture*, 47.59 *Retail sale of furniture* and 47.77 *Retail sales of watches*. As a group, these industries market their products and services to both businesses and consumers.

The 28 industries that are exclusively copyright-intensive are in the service sector, with the exception of two manufacturing industries related to printing. Twenty of these industries are core copyright industries.

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 7.

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

7.1 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.[56]

7.1.1 Employment

In total, approximately 216 million people are employed within the EU.[57] A significant proportion of these jobs, namely 52.8 million, are in NACE divisions O-Q (public administration, defence, education, human health and social work activities), services which are mostly provided in the public sector.[58]

Table 19 shows the share of IPR-intensive industries in EU employment for each of the six IP rights.

56 In particular, as discussed in sections 5.7 and 5.8, in the case of GIs, extensive use was made of information from agricultural statistics published by DG AGRI, and in the case of PVRs, data provided by the CPVO. In addition, in the case of copyright, Eurostat data was supplemented with data from several national statistical offices.

57 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.

58 If such non-market based activities were excluded from the calculation, the share of employment and GDP would be significantly higher than that presented in this report. However, it was considered more appropriate to err on the side of caution and base the calculations on total employment and GDP.

Table 19:
Direct and indirect contribution of IPR-intensive industries to employment, 2011-2013 average

IPR-intensive industries	Employment (direct)	Share of total employment (direct)	Employment (direct+indirect)	Share of total employment (direct+indirect)
Trade-mark-intensive	45,789,224	21.2%	65,486,334	30.3%
Design-intensive	25,662,683	11.9%	38,673,508	17.9%
Patent-intensive	22,268,215	10.3%	36,021,154	16.7%
Copyright-intensive	11,630,753	5.4%	15,240,509	7.1%
GI-intensive	n/a	n/a	399,815	0.2%
PVR-intensive	1,018,754	0.5%	1,220,410	0.6%
All IPR-intensive	**60,032,200**	**27.8%**	**82,214,925**	**38.1%**
Total EU employment			215,808,033	

Note: due to overlapping use of IP rights, the sum of the figures for the individual IPR exceeds the total figure for IPR-intensive industries.

Thus, *IPR-intensive industries account for more than 60 million jobs, or 28% of total employment, in the EU*. More than 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, PVR-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.

7.1.2 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 EU28 Input-Output Tables, published by Eurostat, were used. These tables provide information for 65 industries at the level of divisions (NACE 2-digits level).[59]

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,

59 The information provided includes the supply and use tables and symmetric Input-Output tables (domestic and total). In this context, „domestic“ refers to intra-EU supply relationships.

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.[60] For each IP right (except GI, for which the figures already include indirect employment, as explained in section 5.7), 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 60 million jobs in IPR-intensive industries themselves, another 22 million jobs in the EU economy are generated in non-IPR-intensive industries that supply goods and services to them, see table 20. If those additional jobs are considered, then 82.2 million jobs, or more than 38% of all jobs in the EU, are directly or indirectly contributed by IPR-intensive industries.

Table 20: Direct and indirect employment in IPR-intensive industries, 2011-2013 average

IPR-intensive industries	Employment (direct)	Employment (indirect)	Employment (direct+indirect)
Trade mark-intensive	45,789,224	19,697,110	65,486,334
Design-intensive	25,662,683	13,010,825	38,673,508
Patent-intensive	22,268,215	13,752,939	36,021,154
Copyright-intensive	11,630,753	3,609,756	15,240,509
GI-intensive	n/a	n/a	399,815
PVR-intensive	1,018,754	201,656	1,220,410
All IPR-intensive	**60,032,200**	**22,182,725**	**82,214,925**

Note: due to overlapping use of IP rights, the sum of the figures for the individual IPR exceeds the total figure for IPR-intensive industries.

60 For the calculation of the indirect employment requirements of IPR-intensive industries, the Leontief matrix was calculated on the basis of domestic symmetric input-output tables to ensure that only employment generated within the EU was included.

7.1.3 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 € 13.4 trillion in the period 2011-2013.

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 in table 21.[61] More than 42% of total economic output in the EU is generated in the IPR-intensive industries. Trade mark-intensive industries contribute almost 36% of GDP, while design-intensive and patent-intensive industries contribute 13% and 15%, respectively, with smaller contributions coming from copyright-intensive, PVR-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.

61 As in the case of employment, the value added / GDP figures are averages for the period 2011-2013.

Table 21:
Contribution of IPR-intensive industries to GDP, 2011-2013 average

IPR-intensive industries	Value Added / GDP (€ million)	Share of total EU GDP
Trade mark-intensive	4,812,310	35.9%
Design-intensive	1,788,811	13.4%
Patent-intensive	2,035,478	15.2%
Copyright-intensive	914,612	6.8%
GI-intensive	18,109	0.1%
PVR-intensive	51,710	0.4%
All IPR-intensive	**5,664,168**	**42.3%**
Total EU GDP	13,387,988	

Note: due to overlapping use of IP rights, the sum of the figures for the individual IPR exceeds the total figure for IPR-intensive industries.

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 36% of GDP, but the pattern is similar for designs, patents and copyright, and as will be seen in section 7.1.5, is also reflected in the wages paid to workers in IPR-intensive industries.

7.1.4 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.

Table 22 summarises trade in IPR-intensive industries, based on data from 2013. As in the case of the employment and GDP figures, the trade figures for the six 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, 86% of EU imports consist of products of IPR-intensive industries. However, an even higher share of EU exports, 93%, is accounted for by IPR-intensive industries.

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

Table 22:
EU external trade in IPR-intensive industries, 2013

IPR-intensive industires	Exports (€ million)	Imports (€ million)	Net exports (€ million)
Trade mark-intensive	1,275,472	1,261,002	14,470
Design-intensive	945,084	701,752	243,332
Patent-intensive	1,231,966	1,157,909	74,057
Copyright-intensive	119,554	102,389	17,165
GI-intensive	11,588	1,335	11,588
PVR-intensive	5,065	5,369	-304
Total IPR-intensive	**1,605,516**	**1,509,099**	**96,417**
Non-IPR-intensive	117,561	256,047	-138,487
Total EU Trade	1,723,077	1,765,147	-42,069

Note: due to overlapping use of IP rights, the sum of the figures for the individual IPR exceeds the total figure for IPR-intensive industries.

The EU as a whole has an overall trade deficit of approximately € 42 billion, or 0.3% of GDP. In contrast, it has a trade surplus of € 96 billion with the rest of the world in IPR-intensive industries. This is a marked improvement on the situation three years earlier, as reported in the 2013 study. In 2010, the EU had a trade deficit in IPR-intensive industries of € 126 billion.

Looking at the individual IP rights, the EU has a trade surplus in all IPR-intensive industries, with the exception of PVR-intensive industries, where there is a small trade deficit.

Tables 23 and 24 show the top ten IPR-intensive industries involved in external trade. Among the exporting industries, the top ten account for 41.4% of IPR-intensive exports and 38.6% of EU's total exports. They are heavily concentrated in the manufacturing sectors, in particular pharmaceuticals and various types of advanced technology.

Table 23:
Top 10 IPR-intensive exporting industries, 2013

Rank	NACE code	NACE description	Export (€ million)	Share in all IPR-intensive exports	Intensive IPR
1	29.10	Manufacture of motor vehicles	143,898	9%	TM, DES, PAT
2	21.20	Manufacture of pharmaceutical preparations	100,542	6%	TM, PAT
3	19.20	Manufacture of refined petroleum products	98,108	6%	TM
4	30.30	Manufacture of air and spacecraft and related machinery	82,809	5%	PAT
5	24.41	Precious metals production	75,085	5%	TM, PAT
6	29.32	Manufacture of other parts and accessories for motor vehicles	39,496	2%	DES, PAT
7	26.51	Manufacture of instruments and appliances for measuring, testing and navigation	36,136	2%	TM, DES, PAT
8	20.14	Manufacture of other organic basic chemicals	35,306	2%	TM, PAT
9	32.50	Manufacture of medical and dental instruments and supplies	26,895	2%	TM, DES, PAT
10	28.29	Manufacture of other general-purpose machinery n.e.c.	26,137	2%	TM, DES, PAT
Top 10			**664,413**	**41%**	
All IPR-intensive			**1,605,516**	**100%**	

Compared to 2010, exports of IPR-intensive industries increased by 30% in 2013. This improvement was broadly based. For example, car manufacturing exports increased by 44%, from € 99.6 billion to € 143.9 billion.

The top ten importing industries account for 50% of IPR-intensive imports and 43% of all EU imports. Energy-related imports (industries 06.10, 19.20 and 06.20) account for more than half of IPR-intensive imports.[63]

63 Excluding these three energy industries from the calculation would result in a trade surplus for the EU in IPR-intensive sectors of € 450 billion.

Table 24:
Top 10 IPR-intensive importing industries, 2013

Rank	NACE code	NACE description	Import (€ million)	Share in all IPR-intensive imports	Intensive IPR
1	06.10	Extraction of crude petroleum	302,653	20%	TM, PAT
2	19.20 *	Manufacture of refined petroleum products	93,328	6%	TM, DES, PAT
3	26.20	Manufacture of computers and peripheral equipment	65,297	4%	TM, PAT
4	26.30	Manufacture of communication equipment	57,348	4%	TM, DES, PAT
5	06.20	Extraction of natural gas	55,816	4%	PAT
6	30.30 *	Manufacture of air and spacecraft and related machinery	48,713	3%	PAT
7	21.20 *	Manufacture of pharmaceutical preparations	46,076	3%	TM, DES, PAT
8	20.14 *	Manufacture of other organic basic chemicals	33,045	2%	TM, PAT
9	29.10 *	Manufacture of motor vehicles	30,021	2%	TM, DES, PAT
10	14.13	Manufacture of other outerwear	27,000	2%	TM, PAT
Top 10			**759,297**	**50%**	
All IPR-intensive			**1,509,099**	**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.

7.1.5 Wages

As noted above, 42% of GDP (value added) in the economy and 28% 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.[64] 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

64 Because SBS employment and compensation data is not available for the main public sector industries, the analysis in this sub-section is confined to the private sector.

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 2013. In the case of 9 IPR-intensive industries, however, 2012 was the most recent year for which data was available, and for a further 7 industries, 2011. In addition, for a further 17 industries, no personnel cost data was available at all.[65] Those industries were omitted from the analysis.

As shown in table 25, remuneration in IPR-intensive industries is indeed higher than in non-IPR-intensive industries. The average weekly compensation in IPR-intensive industries is € 776, compared with € 530 in non-IPR-intensive industries – a difference of 46%. This "wage premium" is 31% in GI-intensive industries, 38% in design-intensive industries, 48% in trade mark-intensive industries, 64% in copyright-intensive industries and 69% in patent-intensive industries. In all cases, the premium is higher than in 2010, when the overall premium was 41%.

Table 25: Average personnel costs in IPR-intensive industries, 2013

IPR-intensive industries	Average personnel costs (€ per week)	Premium (compared to non-IP intensive industries)
Trade mark-intensive	783	48%
Design-intensive	732	38%
Patent-intensive	895	69%
Copyright-intensive	871	64%
GI-intensive	692	31%
PVR-intensive*	n/a	n/a
All IPR-intensive	**776**	**46%**
Non-IPR-intensive	**530**	
All EU industries (included in SBS)	629	

*Not calculated because of lack of wage statistics for agriculture

65 The industries for which no personnel cost data was available are: 68.10 *Buying and selling of own real estate*, 82.19 *Photocopying, document preparation and other specialised office support activities,* 85.52 *Cultural education,* 90.01 *Performing arts,* 90.02 *Support activities to performing arts,* 90.03 *Artistic creation,* 90.04 *Operation of arts facilities,* 91.01 *Library and archives activities,* 91.02 *Museums activities,* 91.03 *Operation of historical sites and buildings and similar visitors attractions*, 92.00 *Gambling and betting activities*, 93.00 *Sports activities and amusement and recreation activities,* 93.21 *Activities of amusement parks and theme parks,* 93.29 *Other amusement and recreation activities*, 94.12 *Activities of professional membership organisations*, 94.99 *Activities of other membership organisations n.e.c.* and 95.24 *Repair of furniture and home furnishings.*

7.2 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 26 shows the 20 IPR-intensive industries making the largest contribution to employment.

Table 26:
Top 20 IPR-intensive industries, employment, 2011-2013 average

NACE code	NACE description	Employment	Intensive IPR
71.12	Engineering activities and related technical consultancy	1,974,400	PAT,CR
66.00	Activities auxiliary to financial services and insurance activities	1,618,540	TM
70.22	Business and other management consultancy activities	1,515,600	TM
68.20	Rental and operating of own or leased real estate	1,483,267	TM
93.00	Sports activities and amusement and recreation activities excluding 9329 - Other amusement and recreation activities	1,444,035	TM
62.01	Computer programming activities	1,121,500	TM, CR
62.02	Computer consultancy activities	1,110,133	TM,CR
47.19	Other retail sale in non-specialised stores	1,077,133	TM
29.10	Manufacture of motor vehicles	1,032,400	TM, DES, PAT
29.32	Manufacture of other parts and accessories for motor vehicles	884,567	DES, PAT
46.69	Wholesale of other machinery and equipment	855,933	TM, DES, PAT
73.11	Advertising agencies	804,833	TM, DES, CR
47.59	Retail sale of furniture, lighting equipment and other household articles in specialised stores	795,333	DES,CR
46.90	Non-specialised wholesale trade	669,600	TM, DES
31.09	Manufacture of other furniture	652,633	DES
00.00	Horticulture	637,188	PVR
46.46	Wholesale of pharmaceutical goods	620,167	TM, PAT
18.12	Other printing	574,167	TM, PAT
14.13	Manufacture of other outerwear	569,067	TM, DES
22.29	Manufacture of other plastic products	548,367	TM, DES, PAT
TOP 20		**19,998,863**	

Employment in these 20 industries, at 20 million, accounts for 33% of total employment in the 342 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: 9 of the top 20 industries are design-intensive, and one of them is *exclusively* design-intensive.

Table 27 shows the top 20 IPR-intensive industries, ranked according to their contribution to GDP.

Table 27:
Top 20 IPR-intensive industries, GDP, 2011-2013 average

NACE code	NACE description	Value-added (in million €, adjusted to GDP)	Intensive IPR
68.20	Rental and operating of own or leased real estate	1,356,345	TM
71.12	Engineering activities and related technical consultancy	132,027	PAT
70.22	Business and other management consultancy activities	128,162	TM
29.10	Manufacture of motor vehicles	123,254	TM, DES, PAT
66.00	Activities auxiliary to financial services and insurance activities	106,019	TM
21.20	Manufacture of pharmaceutical preparations	100,880	TM, PT
62.02	Computer consultancy activities	98,080	TM, CR
62.01	Computer programming activities	97,333	TM, CR
61.10	Wired telecommunications activities	93,608	CR
72.19	Other research and experimental development on natural sciences and engineering	88,084	TM, DES, PAT
46.69	Wholesale of other machinery and equipment	68,662	TM, DES, PAT
46.46	Wholesale of pharmaceutical goods	65,256	TM, DES
29.32	Manufacture of other parts and accessories for motor vehicles	58,284	DES, PAT
61.20	Wireless telecommunications activities	56,383	TM, PAT, CR
93.00	Sports activities and amusement and recreation activities excluding 9329 - Other amusement and recreation activities	52,878	TM
06.10	Extraction of crude petroleum	45,805	TM, PAT
61.90	Other telecommunications activities	44,600	TM, DES, PAT, CR
41.10	Development of building projects	43,593	TM
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	41,399	TM, DES, PT
30.30	Manufacture of air and spacecraft and related machinery	40,214	PT
TOP 20		**2,840,867**	

In total, these 20 industries account for 50% of the total GDP generated in the 342 IPR-intensive industries.[66] There is a great deal of overlap between the two top-20 lists, with 11 industries appearing on both lists. There are, however, some industries, for example 61.20 *Wireless telecommunications activities*, which generate high value added relative to employment and hence appear in the top 20 GDP list but not in the top 20 employment list and others, for example 73.11 *Advertising agencies*, which appear in the top 20 list for employment but not in that for GDP.

66 This very high share is partly due to the fact that the top-ranked industry, NACE 68.20 *Rental and operation of own or leased real estate*, includes € 792.8 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 36%. 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.

7.2.1 The overlapping use of IP rights

As explained in section 6.6, there is a high degree of overlap in the use of the various IP rights. Table 28 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 28:
Overlapping use of IP rights: employment, 2011-2013 average

IP right	Number of industries intensive in the IPRs	Employment	Share of employment
TM	62	14,502,310	24.2%
TM+DES+PAT	69	10,500,167	17.5%
TM+DES	56	7,279,917	12.1%
TM+CR	27	5,508,298	9.2%
PAT	15	4,495,349	7.5%
CR	28	4,246,340	7.1%
TM+PAT	33	3,694,900	6.2%
DES	11	2,939,167	4.9%
DES+PAT	7	1,803,200	3.0%
TM+DES+CR	8	1,614,600	2.7%
TM+DES+PAT+CR	9	1,294,567	2.2%
PVR	1	637,188	1.1%
TM+GI	3	550,267	0.9%
TM+PAT+CR	4	408,233	0.7%
TM+PVR	3	318,200	0.5%
DES+CR	2	113,300	0.2%
TM+DES+PAT+PVR	2	63,367	0.1%
TM+DES+GI	1	54,400	0.1%
PAT+CR	1	8,433	0.0%
All IP rights	**342**	**60,032,200**	**100.0%**

The 62 exclusively trade mark-intensive industries account for the largest share of employment, followed by the 69 industries that use all three industrial IP rights simultaneously and the 56 industries using trade mark and designs. The 15 exclusively patent-intensive industries account for 8% of employment and the 28 exclusively copyright-intensive industries for 7%, while the 11 purely design-intensive industries account for 5%.

7.3 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 29 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 900,000 jobs. The secondary sector contributes 24 million of the total 60 million jobs in IPR-intensive industries, while the tertiary sector contributes the remaining 35 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 29:
Employment, GDP and trade in IPR-intensive industries, grouped by sector, 2013 average

Sector	Employment	GDP (million €)	Export (million €)	Import (million €)	Net export (million €)
Primary	893,770	100,746	27,648	389,120	-361,472
% IPR-intensive	8.1%	29.9%	54.0%	83.8%	
Secondary	23,731,083	1,784,338	1,496,257	1,080,174	416,083
% IPR-intensive	48.5%	54.3%	92.9%	93.2%	
Tertiary	35,407,347	3,779,083	81,612	39,805	41,806
% IPR-intensive	22.8%	38.8%	99.9%	99.9%	
Total	**60,032,200**	**5,664,168**	**1,605,516**	**1,509,099**	**96,417**
% IPR-intensive	**27.8%**	**42.3%**	**93.2%**	**85.5%**	

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 € 361 billion is partly offset by a large trade surplus in IPR-intensive manufacturing (secondary sector) products, amounting to € 416 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 € 42 billion in IPR-intensive service industries.

7.4 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 7.1 and 7.2. 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 depends 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 8 and is an area for potential further study.

7.4.1 Patent-intensive industries

Patent-intensive industries contribute 10.3% of employment and 15.2% of GDP in the EU, as shown in table 30. Particularly high shares of employment are found in Austria, the Czech Republic, Denmark, Finland, Germany, Hungary, Italy, Luxembourg, Slovakia, Slovenia and Sweden. When measured on their contribution to value added, however, patent-intensive industries are also very important in 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.

Table 30:
GDP and employment shares in patent-intensive industries by Member State, 2011-2013 average

Country	Value added (€ million)	Share of GDP	Employment	Share of total employment
AT	52,949	16.7%	466,071	11.4%
BE	50,595	13.1%	392,022	8.7%
BG	5,976	14.4%	265,715	9.0%
CY	682	3.6%	14,544	3.8%
CZ	35,839	22.3%	894,103	18.2%
DE	599,040	21.7%	5,913,744	15.1%
DK	43,672	17.4%	339,870	12.6%
EE	2,145	12.0%	49,119	8.0%
EL	13,400	6.9%	257,777	6.9%
ES	113,999	10.9%	1,313,957	7.4%
FI	32,663	16.3%	269,966	10.9%
FR	247,555	11.9%	2,403,319	9.3%
HR	5,829	13.2%	126,300	8.0%
HU	20,597	20.5%	473,042	12.4%
IE	41,011	23.3%	143,435	7.7%
IT	213,524	13.2%	2,440,858	10.9%
LT	4,271	12.9%	83,432	6.5%
LU	4,853	11.0%	30,053	12.9%
LV	1,845	8.5%	45,343	5.2%
MT	617	8.5%	12,611	7.4%
NL	95,840	14.8%	649,913	7.8%
PL	53,828	13.9%	1,288,177	8.3%
PT	16,308	9.5%	297,802	6.5%
RO	19,874	14.5%	620,250	7.2%
SE	74,656	17.7%	598,025	12.8%
SI	7,151	19.7%	133,726	14.5%
SK	12,084	16.7%	296,717	12.8%
UK	264,677	13.3%	2,448,328	8.3%
EU28	**2,035,478**	**15.2%**	**22,268,215**	**10.3%**

7.4.2 Trade mark-intensive industries

In the EU as a whole, trade mark-intensive industries contribute 21.2% of employment and 35.9% of GDP, see table 31. Countries with above-average shares of employment in trade mark-intensive industries include Bulgaria, the Czech Republic, Denmark, Germany, Hungary, Italy, Luxembourg, Slovakia, Slovenia, Sweden and the UK. Bulgaria, the Czech Republic, Denmark, Germany, Greece, Finland, Croatia, Hungary, Ireland, Italy, Luxembourg, Romania, Slovakia and the UK have above-average shares of GDP coming from trade mark-intensive industries.

Table 31:
GDP and employment shares in trade mark-intensive industries by Member State, 2011-2013 average

Country	Value added (€ million)	Share of GDP	Employment	Share of total employment
AT	106,236	33.6%	850,983	20.9%
BE	137,227	35.5%	907,066	20.1%
BG	15,999	38.5%	711,721	24.2%
CY	5,529	29.1%	65,763	17.2%
CZ	59,496	37.1%	1,273,760	26.0%
DE	1,006,193	36.5%	9,345,496	23.9%
DK	94,125	37.4%	668,967	24.8%
EE	5,297	29.6%	129,059	21.0%
EL	69,554	36.1%	747,835	19.9%
ES	363,155	34.6%	3,418,884	19.3%
FI	74,711	37.4%	509,984	20.6%
FR	728,877	34.9%	4,618,720	17.9%
HR	16,047	36.5%	325,149	20.7%
HU	37,852	37.7%	893,017	23.3%
IE	87,564	49.7%	367,106	19.8%
IT	610,650	37.7%	5,170,576	23.0%
LT	10,821	32.6%	261,693	20.5%
LU	16,982	38.5%	67,346	28.9%
LV	5,591	25.8%	174,602	19.9%
MT	2,416	33.3%	35,542	20.8%
NL	189,964	29.4%	1,756,390	21.1%
PL	119,179	30.7%	2,900,206	18.6%
PT	57,331	33.4%	919,776	20.1%
RO	52,955	38.6%	1,337,446	15.6%
SE	136,448	32.4%	1,143,296	24.5%
SI	13,003	35.9%	217,208	23.6%
SK	26,785	37.1%	597,278	25.7%
UK	762,325	38.4%	6,374,351	21.5%
EU28	**4,812,310**	**35.9%**	**45,789,224**	**21.2%**

7.4.3 Design-intensive industries

Design-intensive industries contribute 11.9% of employment and 13.4% of GDP in the EU, see table 32. Austria, Bulgaria, the Czech Republic, Denmark, Estonia, Germany, Croatia, Hungary, Italy, Lithuania, Luxembourg, Portugal, Slovakia, Slovenia and Sweden all have design-intensive employment shares above the EU average. A broadly similar pattern holds for GDP.

Table 32:
GDP and employment shares in design-intensive industries by Member State, 2011-2013 average

Country	Value added (€ million)	Share of GDP	Employment	Share of total employment
AT	47,329	15.0%	516,048	12.6%
BE	41,143	10.6%	439,374	9.7%
BG	4,918	11.8%	409,070	13.9%
CY	1,046	5.5%	29,110	7.6%
CZ	32,584	20.3%	971,038	19.8%
DE	511,237	18.5%	5,931,841	15.2%
DK	28,180	11.2%	332,213	12.3%
EE	2,308	12.9%	78,814	12.9%
EL	15,261	7.9%	362,532	9.7%
ES	105,647	10.1%	1,675,250	9.4%
FI	26,456	13.2%	259,080	10.5%
FR	212,175	10.2%	2,400,537	9.3%
HR	4,987	11.3%	192,903	12.3%
HU	16,552	16.5%	523,699	13.7%
IE	19,801	11.2%	144,551	7.8%
IT	227,812	14.1%	3,294,019	14.7%
LT	4,695	14.1%	155,894	12.2%
LU	5,680	12.9%	32,113	13.8%
LV	2,163	10.0%	84,500	9.6%
MT	633	8.7%	16,809	9.8%
NL	72,264	11.2%	779,456	9.4%
PL	57,674	14.9%	1,845,389	11.8%
PT	23,306	13.6%	615,973	13.5%
RO	18,432	13.5%	864,941	10.1%
SE	60,213	14.3%	597,627	12.8%
SI	6,007	16.6%	144,701	15.7%
SK	12,043	16.7%	359,414	15.5%
UK	228,263	11.5%	2,605,787	8.8%
EU28	**1,788,811**	**13.4%**	**25,662,683**	**11.9%**

7.4.4 Copyright-intensive industries

Overall employment in copyright-intensive industries in the EU is 11.6 million, or 5.4% of the total, and those industries contribute 6.8% of the EU's GDP, see table 33. Countries with above-average employment in copyright-intensive industries include Sweden, Denmark, Finland, the Netherlands, the UK, Ireland, Estonia, Germany, Malta and Luxembourg.

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

Table 33:
GDP and employment shares in copyright-intensive industries by Member State, 2011-2013 average

Country	Value added (€ million)	Share of GDP	Employment	Share of total employment
AT	17,092	5.4%	217,541	5.3%
BE	23,315	6.0%	235,539	5.2%
BG	2,865	6.9%	141,902	4.8%
CY	1,067	5.6%	17,798	4.6%
CZ	11,059	6.9%	247,502	5.1%
DE	189,069	6.9%	2,345,488	6.0%
DK	21,013	8.4%	195,363	7.3%
EE	1,371	7.7%	36,521	6.0%
EL	9,143	4.7%	189,206	5.0%
ES	63,968	6.1%	902,635	5.1%
FI	14,532	7.3%	173,287	7.0%
FR	136,525	6.5%	1,388,420	5.4%
HR	2,778	6.3%	75,697	4.8%
HU	7,339	7.3%	207,934	5.4%
IE	19,593	11.1%	115,414	6.2%
IT	91,888	5.7%	1,077,380	4.8%
LT	1,703	5.1%	58,929	4.6%
LU	3,561	8.1%	23,950	10.3%
LV	1,427	6.6%	45,829	5.2%
MT	848	11.7%	12,653	7.4%
NL	43,728	6.8%	516,120	6.2%
PL	23,447	6.0%	573,568	3.7%
PT	8,989	5.2%	181,371	4.0%
RO	8,995	6.6%	266,217	3.1%
SE	34,537	8.2%	361,897	7.8%
SI	2,278	6.3%	44,664	4.8%
SK	4,798	6.6%	101,560	4.4%
UK	167,683	8.4%	1,876,368	6.3%
EU28	**914,612**	**6.8%**	**11,630,753**	**5.4%**

7.4.5 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, as shown in table 34. France in particular, with its large wine industry, accounts for almost 1/3 of GI-intensive employment in the EU. In relative terms, the highest employment shares are found in Portugal at 0.6% and France at 0.5%.

Table 34:
GDP and employment shares in GI-intensive industries by Member State, 2011-2013 average

Country	Value added (€ million)	Share of GDP	Employment	Share of total employment
AT	236	0.1%	5,313	0.1%
BE	5	0.0%	68	0.0%
BG	31	0.1%	3,008	0.1%
CY	4	0.0%	79	0.0%
CZ	25	0.0%	569	0.0%
DE	1,481	0.1%	31,984	0.1%
DK	20	0.0%	326	0.0%
EE	n/a	n/a	n/a	n/a
EL	478	0.2%	8,734	0.2%
ES	1,939	0.2%	45,560	0.3%
FI	n/a	n/a	n/a	n/a
FR	6,602	0.3%	130,649	0.5%
HR	11	0.0%	387	0.0%
HU	119	0.1%	4,382	0.1%
IE	391	0.2%	861	0.0%
IT	2,910	0.2%	77,563	0.3%
LT	8	0.0%	224	0.0%
LU	14	0.0%	262	0.1%
LV	n/a	n/a	n/a	n/a
MT	n/a	n/a	n/a	n/a
NL	21	0.0%	212	0.0%
PL	n/a	n/a	n/a	n/a
PT	409	0.2%	26,445	0.6%
RO	355	0.3%	3,074	0.0%
SE	n/a	n/a	n/a	n/a
SI	35	0.1%	334	0.0%
SK	39	0.1%	1,466	0.1%
UK	2,978	0.1%	58,316	0.2%
EU28	**18,109**	**0.1%**	**399,815**	**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.

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 IP rights, which are predicated on the assumption that IPR intensity is a fundamental characteristic of an industry, irrespective of its geographical location.

7.4.6 PVR-intensive industries

Overall employment in PVR-intensive industries in the EU is 1 million, or 0.5% of the total, and those industries contribute 0.4% of the EU's GDP, as shown in table 35. Countries with above-average employment in PVR-intensive industries include Austria, Bulgaria, Cyprus, Greece, Spain, Hungary, the Netherlands, Poland, Portugal and Malta.

Austria, Bulgaria, Denmark, France, Hungary, Lithuania, Luxembourg, Malta and the Netherlands all have above-average GDP shares attributable to PVR-intensive industries.

Table 35:
GDP and employment shares in PVR-intensive industries by Member State, 2011-2013 average

Country	Value added (€ million)	Share of GDP	Employment	Share of total employment
AT	1,576	0.5%	28,485	0.7%
BE	1,148	0.3%	17,768	0.4%
BG	268	0.6%	42,179	1.4%
CY	50	0.3%	2,492	0.7%
CZ	390	0.2%	12,963	0.3%
DE	11,257	0.4%	119,423	0.3%
DK	1,167	0.5%	11,901	0.4%
EE	71	0.4%	1,613	0.3%
EL	530	0.3%	32,647	0.9%
ES	3,882	0.4%	120,341	0.7%
FI	440	0.2%	12,859	0.5%
FR	11,572	0.6%	109,588	0.4%
HR	105	0.2%	5,962	0.4%
HU	982	1.0%	22,220	0.6%
IE	283	0.2%	3,395	0.2%
IT	5,186	0.3%	105,998	0.5%
LT	213	0.6%	5,756	0.5%
LU	1,007	2.3%	733	0.3%
LV	71	0.3%	1,962	0.2%
MT	38	0.5%	1,369	0.8%
NL	6,119	0.9%	114,089	1.4%
PL	997	0.3%	90,758	0.6%
PT	445	0.3%	40,896	0.9%
RO	330	0.2%	43,780	0.5%
SE	648	0.2%	10,193	0.2%
SI	79	0.2%	3,105	0.3%
SK	137	0.2%	3,266	0.1%
UK	2,717	0.1%	53,012	0.2%
EU28	**51,710**	**0.4%**	**1,018,754**	**0.5%**

7.4.7 All IPR-intensive industries

If all six IP rights are combined and the overlaps eliminated, the overall contributions of IPR-intensive industries to the economies of the Member States are shown in table 36. At EU level, IPR-intensive industries contribute 27.8% of employment and 42.3% to GDP. They account for an above-average share of employment in Austria, Bulgaria, the Czech Republic, Denmark, Estonia, Germany, Hungary, Italy, Luxembourg, Slovakia, Slovenia and Sweden. In terms of GDP, Bulgaria, the Czech Republic, Denmark, Finland, Croatia, Germany, Hungary, Ireland, Italy, Luxembourg, Romania, Slovenia, Slovakia and the UK have shares above the EU average.

Table 36:
GDP and employment shares in all IPR-intensive industries by Member State, 2011-2013 average

Country	Value added (€ million)	Share of GDP	Employment	Share of total employment
AT	128,325	40.6%	1,148,969	28.2%
BE	155,771	40.3%	1,138,507	25.2%
BG	18,791	45.3%	907,896	30.8%
CY	6,481	34.1%	87,441	22.8%
CZ	74,107	46.2%	1,750,041	35.7%
DE	1,229,202	44.5%	12,550,108	32.1%
DK	108,316	43.1%	849,755	31.6%
EE	6,609	36.9%	176,357	28.8%
EL	77,251	40.1%	981,743	26.2%
ES	427,445	40.8%	4,536,875	25.6%
FI	87,867	44.0%	687,593	27.8%
FR	840,920	40.3%	6,175,205	24.0%
HR	19,814	45.0%	428,699	27.3%
HU	46,877	46.7%	1,170,113	30.6%
IE	94,658	53.8%	444,846	24.0%
IT	715,131	44.1%	6,750,580	30.1%
LT	12,662	38.2%	340,561	26.7%
LU	19,886	45.1%	88,951	38.1%
LV	6,588	30.4%	219,395	25.0%
MT	2,925	40.3%	47,158	27.6%
NL	229,497	35.5%	2,276,034	27.4%
PL	143,721	37.0%	3,801,318	24.4%
PT	65,912	38.4%	1,217,713	26.6%
RO	63,815	46.6%	1,800,000	21.0%
SE	164,955	39.1%	1,484,689	31.8%
SI	16,185	44.6%	290,142	31.5%
SK	32,574	45.1%	757,275	32.6%
UK	867,882	43.7%	7,924,237	26.8%
EU28	**5,664,168**	**42.3%**	**60,032,200**	**27.8%**

08 / Origins of IP rights and job creation in the Single Market

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.

8.1 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 Single 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 on filings and employment, it is possible to explore where the trade marks, designs and patents filed at the EUIPO and the EPO and the PVRs filed at the CPVO originate (as indicated by the nationality of the owner). Table 37 shows the number of patents, trade marks, designs and PVRs originating in each Member State during the period 2011-2013. It should be noted that in order to provide a complete picture of the IPR-generating activities in each country, filings 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.[67]

Table 37 : IPR filings by country of origin in all industries, 2011-2013 average

Country	PAT	PAT rank	TM	TM rank	DES	DES rank	PVR	PVR rank	EMPL ('000)	PAT per 1000 empl.	TM per 1000 empl.	DES per 1000 empl.	PVR per 1000 empl.
AT	1,867	8	2,813	7	2,381	7	13	10	4,081	0.46	0.69	0.58	0.00
BE	1,927	7	1,838	10	1,315	11	51	8	4,521	0.43	0.41	0.29	0.01
BG	17	27	461	19	492	16	0	NA	2,945	0.01	0.16	0.17	0.00
CY	51	20	399	20	47	26	0	NA	383	0.13	1.04	0.12	0.00
CZ	151	15	843	16	802	14	7	13	4,900	0.03	0.17	0.16	0.00
DE	26,654	1	19,943	1	19,040	1	421	3	39,148	0.68	0.51	0.49	0.01
DK	1,776	9	1,379	11	1,476	10	131	4	2,693	0.66	0.51	0.55	0.05
EE	37	22	225	24	115	23	0	NA	613	0.06	0.37	0.19	0.00
EL	75	19	528	18	141	22	0	NA	3,754	0.02	0.14	0.04	0.00
ES	1,484	11	8,164	4	3,762	5	80	7	17,731	0.08	0.46	0.21	0.00
FI	1,764	10	1,043	13	821	13	2	15	2,471	0.71	0.42	0.33	0.00
FR	9,783	2	7,383	5	7,012	3	449	2	25,774	0.38	0.29	0.27	0.02
HR	16	28	71	28	13	28	0	NA	1,572	0.01	0.05	0.01	0.00
HU	101	17	390	21	145	21	9	12	3,826	0.03	0.10	0.04	0.00
IE	609	12	888	15	204	17	0	NA	1,856	0.33	0.48	0.11	0.00
IT	3,807	5	8,312	3	9,351	2	109	5	22,452	0.17	0.37	0.42	0.00
LT	18	26	201	26	47	27	0	NA	1,274	0.01	0.16	0.04	0.00
LU	424	13	1,120	12	545	15	0	NA	233	1.82	4.80	2.34	0.00
LV	44	21	111	27	54	25	3	14	877	0.05	0.13	0.06	0.00
MT	32	24	266	23	82	24	0	NA	171	0.19	1.56	0.48	0.00
NL	5,515	3	3,909	6	2,352	8	1055	1	8,307	0.66	0.47	0.28	0.13
PL	334	14	2,273	9	3,166	6	21	9	15,574	0.02	0.15	0.20	0.00
PT	84	18	1,031	14	1,010	12	0	NA	4,572	0.02	0.23	0.22	0.00
RO	29	25	555	17	164	19	0	NA	8,561	0.00	0.06	0.02	0.00
SE	3,610	6	2,342	8	1,656	9	9	11	4,663	0.77	0.50	0.36	0.00
SI	124	16	206	25	154	20	1	17	922	0.13	0.22	0.17	0.00
SK	36	23	274	22	179	18	1	16	2,325	0.02	0.12	0.08	0.00
UK	4,683	4	10,206	2	5,466	4	104	6	29,610	0.16	0.34	0.18	0.00
EU28	**65,053**		**77,174**		**61,992**		**2,466**		**215,808**	**0.30**	**0.36**	**0.29**	**0.01**

67 As is the case throughout this report, the analysis is based on EU-level filings. Future studies could include national filings as well to provide a more complete picture.

In absolute terms, Germany ranks first for patents, trade marks and designs. The other top spots are generally occupied by, France, the Netherlands, the UK, Italy and Spain. There is some variation among the IP rights; for example, while Spain is in the top 5 for trade marks and designs, it is in 11th place for patents. The group made up of the largest economies is followed by a group of smaller northern European countries, including Austria, Belgium, Denmark and Sweden. The highest placed among the 13 countries that joined the EU from 2004 onwards is Poland, which is also the largest of these countries. The pattern for plant varieties differs from that for the other IP rights: the Netherlands is the leader, followed by France, Germany, Denmark and Italy.

Of course, all other things being equal, large countries will tend to have more IPR filings. Therefore, the table also shows the number of IPR filings per 1,000 employees. This is the measure of IPR intensity employed throughout this report. The overall EU average is 0.36 EUTMs, 0.30 PCT patents, 0.29 RCDs and 0.01 PVRs per 1,000 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, Malta, the Netherlands and Sweden.

8.2 Job creation in the Single Market

Chapter 7 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 IPR being applied for at the EUIPO 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 from 2004 onwards. Indeed, cross-border job creation can be considered a positive manifestation of the Single Market.

This pattern of job creation in the Single 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 is available from Eurostat's Foreign Affiliates Statistics (FATS).[68] In table 38, 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://ec.europa.eu/eurostat/web/structural-business-statistics/global-value-chains/foreign-affiliates.

Table 38:
Jobs in EU Member States attributed to foreign companies in all IPR-intensive industries, 2011-2013 average

	Jobs attributed to companies based in:					
	Other EU Member States	Non-EU countries	Total employment in IPR-intensive industries*	Other EU Share	Non-EU share	Total non-domestic share
HU	257,528	147,835	1,067,094	24.1%	13.9%	38.0%
RO	469,170	144,147	1,669,160	28.1%	8.6%	36.7%
CZ	406,722	180,637	1,648,394	24.7%	11.0%	35.6%
IE	46,096	85,907	390,886	11.8%	22.0%	33.8%
SK	188,659	49,829	720,720	26.2%	6.9%	33.1%
EE	36,498	10,392	161,326	22.6%	6.4%	29.1%
LU	13,051	8,145	75,211	17.4%	10.8%	28.2%
SE	212,394	154,513	1,332,389	15.9%	11.6%	27.5%
AT	186,424	94,972	1,033,054	18.0%	9.2%	27.2%
DK	119,642	80,620	767,232	15.6%	10.5%	26.1%
LV	36,954	13,091	197,028	18.8%	6.6%	25.4%
UK	595,718	1,086,036	6,651,932	9.0%	16.3%	25.3%
PL	591,588	237,002	3,506,204	16.9%	6.8%	23.6%
BE	137,684	102,352	1,033,845	13.3%	9.9%	23.2%
NL	237,650	209,899	1,965,779	12.1%	10.7%	22.8%
LT	45,564	20,768	313,279	14.5%	6.6%	21.2%
FI	73,401	51,611	603,283	12.2%	8.6%	20.7%
BG	116,022	52,972	820,962	14.1%	6.5%	20.6%
FR	599,867	444,987	5,626,122	10.7%	7.9%	18.6%
SI	35,838	13,182	273,119	13.1%	4.8%	17.9%
ES	453,445	203,801	3,933,330	11.5%	5.2%	16.7%
DE	909,627	904,980	11,221,093	8.1%	8.1%	16.2%
HR	47,408	8,716	397,569	11.9%	2.2%	14.1%
PT	111,369	38,941	1,111,189	10.0%	3.5%	13.5%
IT	342,949	293,477	6,068,171	5.7%	4.8%	10.5%
EL	45,654	14,328	837,538	5.5%	1.7%	7.2%
CY	1,649	1,546	74,849	2.2%	2.1%	4.3%
MT	510	495	41,149	1.2%	1.2%	2.4%

*IPR-intensive industries included in FATS

The countries in table 38 are ordered according to the total share of jobs in IPR-intensive industries generated by companies based elsewhere. Thus, 38% of all IPR-intensive employment in Hungary is in non-Hungarian owned firms; of those jobs, 24% are in firms based in other EU countries, while 14% are in firms headquartered outside the EU. Other Member States in which more than 30% of IPR-intensive job creation originates outside the country include Romania, the Czech Republic, Ireland and Slovakia.

The highest share of jobs in IPR-intensive industries generated by companies from outside the EU is to be found in Ireland, at 22%. Other countries with a high share of IPR-intensive jobs in non-EU-based companies are the UK, 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 in Hungary, the country with the highest share of non-domestic companies in IPR-intensive industries, the proportion of jobs in non-Hungarian firms is 38%, so that almost two thirds of such jobs are still generated by Hungarian companies. In the largest economies in the EU, the vast majority of jobs in IPR-intensive industries are generated domestically: 75% in the UK, 81% in France, 84% in Germany, 83% in Spain and 90% in Italy.

Table 39 indicates the share of jobs attributed to non-domestic companies in industries which are intensive in trade marks, patents and designs. As compared with the overall EU average of 20.5% for industries intensive in any one of the six IPRs, industries which are intensive in patents and designs account for a higher proportion of jobs in subsidiaries of foreign companies with 26% and 23%, respectively, at the EU level. In countries such as Hungary, Romania or Ireland the share even exceeds 50%. Due to limited data availability, it is not possible to calculate precisely the share of jobs in subsidiaries of foreign companies for the other IPRs studied in this report. However, it can be inferred from available results that the share for copyright, GIs and PVRs is below the overall average of 20.5% for all IPR-intensive industries.

Table 39:
Jobs in IPR-intensive industries attributed to foreign companies by EU Member State, 2011-2013 average

	All IPR			Patents			Trade marks			Designs		
	Other EU share	Non-EU share	Total non-domestic share	Other EU share	Non-EU share	Total non-domestic share	Other EU share	Non-EU share	Total non-domestic share	Other EU share	Non-EU share	Total non-domestic share
AT	18.0%	9.2%	27.2%	19.4%	12.6%	32.0%	18.8%	9.5%	28.2%	18.7%	10.5%	29.1%
BE	13.3%	9.9%	23.2%	19.5%	17.5%	37.0%	12.9%	10.1%	23.1%	15.8%	12.8%	28.6%
BG	14.1%	6.5%	20.6%	15.2%	8.8%	24.0%	14.5%	6.1%	20.6%	17.9%	6.8%	24.6%
CY	2.2%	2.1%	4.3%	1.1%	1.1%	2.1%	2.3%	2.6%	4.9%	2.2%	1.2%	3.5%
CZ	24.7%	11.0%	35.6%	30.0%	14.7%	44.6%	23.9%	10.7%	34.6%	27.8%	11.8%	39.6%
DE	8.1%	8.1%	16.2%	8.5%	9.7%	18.3%	8.1%	8.5%	16.6%	7.6%	8.8%	16.4%
DK	15.6%	10.5%	26.1%	14.7%	10.4%	25.1%	15.5%	11.3%	26.9%	15.7%	10.3%	26.0%
EE	22.6%	6.4%	29.1%	36.5%	8.3%	44.8%	22.6%	6.6%	29.2%	29.9%	7.9%	37.8%
EL	5.5%	1.7%	7.2%	5.5%	1.6%	7.1%	5.6%	1.8%	7.4%	5.3%	1.7%	7.0%
ES	11.5%	5.2%	16.7%	17.5%	8.6%	26.1%	11.1%	5.3%	16.4%	13.7%	6.5%	20.2%
FI	12.2%	8.6%	20.7%	11.9%	11.1%	23.0%	12.2%	8.8%	21.0%	11.5%	10.2%	21.7%
FR	10.7%	7.9%	18.6%	12.8%	9.9%	22.7%	11.2%	8.8%	20.0%	13.2%	9.6%	22.8%
HR	11.9%	2.2%	14.1%	13.1%	2.1%	15.3%	11.7%	2.2%	13.9%	12.6%	1.9%	14.5%
HU	24.1%	13.9%	38.0%	31.7%	22.5%	54.3%	23.3%	14.0%	37.4%	30.6%	18.9%	49.5%
IE	11.8%	22.0%	33.8%	12.6%	41.1%	53.6%	10.9%	22.8%	33.7%	13.8%	36.2%	50.0%
IT	5.7%	4.8%	10.5%	7.4%	7.1%	14.5%	5.8%	5.1%	10.9%	5.3%	4.5%	9.7%
LT	14.5%	6.6%	21.2%	14.9%	10.2%	25.0%	14.0%	6.5%	20.5%	16.0%	8.0%	24.1%
LU	17.4%	10.8%	28.2%	15.7%	7.1%	22.8%	20.5%	11.4%	31.8%	15.2%	5.7%	21.0%
LV	18.8%	6.6%	25.4%	22.4%	8.4%	30.8%	18.1%	6.5%	24.7%	21.8%	7.8%	29.6%
MT	1.2%	1.2%	2.4%	1.2%	0.6%	1.9%	1.2%	1.3%	2.5%	0.6%	0.7%	1.3%
NL	12.1%	10.7%	22.8%	13.1%	16.2%	29.3%	12.3%	11.4%	23.7%	11.9%	12.6%	24.5%
PL	16.9%	6.8%	23.6%	24.3%	11.6%	35.9%	15.5%	6.4%	21.8%	20.1%	8.2%	28.3%
PT	10.0%	3.5%	13.5%	18.0%	5.9%	24.0%	9.9%	3.6%	13.6%	10.9%	3.4%	14.3%
RO	28.1%	8.6%	36.7%	37.3%	13.7%	51.0%	26.4%	8.1%	34.5%	35.1%	10.3%	45.3%
SE	15.9%	11.6%	27.5%	18.1%	12.7%	30.8%	15.5%	11.7%	27.1%	17.9%	12.2%	30.1%
SI	13.1%	4.8%	17.9%	16.4%	5.9%	22.2%	12.9%	5.4%	18.3%	16.0%	6.0%	22.0%
SK	26.2%	6.9%	33.1%	40.4%	13.9%	54.3%	24.2%	6.0%	30.2%	34.7%	10.9%	45.6%
UK	9.0%	16.3%	25.3%	10.0%	17.6%	27.6%	9.0%	16.1%	25.1%	9.4%	16.5%	25.9%
EU28	**11.8%**	**8.7%**	**20.5%**	**14.4%**	**11.5%**	**25.8%**	**11.6%**	**8.9%**	**20.5%**	**13.2%**	**9.4%**	**22.7%**

Table 40 shows the cross-border flows of jobs within the Single Market from a different perspective, namely by looking at where the approximately 4 million jobs created in EU Member States by companies from other Member States originate. Thus, German companies create almost 1.3 million jobs in other Member States, or about 32% of the total. French companies create almost 979,000 jobs elsewhere in the EU, and so on. The top of the list is dominated by the large Member States, although Austrian and Scandinavian companies also create significant numbers of jobs in other Member States.

Table 40:
Jobs in EU Member States attributed to companies from other Member States (IPR-intensive industries, 2011-2013 average)

Member State	Jobs in the rest of EU attributed to companies based in the Member State	Share of all EU cross-border jobs
DE	1,291,031	32.1%
FR	978,642	24.3%
UK	582,455	14.5%
IT	325,515	8.1%
DK	172,962	4.3%
AT	170,115	4.2%
FI	140,978	3.5%
SE	107,686	2.7%
ES	85,239	2.1%
BE	47,928	1.2%
EL	24,668	0.6%
LU	20,005	0.5%
LT	16,180	0.4%
PT	15,935	0.4%
PL	13,596	0.3%
HU	7,653	0.2%
SI	7,199	0.2%
CZ	5,784	0.1%
HR	5,041	0.1%
IE	4,415	0.1%
SK	2,594	0.1%
LV	1,670	0.0%
RO	491	0.0%
CY	37	0.0%
MT	5	0.0%
BG	n/a	n/a
EE	n/a	n/a
NL	n/a	n/a
EU total	**4,027,824**	**100%**

09 / Technology focus: Climate change mitigation technologies

This chapter focuses on a technology area that is of particular importance for the future of Europe's economy: technologies to help mitigate the effects of climate change. Climate change is clearly one of the biggest challenges of the 21st century. Under the Paris Agreement, adopted by 195 countries at the 2015 Climate Change Conference, Europe has committed itself to fight global warming. Climate change mitigation technologies (CCMTs) will play an important role in achieving the ambitious goals. New and far-reaching inventions are needed to curb emissions without having a negative impact on the economic development. Besides, CCMTs can create considerable opportunities for future economic growth, with the worldwide market volume for environmental technology and resource efficiency predicted to almost double to € 5,385 billion by 2025.[69]

CCMTs are expected to transform a large array of businesses in the coming years and are already widespread across many European industries. The purpose of this chapter is therefore twofold: first, to identify European industries that have a leading position in CCMTs and, second, to analyse the economic characteristics of those industries that are CCMT-intensive.

9.1 Europe's inventive activity in CCMTs

As a recently published EPO and UNEP report (2015) shows, Europe is one of the main centres of inventive activity in the area of CCMTs and many companies operating in that area rely on IP rights to protect the value of their innovations.

In order to facilitate the identification of inventions that cover technical solutions related to controlling, reducing or preventing emissions of greenhouse gases, the EPO has developed the "Y02/Y04S" tagging scheme. This scheme, which was established by the EPO's patent examiners with the help of external experts in the field, allows structured access to more than 3 million patent documents disclosing technical information on CCMTs relating to buildings, greenhouse-gas capture and storage, renewable-energy generation, transmission or distribution, industrial production activity and transportation, waste or wastewater treatment and smart grid technologies.[70]

69 See BMUB (2014).

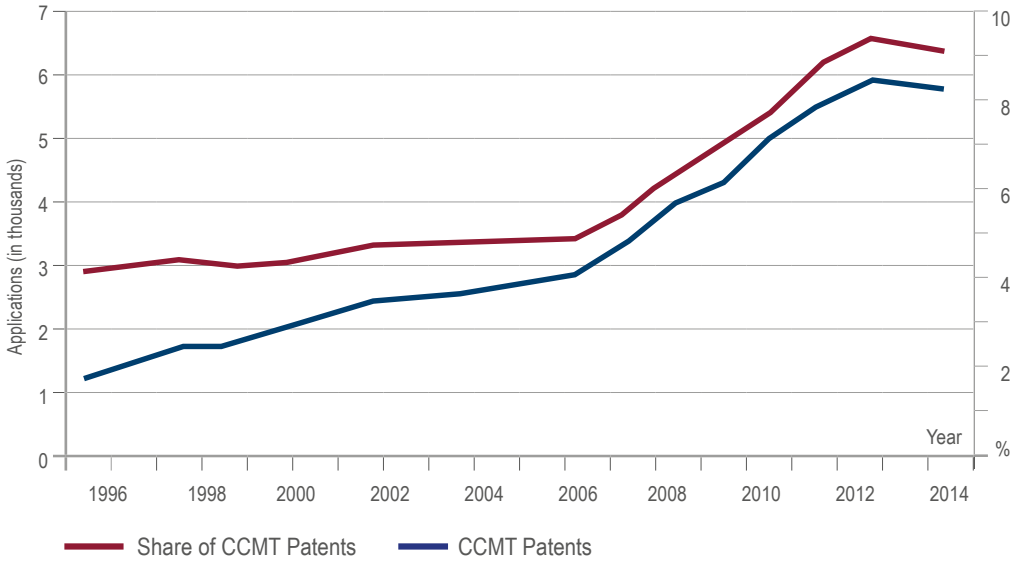
70 This information is freely available via the EPO's online database Espacenet and can be used to find out about the newest technological developments in CCMTs and to generate statistics for evidence-based decision-making.

EPO'S Y02/Y04S tagging scheme for CCMTs

- **Y02C** Greenhouse gas capture and storage
- **Y02E** Energy generation, storage and distribution
- **Y02B** CCMTs relating to buildings
- **Y02P** CCMTs in production
- **Y02T** CCMTs relating to transportation
- **Y02W** CCMTs in waste and wastewater treatment
- **Y04S** Smart Grids

As shown in figure 8, which was created using the Y02/Y04S tagging scheme, the number of EPC patent filings by European applicants in the area of CCMTs has grown strongly, in both absolute and relative terms, particularly over the last decade. While the share of CCMT patent filings in overall patent filings by European applicants, which can be interpreted as a measure of the importance of CCMTs in Europe, was still below 5% in 2006, it had increased to more than 9% by 2013.

Figure 8:
Number and share of CCMT EPC patents filed by EU applicants in climate change mitigation technologies between 1996 and 2013



9.2 Identification of CCMT-intensive industries in Europe

Applying the methodology used in Chapter 5 shows that, in the EU, 232 out of 615 NACE classes in the matched database had at least one CCMT patent filed and then granted by the EPO during the period 2004-2008. Overall, 5.9% of the total European patents considered were related to CCMTs.

In order to identify industries which can be considered as being intensive users of CCMTs, the following criteria are applied. First, only IPR-intensive industries are selected. In the next step, the relative CCMT-patent intensity measure is calculated. This is defined as the number of granted CCMT patents per 1,000 employees in the same NACE class. To account for the importance of CCMT patents within the overall patent portfolio of the industry, the CCMT-patent share is also calculated for each NACE class. The set of CCMT-intensive industries is then defined as those industries which are IPR-intensive and in which both the relative CCMT-patent intensity and the CCMT-patent share are above the overall, employment-weighted average for all industries with at least one CCMT patent.[71] A successive application of the criteria reveals that although CCMT patents are used in many NACE classes, the majority of them are concentrated in relatively few classes, and CCMT patents account for a significant part of an industry's patent portfolio only in a number of sectors.

Overall, 14 industries fulfil all the criteria, and these are shown in the table 41. Together, they represent 30.4% of all matched CCMT patents in European industries. Given that the identification was based on patent information, all CCMT-intensive industries are also patent-intensive. However, most of them do not belong to the group of the most patent-intensive industries in Europe. Half of the CCMT-intensive industries are also trade mark-intensive and five of them are also intensive users of design rights.

The majority of CCMT-intensive industries are in the manufacturing sector. The exceptions are two industries in the mining and quarrying sector: extraction of natural gases and mining of other non-ferrous metal ores. Although most of the industries cannot be regarded as environmentally friendly in the conventional sense, this shows that European companies in these industries are innovating to reduce the negative impact of their economic activity on the climate.

71 The intermediate steps in the CCMT identification approach, together with a list of NACE classes meeting the identification criteria, can be found in Appendix 13.

Table 41:
CCMT-intensive industries in Europe

NACE code	NACE description	CCMT-patent share	CCMT patents / 1000 employees	Patent-intensity rank	Intensive IPR
06.20	Extraction of natural gas	18.2%	1.54	16	P
20.11	Manufacture of industrial gases	22.8%	1.77	18	P,TM
30.30	Manufacture of air and spacecraft and related machinery	21.7%	1.40	25	P
27.90	Manufacture of other electrical equipment	10.0%	0.58	27	P,TM,D
23.11	Manufacture of flat glass	14.0%	0.62	38	P,TM,D
20.13	Manufacture of other inorganic basic chemicals	11.4%	0.49	40	P,TM
29.10	Manufacture of motor vehicles	16.1%	0.52	45	P,TM,D
27.20	Manufacture of batteries and accumulators	58.0%	1.62	52	P,TM,D
29.31	Manufacture of electrical and electronic equipment for motor vehicles	11.6%	0.27	65	P
28.25	Manufacture of non-domestic cooling and ventilation equipment	19.1%	0.42	66	P,TM,D
24.46	Processing of nuclear fuel	73.7%	1.35	76	P
28.96	Manufacture of plastics and rubber machinery	10.5%	0.19	78	P
07.29	Mining of other non-ferrous metal ores	46.4%	0.68	90	P
28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	22.9%	0.22	116	p

9.3 Economic contribution of CCMT-intensive industries to the EU's economy

As shown in table 42, CCMT-intensive industries accounted for 1.2% of total EU employment in the period 2011-2013. Compared to the period 2008-2010, the number of employees in the relevant NACE classes has decreased by 1.8%, which is of the same order of magnitude as the overall decline in total EU employment during that period.

Table 42:
Economic contribution of CCMT-intensive industries to European employment, GDP and trade

	Share EU GDP	Share EU employment (direct)		Share EU imports	Share EU exports	Net exports (€ million)	Average personnel cost (€ per week)
Period 2011-13	2.1%	1.2%	Period 2013	11.1%	17.4%	102,471	1,007
Change in total compared to 2008-10	13.1%	-1.8%	Change in total compared to 2010	9.6%	36.4%		

The contribution of CCMT-intensive industries to the EU's GDP in the more recent period was 2.1% and almost twice as large as their contribution to EU employment. Furthermore, those industries have also been able to increase their economic output compared to the earlier period by 9.6%. This means that CCMT-intensive industries, on average, were able to increase their productivity. Furthermore, their performance far exceeds the overall performance of European industries over the same period.

CCMT-intensive industries also contribute disproportionally to the EU's external trade. The share of the EU's imports attributable to these industries was 11.1%, while the share of EU's exports was 17.4%. More importantly, CCMT-intensive industries have generated a significant trade surplus for the EU.

Finally, the CCMT-intensive industries were paying an average weekly wage of € 1,007, which exceeds the average wage of all IPR-intensive industries by a wide margin.

10 / Appendix: List of all 342 IPR-intensive industries

Table 43:

NACE code	Description	Trade mark-intensive	Design-intensive	Patent-intensive	Copy-right-intensive	GI-intensive	PVR-intensive
00.00	Horticulture						●
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.	●		●			
10.91	Manufacture of prepared feeds for farm animals	●					

NACE code	Description	Trade mark-intensive	Design-intensive	Patent-intensive	Copy-right-intensive	GI-intensive	PVR-intensive
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		●				
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	●	●				
17.29	Manufacture of other articles of paper and paperboard	●	●	●			
18.11	Printing of newspapers	●			●		
18.12	Other printing				●		

NACE code	Description	Trade mark-intensive	Design-intensive	Patent-intensive	Copyright-intensive	GI-intensive	PVR-intensive
18.13	Pre-press and pre-media services		●		●		
18.14	Binding and related 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	●		●			
23.44	Manufacture of other technical ceramic products	●		●			
23.49	Manufacture of other ceramic products	●	●				

NACE code	Description	Trade mark-intensive	Design-intensive	Patent-intensive	Copyright-intensive	GI-intensive	PVR-intensive
23.62	Manufacture of plaster products for construction purposes	●		●			
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		●	●			
24.45	Other non-ferrous metal production	●	●	●			
24.46	Processing of nuclear fuel			●			
24.52	Casting of steel	●					
25.12	Manufacture of doorsand windowsof 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	●	●	●	●		
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	●	●	●			

NACE code	Description	Trade mark-intensive	Design-intensive	Patent-intensive	Copy-right-intensive	GI-intensive	PVR-intensive
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	●		●			
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		●				

NACE code	Description	Trade mark-intensive	Design-intensive	Patent-intensive	Copy-right-intensive	GI-intensive	PVR-intensive
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	●					
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	●	●				

NACE code	Description	Trade mark-intensive	Design-intensive	Patent-intensive	Copy-right-intensive	GI-intensive	PVR-intensive
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	●	●				
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	●	●				
46.66	Wholesale of other office machinery and equipment				●		
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	●			●		
47.43	Retail sale of audio and video equipment 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		●				
47.61	Retail sale of books in specialised stores				●		
47.62	Retail sale of newspapers and stationery in specialised stores				●		
47.63	Retail sale of music and video recording 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		●				
47.78	Other retail sale of new goods 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	Description	Trade mark-intensive	Design-intensive	Patent-intensive	Copy-right-intensive	GI-intensive	PVR-intensive
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	●			●		
61.10	Wired telecommunications 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	●	●		●		

NACE code	Description	Trade mark-intensive	Design-intensive	Patent-intensive	Copy-right-intensive	GI-intensive	PVR-intensive
73.12	Media representation	●			●		
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	●					
77.22	Rental of video tapes and disks				●		
77.29	Rental and leasing of other personal and household goods				●		
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	●					
79.90	Other reservation service and related activities				●		
82.11	Combined office administrative service activities	●					
82.19	Photocopying, document preparation and other specialised office support activities					●	
82.30	Organisation of conventions and trade shows	●					
85.52	Cultural education				●		
90.01	Performing arts				●		
90.02	Support activities to performing arts				●		
90.03	Artistic creation				●		
90.04	Operation of arts facilities				●		
91.01	Library and archives activities				●		
91.02	Museums activities				●		
91.03	Operation of historical sites and buildings and similar visitors attractions				●		
92.00	Gambling and betting activities	●					
93.00	Sports activities and amusement and recreation activities excluding 9329 - Other amusement and recreation activities	●					
93.21	Activities of amusement parks and theme parks				●		
93.29	Other amusement and recreation activities	●			●		
94.12	Activities of professional membership organisations				●		
94.99	Activities of other membership organisations n.e.c.				●		
95.24	Repair of furniture and home furnishings		●				

11 / Appendix: Methodology

11.1 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.[72] 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 (28 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 methodology.[73]

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

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

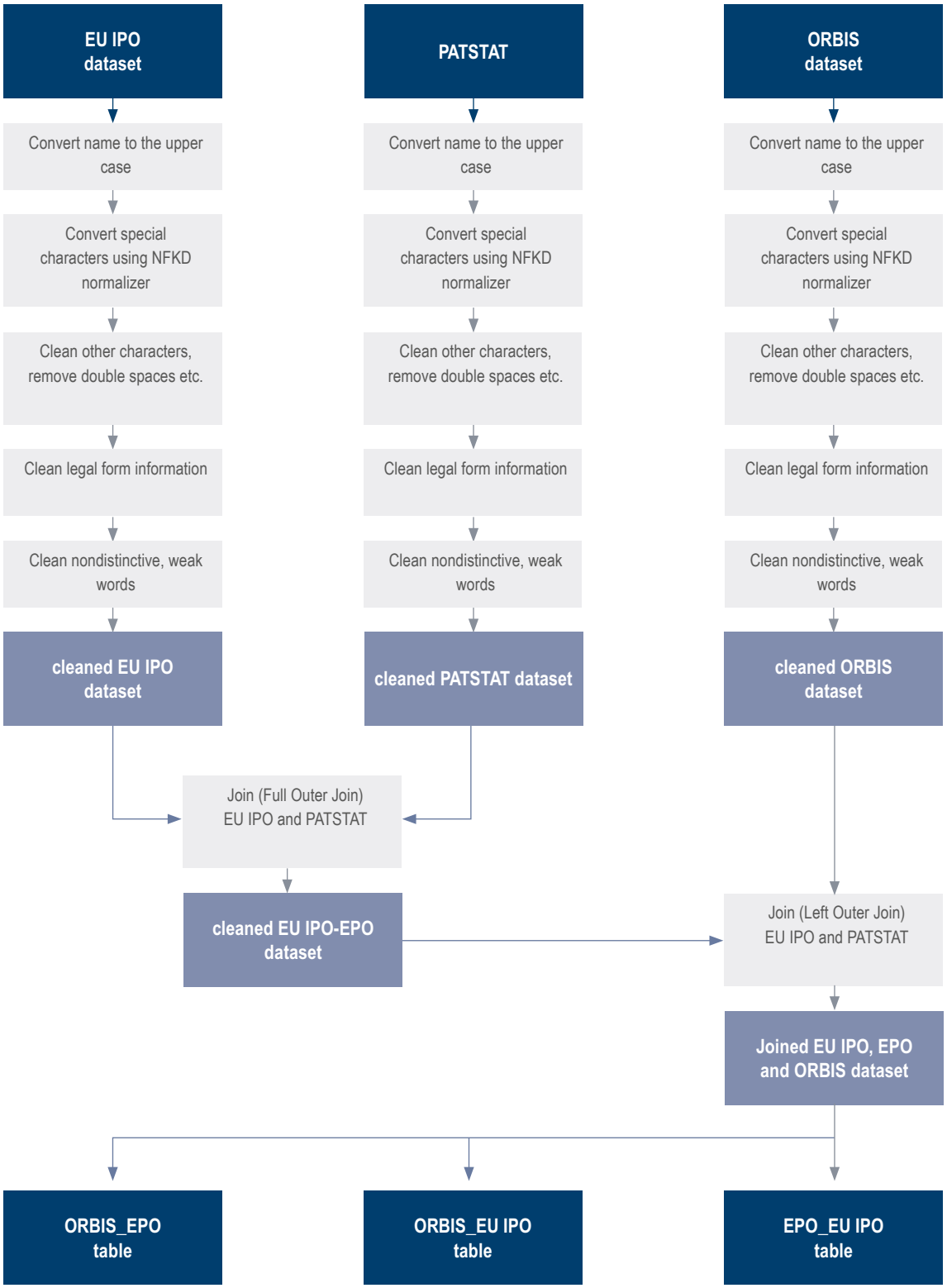
The second phase consisted of matching cleaned and harmonised EUIPO, CPVO and PATSTAT data with the ORBIS database. ORBIS is a source of comprehensive demographic and financial firm data gathered from the national registers. It is commonly used to analyse the economic performance of business entities.[74] 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 records.[75]

There were several stages to the name harmonisation and matching process carried out to create the matched dataset, as shown in figure 9.

74 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.

75 http://www.bvdinfo.com/products/company-information/international/orbis, retrieved 29/5/2013.

Figure 9:
Outline of harmonisation and matching process



11.1.1 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 EUIPO 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.

11.1.2 Legal form cleaning

After the initial data pre-processing, proper name cleaning 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 28 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 is 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 relevant for the given country and looping the names of applicants having their seat in that same country over each *regex*. 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 four datasets (EUIPO, EPO, CPVO and ORBIS) separately.

After completion of this step, there were separate tables (four tables for each country, corresponding to the four data sources) containing the normalised name field, without legal form denominations, for each company present in the original EUIPO, EPO, CPVO 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.

11.1.3 Preparation of data for the matching algorithm

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

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 EUIPO 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 EUIPO 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 "European Union Intellectual Property Office trading as EUIPO" would be converted into three fields: the normalised field EUROPEAN UNION INTELLECTUAL PROPERTY OFFICE TRADING AS EUIPO; the *NormCompany_short* field EUROPEAN UNION INTELLECTUAL PROPERTY OFFICE; and the *TradingAs* field EUIPO.

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, EUIPO 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.

11.1.4 Matching data between EUIPO and EPO

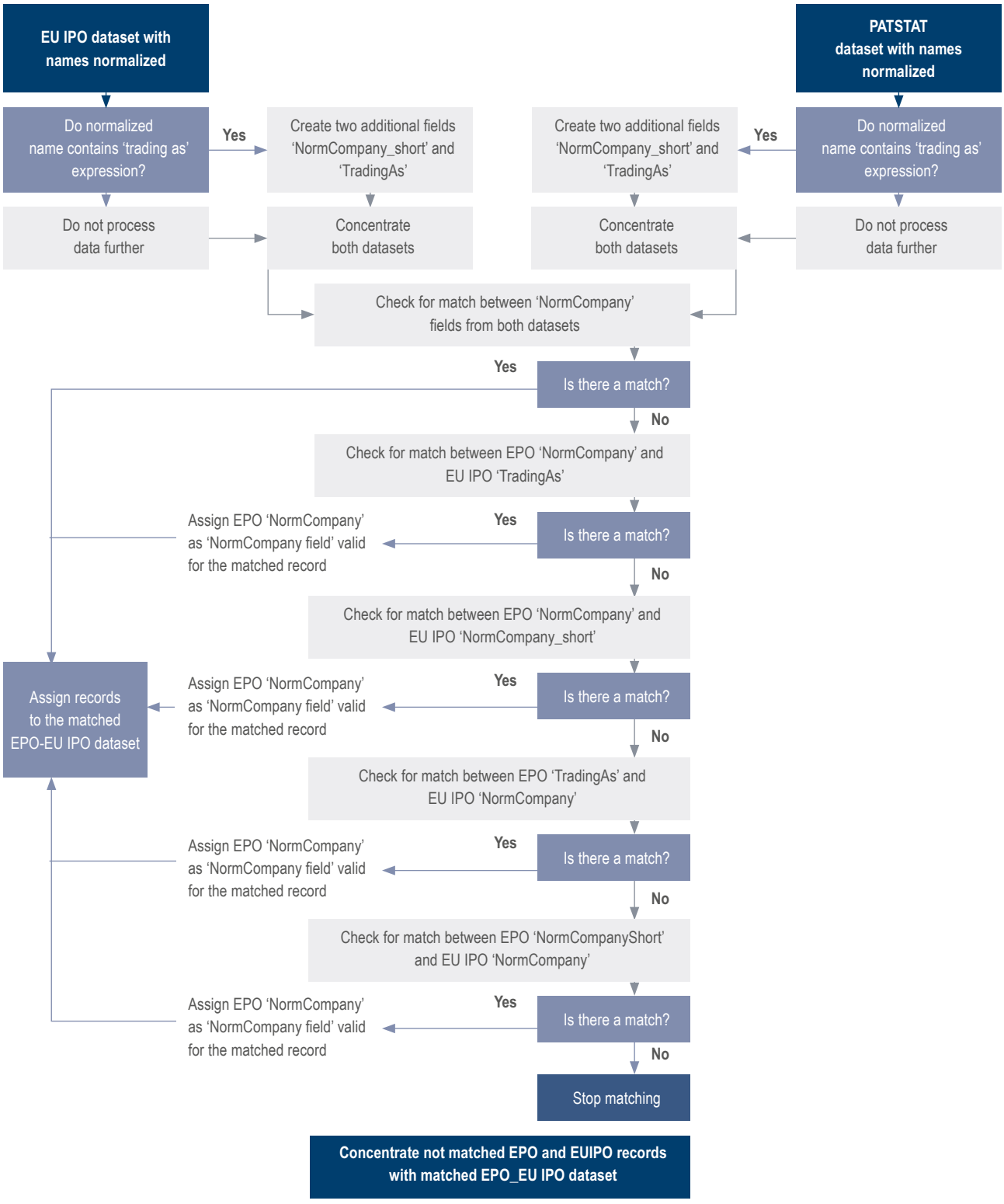
In order to combine EUIPO and EPO data, an initial match was attempted using the *NormCompany* names from both datasets. In the next step, all the records for which there was a match were filtered out and assigned to a separate dataset.

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 EUIPO*TradingAs* field, followed by a match on the EPO *NormCompany* name and EUIPO *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 EUIPO *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 EUIPO_EPO dataset were assigned the common normalised EPO-EUIPO name *NormCompany*_EUIPO_*EPO*. Subsequently, all the records from the original PATSTAT and EUIPO 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_EUIPO_EPO* to standardise it over the whole dataset. Figure 10 outlines the procedure for matching the EUIPO and PATSTAT datasets.

Figure 10:
Matching data between EUIPO and EPO



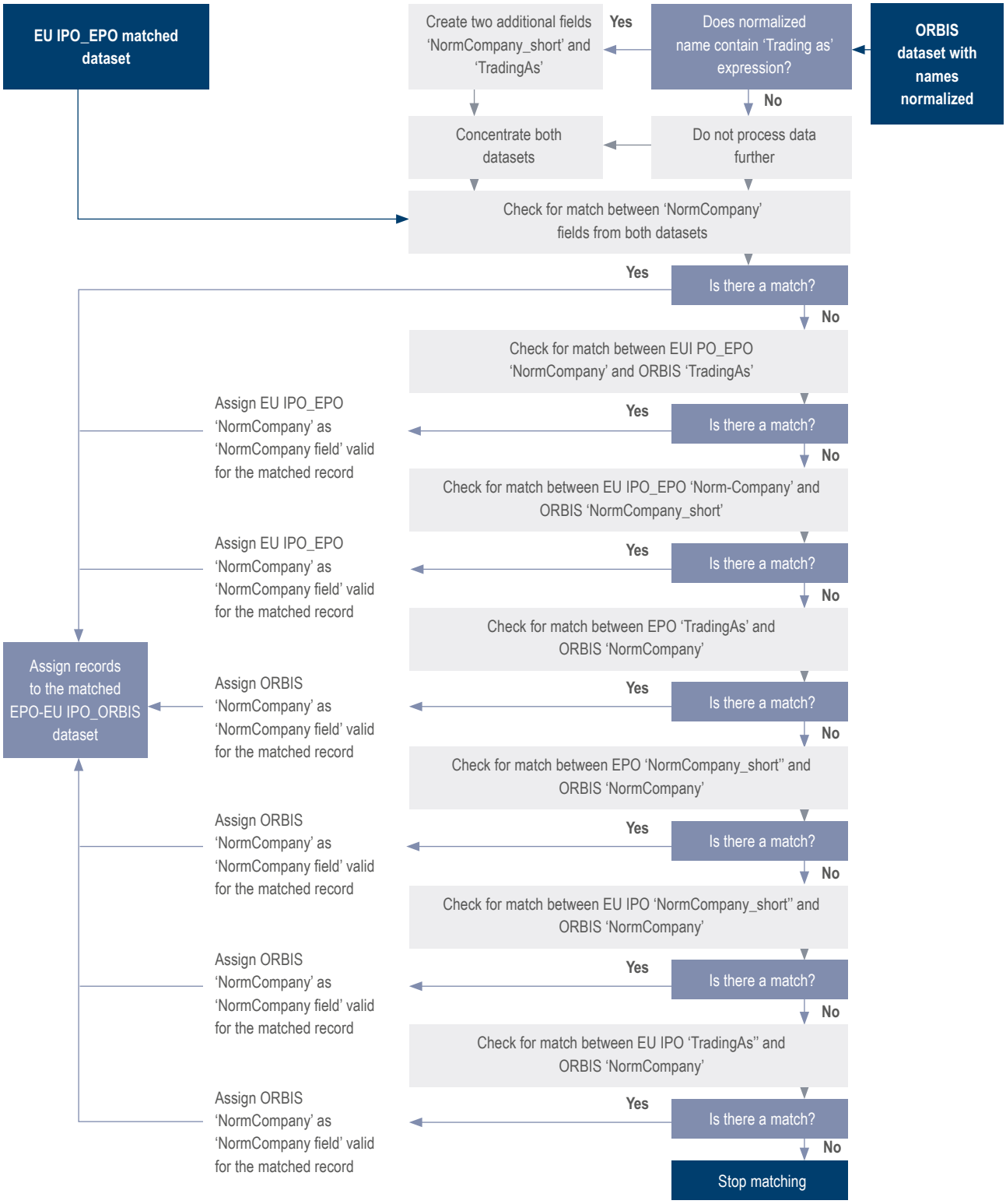
11.1.5 Matching EUIPO/EPO dataset with ORBIS

The second step in the matching procedure was to match the EUIPO_EPO dataset with ORBIS. In the first iteration, possible matches were checked using *NormCompany_EUIPO_EPO* from the EUIPO/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_EUIPO_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_EUIPO_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 EUIPO *owner_name* field and *NormCompany_short* based on the EUIPO *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 11.

Figure 11:
Matching EUIPO/EPO dataset with ORBIS



11.1.6 Post-match data processing (disambiguation)

After the initial matching phase described in the preceding section, the one-to-one matches (one EPO/EUIPO record matched with only one ORBIS record) were filtered out, and one-to-many matches (where one EPO/EUIPO 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/EUIPO 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 Dijk[76] (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/EUIPO 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/EUIPO database.

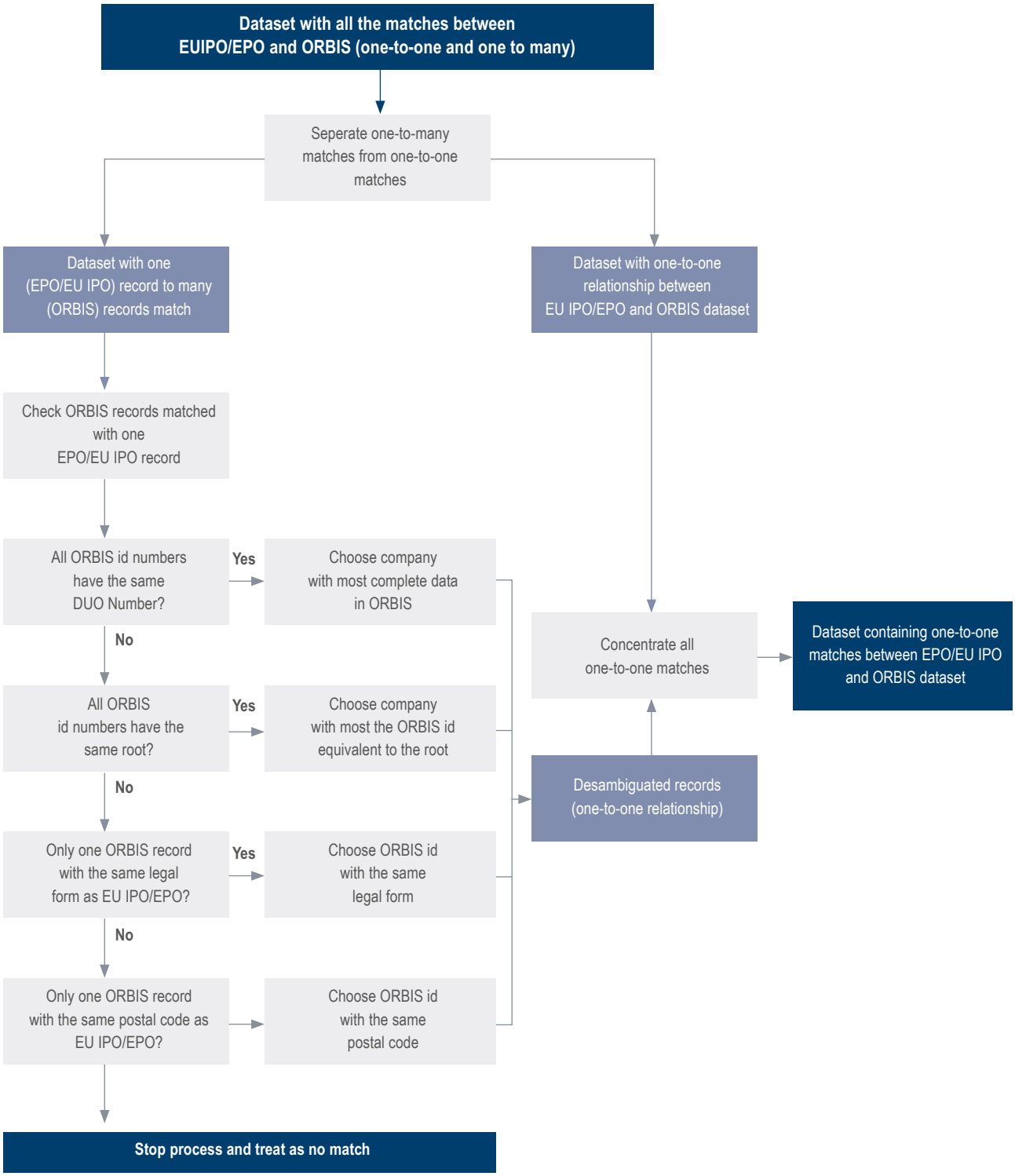
In a final attempt to find a unique match, the postal codes in the EPO-EUIPO record were compared with those in the various ORBIS records matched to it. If only one ORBIS record matched the postal code in the EPO-EUIPO record, it was added to the matched dataset.

The final stage of the disambiguation process consisted of concatenating the initial matched dataset (one-to-one matches between EPO-EUIPO 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-EUIPO 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 12.

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

Figure 12:
Post-match data processing (disambiguation)



11.1.7 Manual matching phase

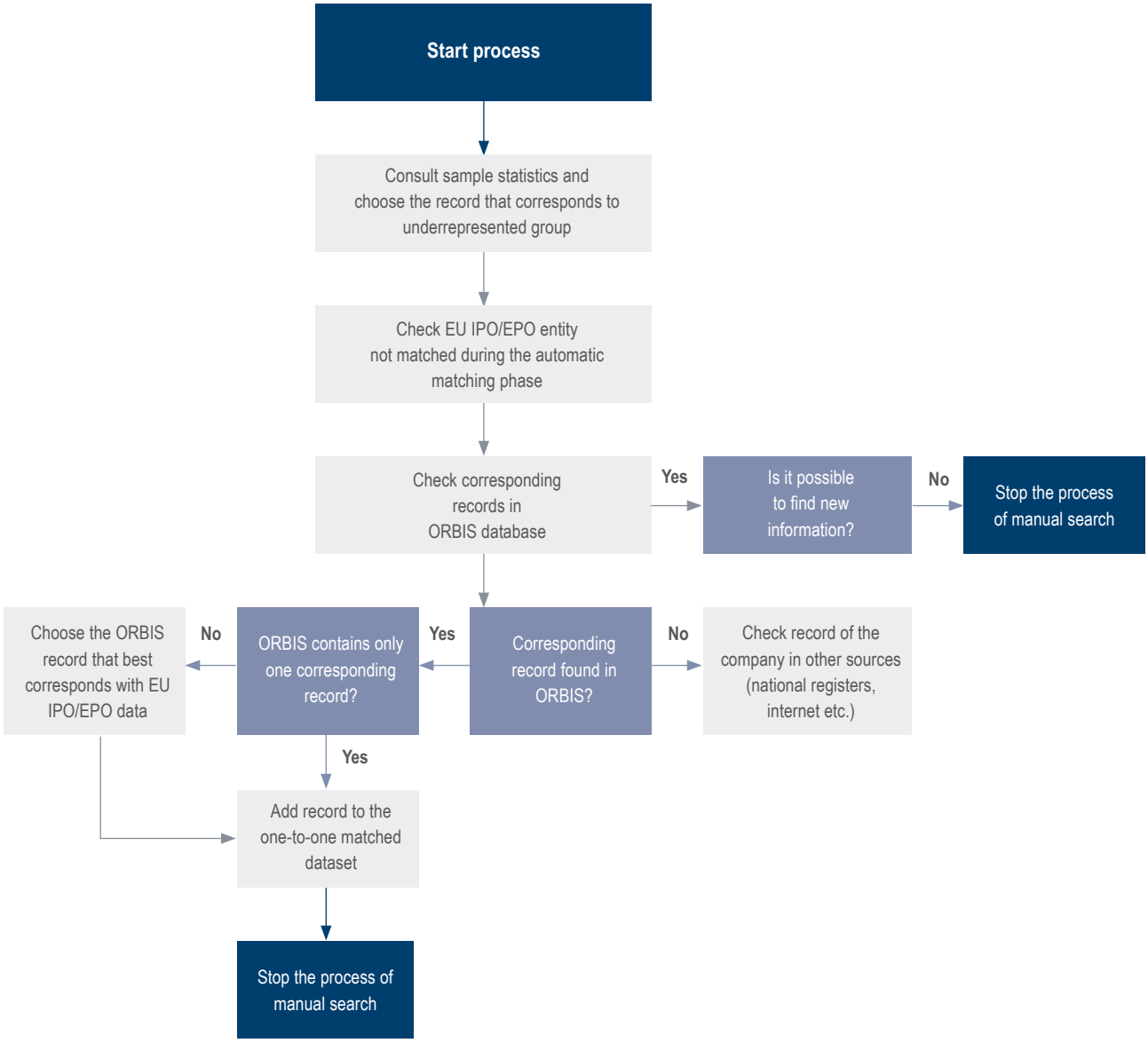
The matching algorithms described up to this point were automated. In order to ensure that the sample of companies in the matched dataset was representative of the overall population of EUIPO/EPO applicants, a further manual matching procedure was carried out.

For the manual matching phase, 28 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 (the EUIPO's or the 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 EUIPO/EPO database.

A simplified outline of the manual search phase is shown in figure 13.

Figure 13:
Manual matching phase



11.1.8 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.

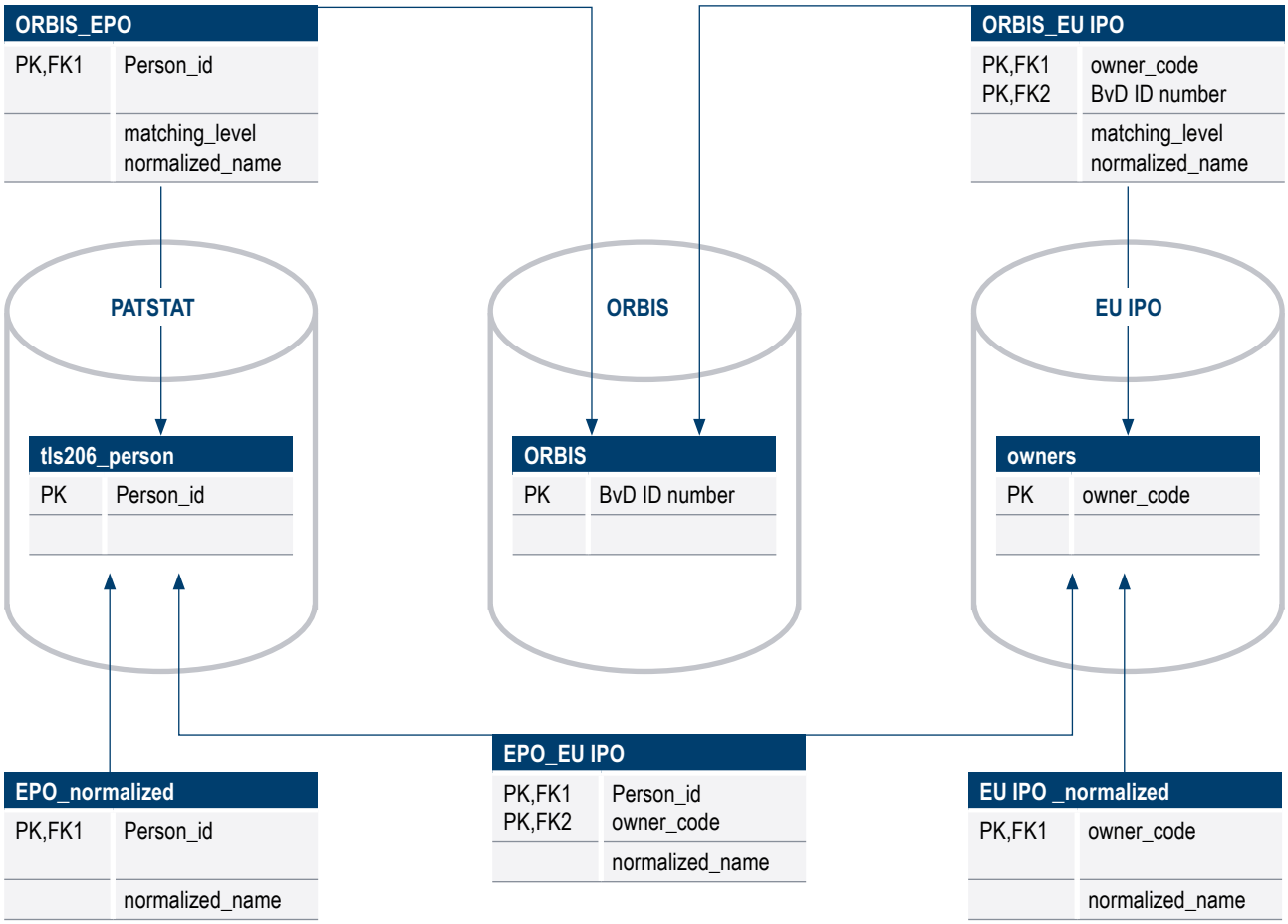
Figure 14 presents a schematic illustration of the final tables compiled on the basis of the matching exercise and their relationships with key tables from the PATSTAT, EUIPO and ORBIS data repositories. There are three main concordance tables:

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

- The **EPO-EUIPO 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 EUIPO's datawarehouse. This table was used to link the patent information in PATSTAT directly with the trade mark and design information in the EUIPO 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 EUIPO register).

Figure 14:
Preparation of the final concordance tables



11.1.9 Adjustments to absolute intensity calculations

Once the EPO/EUIPO/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 70.10 *Activities of head offices*, 64.20 *Activities of holding companies* and 82.99 *Other business support service activities n.e.c.*[77] 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 70.10, 64.20 and 82.99 were analysed in detail as follows:

1. In the PATSTAT-ORBIS concordance table, patent applicants associated with NACE codes 70.10, 64.20 and 82.99 (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 64.20, 70.10 or 82.99. 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.

   ➔ 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

77 „N.e.c." is a common abbreviation in national account statistics, meaning „not elsewhere classified".

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 64.20, 70.10 and 82.99, 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 64.20, 70.10 and 82.99 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 70.10 *Activities of head offices*, 64.20 *Activities of holding companies* and 82.99 *Other business support service activities n.e.c.* Those industries ranked highly in terms of the overall number of trade marks, with 70.10 coming first, 64.20 second and 82.99 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 70.10 *Activities of head offices*, 64.20 *Activities of holding companies* and 82.99 *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).

11.2 Patent-intensive industries

Table 44:

NACE code	NACE description	Patents/1000 employees
28.24	Manufacture of power-driven hand tools	109.7407
77.40	Leasing of intellectual property and similar products, except copyrighted works	69.2315
21.10	Manufacture of basic pharmaceutical products	27.5691
20.59	Manufacture of other chemical products n.e.c.	19.0797
72.11	Research and experimental development on biotechnology	15.6386
26.70	Manufacture of optical instruments and photographic equipment	13.6733
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	13.3490
27.51	Manufacture of electric domestic appliances	13.1191
28.91	Manufacture of machinery for metallurgy	12.3325
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	12.2604
28.94	Manufacture of machinery for textile, apparel and leather production	9.8429
72.19	Other research and experimental development on natural sciences and engineering	9.6509
24.45	Other non-ferrous metal production	9.5625
26.30	Manufacture of communication equipment	9.3536
26.11	Manufacture of electronic components	8.5149
06.20	Extraction of natural gas	8.5076
30.99	Manufacture of other transport equipment n.e.c.	7.9876
20.11	Manufacture of industrial gases	7.7689
28.95	Manufacture of machinery for paper and paperboard production	7.5835
30.40	Manufacture of military fighting vehicles	7.5787
28.99	Manufacture of other special-purpose machinery n.e.c.	7.2223
22.11	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	7.0396
24.34	Cold drawing of wire	6.8067
28.15	Manufacture of bearings, gears, gearing and driving elements	6.6619
30.30	Manufacture of air and spacecraft and related machinery	6.4605
20.42	Manufacture of perfumes and toilet preparations	5.9670
27.90	Manufacture of other electrical equipment	5.7360
25.72	Manufacture of locks and hinges	5.7158
28.93	Manufacture of machinery for food, beverage and tobacco processing	5.6632
23.43	Manufacture of ceramic insulators and insulating fittings	5.2842
61.90	Other telecommunications activities	5.0047
28.30	Manufacture of agricultural and forestry machinery	4.9834
32.30	Manufacture of sports goods	4.7602
27.31	Manufacture of fibre optic cables	4.7593
20.51	Manufacture of explosives	4.6498
20.41	Manufacture of soap and detergents, cleaning and polishing preparations	4.5471
28.49	Manufacture of other machine tools	4.4931
23.11	Manufacture of flat glass	4.4152
20.16	Manufacture of plastics in primary forms	4.3948
20.13	Manufacture of other inorganic basic chemicals	4.3164
28.29	Manufacture of other general-purpose machinery n.e.c.	4.0477

NACE code	NACE description	Patents/1000 employees
29.32	Manufacture of other parts and accessories for motor vehicles	3.7824
74.90	Other professional, scientific and technical activities n.e.c.	3.7204
21.20	Manufacture of pharmaceutical preparations	3.5974
29.10	Manufacture of motor vehicles	3.1959
26.40	Manufacture of consumer electronics	3.0068
30.92	Manufacture of bicycles and invalid carriages	2.9853
26.80	Manufacture of magnetic and optical media	2.9605
32.50	Manufacture of medical and dental instruments and supplies	2.8737
20.20	Manufacture of pesticides and other agrochemical products	2.8548
28.14	Manufacture of other taps and valves	2.8533
27.20	Manufacture of batteries and accumulators	2.8013
25.71	Manufacture of cutlery	2.7292
28.41	Manufacture of metal forming machinery	2.6811
30.20	Manufacture of railway locomotives and rolling stock	2.6330
28.92	Manufacture of machinery for mining, quarrying and construction	2.6099
28.13	Manufacture of other pumps and compressors	2.6090
32.99	Other manufacturing n.e.c.	2.4806
25.40	Manufacture of weapons and ammunition	2.4784
23.19	Manufacture and processing of other glass, including technical glassware	2.4657
22.29	Manufacture of other plastic products	2.3612
20.14	Manufacture of other organic basic chemicals	2.3563
10.89	Manufacture of other food products n.e.c.	2.3504
25.93	Manufacture of wire products, chain and springs	2.3204
29.31	Manufacture of electrical and electronic equipment for motor vehicles	2.3031
28.25	Manufacture of non-domestic cooling and ventilation equipment	2.2020
24.41	Precious metals production	2.1946
23.99	Manufacture of other non-metallic mineral products n.e.c.	2.1532
20.12	Manufacture of dyes and pigments	2.1326
25.73	Manufacture of tools	2.1081
27.40	Manufacture of electric lighting equipment	2.1053
28.22	Manufacture of lifting and handling equipment	2.0100
26.20	Manufacture of computers and peripheral equipment	1.9231
22.22	Manufacture of plastic packing goods	1.9064
58.29	Other software publishing	1.9060
24.46	Processing of nuclear fuel	1.8375
28.23	Manufacture of office machinery and equipment (except computers and peripheral equipment)	1.8242
28.96	Manufacture of plastics and rubber machinery	1.8229
30.91	Manufacture of motorcycles	1.8149
20.60	Manufacture of man-made fibres	1.8013
22.19	Manufacture of other rubber products	1.7433
23.14	Manufacture of glass fibres	1.7071
17.22	Manufacture of household and sanitary goods and of toilet requisites	1.6843
13.94	Manufacture of cordage, rope, twine and netting	1.6044
10.83	Processing of tea and coffee	1.6008
20.52	Manufacture of glues	1.5288

NACE code	NACE description	Patents/1000 employees
46.75	Wholesale of chemical products	1.5055
46.69	Wholesale of other machinery and equipment	1.4938
13.95	Manufacture of non-wovens and articles made from non-wovens, except apparel	1.4835
07.29	Mining of other non-ferrous metal ores	1.4748
25.92	Manufacture of light metal packaging	1.4595
09.10	Support activities for petroleum and natural gas extraction	1.4447
46.46	Wholesale of pharmaceutical goods	1.4441
23.44	Manufacture of other technical ceramic products	1.4436
26.52	Manufacture of watches and clocks	1.4360
27.11	Manufacture of electric motors, generators and transformers	1.4238
25.94	Manufacture of fasteners and screw machine products	1.4226
06.10	Extraction of crude petroleum	1.3809
27.32	Manufacture of other electronic and electric wires and cables	1.3316
26.12	Manufacture of loaded electronic boards	1.2971
28.12	Manufacture of fluid power equipment	1.2868
29.20	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	1.2730
22.21	Manufacture of plastic plates, sheets, tubes and profiles	1.2408
25.99	Manufacture of other fabricated metal products n.e.c.	1.2355
71.20	Technical testing and analysis	1.1923
23.91	Production of abrasive products	1.1789
71.12	Engineering activities and related technical consultancy	1.1776
27.12	Manufacture of electricity distribution and control apparatus	1.1581
28.21	Manufacture of ovens, furnaces and furnace burners	1.1500
33.20	Installation of industrial machinery and equipment	1.1464
14.11	Manufacture of leather clothes	1.1281
72.20	Research and experimental development on social sciences and humanities	1.0914
25.30	Manufacture of steam generators, except central heating hot water boilers	1.0683
32.91	Manufacture of brooms and brushes	1.0580
46.14	Agents involved in the sale of machinery, industrial equipment, ships and aircraft	1.0419
28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	0.9816
61.30	Satellite telecommunications activities	0.9558
10.41	Manufacture of oils and fats	0.9421
32.40	Manufacture of games and toys	0.9222
23.65	Manufacture of fibre cement	0.9014
17.12	Manufacture of paper and paperboard	0.8924
31.03	Manufacture of mattresses	0.8580
45.31	Wholesale trade of motor vehicle parts and accessories	0.8552
46.43	Wholesale of electrical household appliances	0.8463
33.19	Repair of other equipment	0.8442
20.30	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	0.8259
25.50	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	0.7866
20.53	Manufacture of essential oils	0.7843
25.91	Manufacture of steel drums and similar containers	0.7735
27.33	Manufacture of wiring devices	0.7719
13.99	Manufacture of other textiles n.e.c.	0.7701

NACE code	NACE description	Patents/1000 employees
12.00	Manufacture of tobacco products	0.7343
46.12	Agents involved in the sale of fuels, ores, metals and industrial chemicals	0.7303
46.62	Wholesale of machine tools	0.7113
61.20	Wireless telecommunications activities	0.7063
24.42	Aluminium production	0.7057
17.29	Manufacture of other articles of paper and paperboard	0.7047
22.23	Manufacture of builders' ware of plastic	0.7022
46.15	Agents involved in the sale of furniture, household goods, hardware and ironmongery	0.6967

11.3 Trade mark-intensive industries

Table 45:

NACE code	NACE description	Trade marks/1000 employees
77.40	Leasing of intellectual property and similar products, except copyrighted works	212.2154
21.10	Manufacture of basic pharmaceutical products	38.8062
11.02	Manufacture of wine from grape	38.7819
72.11	Research and experimental development on biotechnology	35.9067
20.42	Manufacture of perfumes and toilet preparations	32.3966
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	27.0755
30.99	Manufacture of other transport equipment n.e.c.	26.6333
32.40	Manufacture of games and toys	26.2134
32.30	Manufacture of sports goods	25.5158
61.90	Other telecommunications activities	25.4622
58.21	Publishing of computer games	25.0539
11.01	Distilling, rectifying and blending of spirits	24.4711
59.13	Motion picture, video and television programme distribution activities	24.3534
63.12	Web portals	24.3202
17.24	Manufacture of wallpaper	23.4175
24.45	Other non-ferrous metal production	22.6964
32.99	Other manufacturing n.e.c.	22.5397
10.73	Manufacture of macaroni, noodles, couscous and similar farinaceous products	22.1695
18.11	Printing of newspapers	21.5056
59.20	Sound recording and music publishing activities	21.2633
58.29	Other software publishing	20.7077
20.59	Manufacture of other chemical products n.e.c.	20.4070
10.83	Processing of tea and coffee	19.8045
10.86	Manufacture of homogenised food preparations and dietetic food	19.0495
26.52	Manufacture of watches and clocks	18.8470
20.30	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	17.7452
20.20	Manufacture of pesticides and other agrochemical products	17.5340
10.92	Manufacture of prepared pet foods	17.1965
58.11	Book publishing	17.0897
11.03	Manufacture of cider and other fruit wines	16.6607
23.49	Manufacture of other ceramic products	16.5271
46.45	Wholesale of perfume and cosmetics	16.4938
24.41	Precious metals production	16.3430
46.42	Wholesale of clothing and footwear	16.0696
10.89	Manufacture of other food products n.e.c.	16.0696
62.09	Other information technology and computer service activities	15.3635
58.12	Publishing of directories and mailing lists	15.2067
20.52	Manufacture of glues	15.2024
72.19	Other research and experimental development on natural sciences and engineering	15.0007
21.20	Manufacture of pharmaceutical preparations	14.9879
82.30	Organisation of conventions and trade shows	14.8987
20.41	Manufacture of soap and detergents, cleaning and polishing preparations	14.6800
30.91	Manufacture of motorcycles	14.6779

NACE code	NACE description	Trade marks/1000 employees
20.11	Manufacture of industrial gases	14.6279
11.04	Manufacture of other non-distilled fermented beverages	14.4659
13.95	Manufacture of non-wovens and articles made from non-wovens, except apparel	14.2909
59.11	Motion picture, video and television programme production activities	14.2308
27.51	Manufacture of electric domestic appliances	14.1201
46.37	Wholesale of coffee, tea, cocoa and spices	13.7984
46.48	Wholesale of watches and jewellery	13.6442
30.92	Manufacture of bicycles and invalid carriages	13.4221
46.43	Wholesale of electrical household appliances	13.1173
20.17	Manufacture of synthetic rubber in primary forms	12.9731
23.11	Manufacture of flat glass	12.5344
68.10	Buying and selling of own real estate	12.3048
26.70	Manufacture of optical instruments and photographic equipment	12.2972
25.71	Manufacture of cutlery	12.0696
10.41	Manufacture of oils and fats	11.8352
58.14	Publishing of journals and periodicals	11.7910
13.99	Manufacture of other textiles n.e.c.	11.7755
60.20	Television programming and broadcasting activities	11.7749
14.11	Manufacture of leather clothes	11.7475
79.12	Tour operator activities	11.7335
74.90	Other professional, scientific and technical activities n.e.c.	11.7123
46.41	Wholesale of textiles	11.6009
28.91	Manufacture of machinery for metallurgy	11.2314
46.49	Wholesale of other household goods	11.1465
23.43	Manufacture of ceramic insulators and insulating fittings	10.9993
46.34	Wholesale of beverages	10.8906
70.21	Public relations and communication activities	10.8769
14.19	Manufacture of other wearing apparel and accessories	10.8456
09.10	Support activities for petroleum and natural gas extraction	10.8120
11.06	Manufacture of malt	10.6980
06.10	Extraction of crude petroleum	10.5981
10.32	Manufacture of fruit and vegetable juice	10.4553
46.24	Wholesale of hides, skins and leather	10.3716
46.90	Non-specialised wholesale trade	10.2989
19.20	Manufacture of refined petroleum products	10.2565
26.80	Manufacture of magnetic and optical media	10.2560
11.05	Manufacture of beer	10.2145
31.03	Manufacture of mattresses	10.1743
46.46	Wholesale of pharmaceutical goods	10.1432
28.14	Manufacture of other taps and valves	10.0438
26.20	Manufacture of computers and peripheral equipment	10.0404
23.42	Manufacture of ceramic sanitary fixtures	9.9644
27.90	Manufacture of other electrical equipment	9.9148
46.76	Wholesale of other intermediate products	9.7124
46.75	Wholesale of chemical products	9.6925
47.91	Retail sale via mail order houses or via Internet	9.6639
10.52	Manufacture of ice cream	9.6459

NACE code	NACE description	Trade marks/1000 employees
32.20	Manufacture of musical instruments	9.6174
77.35	Rental and leasing of air transport equipment	9.6047
10.81	Manufacture of sugar	9.5912
58.19	Other publishing activities	9.2139
28.23	Manufacture of office machinery and equipment (except computers and peripheral equipment)	9.0334
11.07	Manufacture of soft drinks; production of mineral waters and other bottled waters	8.8434
46.38	Wholesale of other food, including fish, crustaceans and molluscs	8.8419
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	8.8200
14.20	Manufacture of articles of fur	8.8130
46.11	Agents involved in the sale of agricultural raw materials, live animals, textile raw materials and semi-finished goods	8.7656
10.82	Manufacture of cocoa, chocolate and sugar confectionery	8.7277
23.99	Manufacture of other non-metallic mineral products n.e.c.	8.6739
62.01	Computer programming activities	8.6470
13.94	Manufacture of cordage, rope, twine and netting	8.4779
41.10	Development of building projects	8.4229
74.10	Specialised design activities	8.3636
59.12	Motion picture, video and television programme post-production activities	8.3498
08.99	Other mining and quarrying n.e.c.	8.3136
28.93	Manufacture of machinery for food, beverage and tobacco processing	8.2518
26.11	Manufacture of electronic components	8.2341
20.15	Manufacture of fertilisers and nitrogen compounds	8.2327
62.03	Computer facilities management activities	8.2206
23.64	Manufacture of mortars	8.1728
26.30	Manufacture of communication equipment	8.1491
32.91	Manufacture of brooms and brushes	8.1237
30.12	Building of pleasure and sporting boats	7.9613
46.47	Wholesale of furniture, carpets and lighting equipment	7.9548
46.14	Agents involved in the sale of machinery, industrial equipment, ships and aircraft	7.9511
27.40	Manufacture of electric lighting equipment	7.9115
17.22	Manufacture of household and sanitary goods and of toilet requisites	7.8351
28.99	Manufacture of other special-purpose machinery n.e.c.	7.8228
10.84	Manufacture of condiments and seasonings	7.8031
23.62	Manufacture of plaster products for construction purposes	7.8027
28.13	Manufacture of other pumps and compressors	7.7962
46.64	Wholesale of machinery for the textile industry and of sewing and knitting machines	7.6502
70.22	Business and other management consultancy activities	7.4743
77.33	Rental and leasing of office machinery and equipment (including computers)	7.2809
46.44	Wholesale of china and glassware and cleaning materials	7.2724
17.23	Manufacture of paper stationery	7.2637
46.33	Wholesale of dairy products, eggs and edible oils and fats	7.2035
23.19	Manufacture and processing of other glass, including technical glassware	7.1824
28.24	Manufacture of power-driven hand tools	7.1787
13.91	Manufacture of knitted and crocheted fabrics	7.1658
24.32	Cold rolling of narrow strip	6.9940
20.13	Manufacture of other inorganic basic chemicals	6.9804
79.11	Travel agency activities	6.8811

NACE code	NACE description	Trade marks/1000 employees
25.21	Manufacture of central heating radiators and boilers	6.8129
46.36	Wholesale of sugar and chocolate and sugar confectionery	6.7676
20.53	Manufacture of essential oils	6.7343
15.12	Manufacture of luggage, handbags and the like, saddlery and harness	6.7288
32.12	Manufacture of jewellery and related articles	6.7085
12.00	Manufacture of tobacco products	6.6999
32.50	Manufacture of medical and dental instruments and supplies	6.6877
24.52	Casting of steel	6.6855
23.69	Manufacture of other articles of concrete, plaster and cement	6.6368
46.18	Agents specialised in the sale of other particular products	6.5509
23.91	Production of abrasive products	6.5313
28.21	Manufacture of ovens, furnaces and furnace burners	6.5267
26.40	Manufacture of consumer electronics	6.5109
10.51	Operation of dairies and cheese making	6.4615
60.10	Radio broadcasting	6.4420
10.42	Manufacture of margarine and similar edible fats	6.4378
25.72	Manufacture of locks and hinges	6.4313
45.31	Wholesale trade of motor vehicle parts and accessories	6.4293
28.29	Manufacture of other general-purpose machinery n.e.c.	6.3696
23.65	Manufacture of fibre cement	6.3527
73.20	Market research and public opinion polling	6.3317
63.99	Other information service activities n.e.c.	6.3225
32.13	Manufacture of imitation jewellery and related articles	6.3115
15.20	Manufacture of footwear	6.2916
10.62	Manufacture of starches and starch products	6.2662
72.20	Research and experimental development on social sciences and humanities	6.1379
20.16	Manufacture of plastics in primary forms	6.0708
46.22	Wholesale of flowers and plants	6.0086
25.30	Manufacture of steam generators, except central heating hot water boilers	5.8792
46.39	Non-specialised wholesale of food, beverages and tobacco	5.8725
46.17	Agents involved in the sale of food, beverages and tobacco	5.8674
18.20	Reproduction of recorded media	5.8246
22.29	Manufacture of other plastic products	5.8096
20.12	Manufacture of dyes and pigments	5.7440
46.69	Wholesale of other machinery and equipment	5.6368
92.00	Gambling and betting activities	5.6242
20.51	Manufacture of explosives	5.6148
82.11	Combined office administrative service activities	5.5508
10.91	Manufacture of prepared feeds for farm animals	5.5409
22.23	Manufacture of builders' ware of plastic	5.5262
25.92	Manufacture of light metal packaging	5.5069
23.31	Manufacture of ceramic tiles and flags	5.4891
20.60	Manufacture of man-made fibres	5.4610
13.20	Weaving of textiles	5.4471
13.93	Manufacture of carpets and rugs	5.2987
28.30	Manufacture of agricultural and forestry machinery	5.2705
24.34	Cold drawing of wire	5.2348

NACE code	NACE description	Trade marks/1000 employees
46.19	Agents involved in the sale of a variety of goods	5.2260
46.16	Agents involved in the sale of textiles, clothing, fur, footwear and leather goods	5.1711
22.11	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	5.1708
25.99	Manufacture of other fabricated metal products n.e.c.	5.1528
28.92	Manufacture of machinery for mining, quarrying and construction	5.1095
50.20	Sea and coastal freight water transport	5.1001
25.73	Manufacture of tools	5.0610
23.44	Manufacture of other technical ceramic products	5.0574
17.29	Manufacture of other articles of paper and paperboard	5.0209
13.10	Preparation and spinning of textile fibres	4.9342
23.14	Manufacture of glass fibres	4.8693
73.11	Advertising agencies	4.8281
16.22	Manufacture of assembled parquet floors	4.8142
46.74	Wholesale of hardware, plumbing and heating equipment and supplies	4.8083
63.91	News agency activities	4.7974
10.39	Other processing and preserving of fruit and vegetables	4.7503
61.20	Wireless telecommunications activities	4.6796
17.12	Manufacture of paper and paperboard	4.6662
23.20	Manufacture of refractory products	4.6261
45.40	Sale, maintenance and repair of motorcycles and related parts and accessories	4.6254
10.61	Manufacture of grain mill products	4.6247
30.40	Manufacture of military fighting vehicles	4.5924
46.15	Agents involved in the sale of furniture, household goods, hardware and ironmongery	4.5350
14.13	Manufacture of other outerwear	4.4636
14.31	Manufacture of knitted and crocheted hosiery	4.4574
28.25	Manufacture of non-domestic cooling and ventilation equipment	4.4538
20.14	Manufacture of other organic basic chemicals	4.4484
14.12	Manufacture of workwear	4.4156
63.11	Data processing, hosting and related activities	4.4108
33.19	Repair of other equipment	4.3995
46.13	Agents involved in the sale of timber and building materials	4.3989
46.31	Wholesale of fruit and vegetables	4.3547
08.93	Extraction of salt	4.3451
13.92	Manufacture of made-up textile articles, except apparel	4.3400
22.21	Manufacture of plastic plates, sheets, tubes and profiles	4.2903
46.52	Wholesale of electronic and telecommunications equipment and parts	4.2897
47.19	Other retail sale in non-specialised stores	4.2510
47.74	Retail sale of medical and orthopaedic goods in specialised stores	4.2289
08.91	Mining of chemical and fertiliser minerals	4.2230
08.11	Quarrying of ornamental and building stone, limestone, gypsum, chalk and slate	4.2157
28.49	Manufacture of other machine tools	4.2034
77.39	Rental and leasing of other machinery, equipment and tangible goods n.e.c.	4.2032
29.10	Manufacture of motor vehicles	4.1614
66.00	Activities auxiliary to financial services and insurance activities	4.1499
27.32	Manufacture of other electronic and electric wires and cables	4.1486
25.94	Manufacture of fasteners and screw machine products	4.1331
61.30	Satellite telecommunications activities	4.1169

NACE code	NACE description	Trade marks/1000 employees
14.39	Manufacture of other knitted and crocheted apparel	4.0362
50.10	Sea and coastal passenger water transport	3.9837
46.12	Agents involved in the sale of fuels, ores, metals and industrial chemicals	3.9735
24.33	Cold forming or folding	3.9615
22.22	Manufacture of plastic packing goods	3.9506
28.95	Manufacture of machinery for paper and paperboard production	3.9247
31.01	Manufacture of office and shop furniture	3.9215
28.41	Manufacture of metal forming machinery	3.9208
51.10	Passenger air transport	3.8932
27.52	Manufacture of non-electric domestic appliances	3.8331
17.11	Manufacture of pulp	3.8181
25.93	Manufacture of wire products, chain and springs	3.7940
47.75	Retail sale of cosmetic and toilet articles in specialised stores	3.7922
46.21	Wholesale of grain, unmanufactured tobacco, seeds and animal feeds	3.7743
46.51	Wholesale of computers, computer peripheral equipment and software	3.7491
47.51	Retail sale of textiles in specialised stores	3.7420
46.72	Wholesale of metals and metal ores	3.7058
27.20	Manufacture of batteries and accumulators	3.7053
93.00	Sports activities and amusement and recreation activities[78]	3.6983
46.65	Wholesale of office furniture	3.6929
16.21	Manufacture of veneer sheets and wood-based panels	3.6688
46.62	Wholesale of machine tools	3.5978
23.41	Manufacture of ceramic household and ornamental articles	3.5851
46.71	Wholesale of solid, liquid and gaseous fuels and related products	3.5411
62.02	Computer consultancy activities	3.5254
14.14	Manufacture of underwear	3.5223
23.32	Manufacture of bricks, tiles and construction products, in baked clay	3.5062
13.30	Finishing of textiles	3.4689
10.20	Processing and preserving of fish, crustaceans and molluscs	3.4632
47.65	Retail sale of games and toys in specialised stores	3.4527
28.15	Manufacture of bearings, gears, gearing and driving elements	3.4476
46.32	Wholesale of meat and meat products	3.4204
10.72	Manufacture of rusks and biscuits; manufacture of preserved pastry goods and cakes	3.3913
28.22	Manufacture of lifting and handling equipment	3.3741
77.12	Rental and leasing of trucks	3.3674
23.13	Manufacture of hollow glass	3.3616
68.20	Rental and operating of own or leased real estate	3.3161
47.41	Retail sale of computers, peripheral units and software in specialised stores	3.3132
22.19	Manufacture of other rubber products	3.3093
73.12	Media representation	3.2655
10.13	Production of meat and poultry meat products	3.2537
16.29	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	3.2534
47.99	Other retail sale not in stores, stalls or markets	3.2421
47.25	Retail sale of beverages in specialised stores	3.2322
25.40	Manufacture of weapons and ammunition	3.2083
51.20	Freight air transport and space transport	3.1943

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

11.4 Design-intensive industries

Table 46:

NACE code	NACE description	Designs/1000 employees
26.52	Manufacture of watches and clocks	90.6758
77.40	Leasing of intellectual property and similar products, except copyrighted works	78.5878
25.71	Manufacture of cutlery	70.2333
23.41	Manufacture of ceramic household and ornamental articles	66.2383
46.48	Wholesale of watches and jewellery	39.7972
27.40	Manufacture of electric lighting equipment	39.1796
28.24	Manufacture of power-driven hand tools	36.9768
14.11	Manufacture of leather clothes	35.5173
32.30	Manufacture of sports goods	30.7923
27.51	Manufacture of electric domestic appliances	29.0717
32.40	Manufacture of games and toys	26.2481
28.14	Manufacture of other taps and valves	25.2112
23.49	Manufacture of other ceramic products	24.3616
32.99	Other manufacturing n.e.c.	23.6981
23.42	Manufacture of ceramic sanitary fixtures	23.0453
46.47	Wholesale of furniture, carpets and lighting equipment	22.1690
30.99	Manufacture of other transport equipment n.e.c.	22.1341
25.72	Manufacture of locks and hinges	21.5714
46.42	Wholesale of clothing and footwear	19.6549
17.22	Manufacture of household and sanitary goods and of toilet requisites	17.0849
46.15	Agents involved in the sale of furniture, household goods, hardware and ironmongery	16.6784
74.10	Specialised design activities	16.1545
31.09	Manufacture of other furniture	15.5346
28.93	Manufacture of machinery for food, beverage and tobacco processing	15.4963
46.43	Wholesale of electrical household appliances	14.3724
15.20	Manufacture of footwear	13.5503
20.41	Manufacture of soap and detergents, cleaning and polishing preparations	13.3925
32.91	Manufacture of brooms and brushes	13.1620
23.69	Manufacture of other articles of concrete, plaster and cement	12.2293
17.24	Manufacture of wallpaper	12.2002
46.49	Wholesale of other household goods	12.0160
15.12	Manufacture of luggage, handbags and the like, saddlery and harness	11.7208
25.21	Manufacture of central heating radiators and boilers	11.5269
32.12	Manufacture of jewellery and related articles	11.5145
32.13	Manufacture of imitation jewellery and related articles	11.4811
46.44	Wholesale of china and glassware and cleaning materials	11.2804
14.14	Manufacture of underwear	10.6258
23.65	Manufacture of fibre cement	10.4286
26.70	Manufacture of optical instruments and photographic equipment	10.2794

NACE code	NACE description	Designs/1000 employees
13.92	Manufacture of made-up textile articles, except apparel	10.2381
25.99	Manufacture of other fabricated metal products n.e.c.	10.0078
13.20	Weaving of textiles	9.9055
23.19	Manufacture and processing of other glass, including technical glassware	9.8934
13.93	Manufacture of carpets and rugs	9.2987
22.22	Manufacture of plastic packing goods	8.4103
31.01	Manufacture of office and shop furniture	8.3852
27.52	Manufacture of non-electric domestic appliances	8.3698
46.41	Wholesale of textiles	8.2564
13.91	Manufacture of knitted and crocheted fabrics	8.1904
31.02	Manufacture of kitchen furniture	7.9670
17.12	Manufacture of paper and paperboard	7.9444
25.92	Manufacture of light metal packaging	7.9343
30.92	Manufacture of bicycles and invalid carriages	7.7819
14.12	Manufacture of workwear	7.6336
20.42	Manufacture of perfumes and toilet preparations	7.4713
22.29	Manufacture of other plastic products	7.3448
26.40	Manufacture of consumer electronics	7.1789
14.19	Manufacture of other wearing apparel and accessories	7.0665
26.60	Manufacture of irradiation, electromedical and electrotherapeutic equipment	6.9426
32.20	Manufacture of musical instruments	6.8511
13.96	Manufacture of other technical and industrial textiles	6.8329
26.30	Manufacture of communication equipment	6.5551
27.90	Manufacture of other electrical equipment	6.3299
23.31	Manufacture of ceramic tiles and flags	5.8258
16.29	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	5.6283
46.65	Wholesale of office furniture	5.3709
31.03	Manufacture of mattresses	5.1134
10.83	Processing of tea and coffee	5.0838
22.23	Manufacture of builders' ware of plastic	4.7619
17.23	Manufacture of paper stationery	4.6158
46.90	Non-specialised wholesale trade	4.5315
10.73	Manufacture of macaroni, noodles, couscous and similar farinaceous products	4.5144
21.10	Manufacture of basic pharmaceutical products	4.5078
28.29	Manufacture of other general-purpose machinery n.e.c.	4.5075
26.51	Manufacture of instruments and appliances for measuring, testing and navigation	4.4596
11.03	Manufacture of cider and other fruit wines	4.4021
25.94	Manufacture of fasteners and screw machine products	4.3927
47.65	Retail sale of games and toys in specialised stores	4.2730
29.20	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	4.1536
23.70	Cutting, shaping and finishing of stone	4.1307
20.59	Manufacture of other chemical products n.e.c.	4.0895

NACE code	NACE description	Designs/1000 employees
23.99	Manufacture of other non-metallic mineral products n.e.c.	4.0235
32.50	Manufacture of medical and dental instruments and supplies	3.9935
23.91	Production of abrasive products	3.8128
11.01	Distilling, rectifying and blending of spirits	3.8052
28.21	Manufacture of ovens, furnaces and furnace burners	3.8000
30.91	Manufacture of motorcycles	3.7976
25.73	Manufacture of tools	3.7562
47.59	Retail sale of furniture, lighting equipment and other household articles in specialised stores	3.6871
46.45	Wholesale of perfume and cosmetics	3.5574
22.19	Manufacture of other rubber products	3.5145
23.11	Manufacture of flat glass	3.4629
72.19	Other research and experimental development on natural sciences and engineering	3.4233
46.76	Wholesale of other intermediate products	3.3639
29.10	Manufacture of motor vehicles	3.3297
23.13	Manufacture of hollow glass	3.2915
46.69	Wholesale of other machinery and equipment	3.2493
26.11	Manufacture of electronic components	3.2376
10.32	Manufacture of fruit and vegetable juice	3.2190
28.13	Manufacture of other pumps and compressors	3.2028
46.74	Wholesale of hardware, plumbing and heating equipment and supplies	3.1889
24.45	Other non-ferrous metal production	3.1374
14.31	Manufacture of knitted and crocheted hosiery	3.0680
28.99	Manufacture of other special-purpose machinery n.e.c.	3.0544
17.29	Manufacture of other articles of paper and paperboard	3.0123
27.12	Manufacture of electricity distribution and control apparatus	3.0000
18.13	Pre-press and pre-media services	2.9783
46.72	Wholesale of metals and metal ores	2.9638
22.11	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	2.9377
46.18	Agents specialised in the sale of other particular products	2.8820
28.94	Manufacture of machinery for textile, apparel and leather production	2.8327
10.82	Manufacture of cocoa, chocolate and sugar confectionery	2.7915
16.22	Manufacture of assembled parquet floors	2.7827
25.12	Manufacture of doors and windows of metal	2.7732
61.90	Other telecommunications activities	2.7229
12.00	Manufacture of tobacco products	2.6823
22.21	Manufacture of plastic plates, sheets, tubes and profiles	2.6477
74.90	Other professional, scientific and technical activities n.e.c.	2.6418
26.20	Manufacture of computers and peripheral equipment	2.6184
73.11	Advertising agencies	2.5995
10.84	Manufacture of condiments and seasonings	2.5879
68.10	Buying and selling of own real estate	2.5358
11.07	Manufacture of soft drinks; production of mineral waters and other bottled waters	2.5234

NACE code	NACE description	Designs/1000 employees
10.92	Manufacture of prepared pet foods	2.4992
16.23	Manufacture of other builders' carpentry and joinery	2.4777
24.42	Aluminium production	2.4740
46.36	Wholesale of sugar and chocolate and sugar confectionery	2.4240
28.30	Manufacture of agricultural and forestry machinery	2.3881
13.30	Finishing of textiles	2.3093
20.20	Manufacture of pesticides and other agrochemical products	2.3031
20.30	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	2.2876
46.13	Agents involved in the sale of timber and building materials	2.2115
23.32	Manufacture of bricks, tiles and construction products, in baked clay	2.1953
72.11	Research and experimental development on biotechnology	2.1797
28.91	Manufacture of machinery for metallurgy	2.1615
20.16	Manufacture of plastics in primary forms	2.1488
16.21	Manufacture of veneer sheets and wood-based panels	2.1396
47.77	Retail sale of watches and jewellery in specialised stores	2.1353
13.99	Manufacture of other textiles n.e.c.	2.1231
26.80	Manufacture of magnetic and optical media	2.0950
13.94	Manufacture of cordage, rope, twine and netting	2.0927
30.20	Manufacture of railway locomotives and rolling stock	2.0859
23.14	Manufacture of glass fibres	2.0321
70.21	Public relations and communication activities	2.0175
95.24	Repair of furniture and home furnishings	2.0170
27.20	Manufacture of batteries and accumulators	1.9861
27.33	Manufacture of wiring devices	1.9815
47.91	Retail sale via mail order houses or via Internet	1.9669
55.90	Other accommodation	1.9571
28.25	Manufacture of non-domestic cooling and ventilation equipment	1.9469
11.04	Manufacture of other non-distilled fermented beverages	1.9362
46.63	Wholesale of mining, construction and civil engineering machinery	1.9335
27.32	Manufacture of other electronic and electric wires and cables	1.9316
14.20	Manufacture of articles of fur	1.8414
25.93	Manufacture of wire products, chain and springs	1.8356
32.11	Striking of coins	1.8313
13.95	Manufacture of non-wovens and articles made from non-wovens, except apparel	1.7599
29.32	Manufacture of other parts and accessories for motor vehicles	1.7551
14.39	Manufacture of other knitted and crocheted apparel	1.7452
46.14	Agents involved in the sale of machinery, industrial equipment, ships and aircraft	1.7149
46.52	Wholesale of electronic and telecommunications equipment and parts	1.6876
10.52	Manufacture of ice cream	1.6808
59.20	Sound recording and music publishing activities	1.6534
14.13	Manufacture of other outerwear	1.6461
24.41	Precious metals production	1.6351

11.5 PVR-intensive industries

Table 47:

NACE code	NACE description	PVR/1000 employees
00.00	Horticulture	n/a
46.11	Agents involved in the sale of agricultural raw materials, live animals, textile raw materials and semi-finished goods	2.37
46.21	Wholesale of grain, unmanufactured tobacco, seeds and animal feeds	2.22
46.22	Wholesale of flowers and plants	4.51
72.11	Research and experimental development on biotechnology	6.20
77.40	Leasing of intellectual property and similar products, except copyrighted works	29.03

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

As explained in Chapter 6, the copyright-intensive industries presented there were selected on the basis of the WIPO methodology. In this Appendix, the standard WIPO methodology, as outlined in WIPO (2003), is explained in more detail.

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

- Core
- Interdependent
- Partial
- Non-dedicated support

12.1 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.

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.

Thus, all in all, the 49 industries listed in table 48 are defined as core copyright-intensive by WIPO.

Table 48:
The list of core copyright-intensive industries according to WIPO

NACE code	NACE description
58.11	Book publishing
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
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
63.12	Web portals
63.91	News agency activities
63.99	Other information service activities n.e.c.
73.11	Advertising agencies
73.12	Media representation
74.10	Specialised design activities
74.20	Photographic activities
74.30	Translation and interpretation activities
90.01	Performing arts
90.02	Support activities to performing arts
90.03	Artistic creation
91.01	Library and archives activities
93.29	Other amusement and recreation activities
18.11	Printing of newspapers
18.12	Other printing
18.13	Pre-press and pre-media services
18.14	Binding and related services
18.20	Reproduction of recorded media
18.14	Binding and related services

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

12.2 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: interdependent, 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:

Interdependent 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 interdependent, partial and non-dedicated support industries have been adopted from a Dutch study "The Economic Contribution

of Copyright-Based Industries in the Netherlands"[79] and a Finnish study "Economic Contribution of Copyright-Based Industries in Finland 2005-2008",[80] both published in 2011. These studies are considered authoritative by many authors and are available from WIPO.

Table 49 shows the interdependent industries and the factors assigned to each industry.

Table 49: Interdependent 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 50 shows the 42 industries classified by WIPO as partially copyright-intensive industries and their factors.

79 http://www.wipo.int/export/sites/www/copyright/en/performance/pdf/econ_contribution_cr_nl.pdf
80 http://www.wipo.int/export/sites/www/copyright/en/performance/pdf/econ_contribution_cr_fi.pdf

Table 50:
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	0,55%
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%
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 51.

Table 51: 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.

In this study, only the core industries and the non-core industries with a factor of at least 20% are included as copyright-intensive.

13 / Identification of CCMT-intensive industries

In addition to the requirement that the industry be IPR intensive, two CCMT-related criteria are applied. The first criterion is the relative CCMT-patent intensity, defined as the number of CCMT-patents per 1,000 employees in the relevant NACE class:

$$\textbf{Relative CCMT-patent intensity:} \quad \frac{CCMT\ patents\ in\ NACE\ class}{1{,}000\ empolyees\ in\ NACE\ class}$$

The second criterion is the share of CCMT-patents in all patents in the industry. This is designed to account for the importance of CCMT-patents within the industry's patent portfolio:

$$\textbf{CCMT-patent share:} \quad \frac{CCMT\ patents\ in\ NACE\ class}{Patents\ in\ NACE\ class}$$

The industries that are both IPR-intensive and CCMT-patent intensive, i.e. in which the relative CCMT-patent intensity is above the overall, employment-weighted average for all industries with at least one CCMT patent, are listed in table 52, together with their intensity scores and rankings. All in all, 38 industries can be identified according to the above criteria. They account for 66.5% of all CCMT patents in all industries.

Table 52:
CCMT-patent-intensive industries

RANK	NACE code	NACE description	CCMT patents/1000 employees
1	28.24	Manufacture of power-driven hand tools	9.02
2	77.40	Leasing of intellectual property and similar products, except copyrighted works	3.00
3	20.11	Manufacture of industrial gases	1.77
4	27.20	Manufacture of batteries and accumulators	1.62
5	06.20	Extraction of natural gas	1.54
6	30.30	Manufacture of air and spacecraft and related machinery	1.40
7	24.46	Processing of nuclear fuel	1.35
8	72.11	Research and experimental development on biotechnology	1.15
9	20.59	Manufacture of other chemical products n.e.c.	1.03
10	26.51	Manufacture of instruments and appliances for measuring, testing and navigation	0.98
11	72.19	Other research and experimental development on natural sciences and engineering	0.71
12	21.10	Manufacture of basic pharmaceutical products	0.71
13	07.29	Mining of other non-ferrous metal ores	0.68
14	28.91	Manufacture of machinery for metallurgy	0.63
15	23.11	Manufacture of flat glass	0.62
16	24.45	Other non-ferrous metal production	0.59
17	27.90	Manufacture of other electrical equipment	0.58
18	29.10	Manufacture of motor vehicles	0.52
19	24.34	Cold drawing of wire	0.51
20	30.99	Manufacture of other transport equipment n.e.c.	0.51
21	20.13	Manufacture of other inorganic basic chemicals	0.49
22	22.11	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	0.44
23	28.25	Manufacture of non-domestic cooling and ventilation equipment	0.42
24	27.51	Manufacture of electric domestic appliances	0.41
25	26.11	Manufacture of electronic components	0.37
26	28.15	Manufacture of bearings, gears, gearing and driving elements	0.37
27	27.31	Manufacture of fibre optic cables	0.31
28	29.31	Manufacture of electrical and electronic equipment for motor vehicles	0.27
29	26.30	Manufacture of communication equipment	0.24
30	28.95	Manufacture of machinery for paper and paperboard production	0.24
31	74.90	Other professional, scientific and technical activities n.e.c.	0.23
32	28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	0.22
33	28.49	Manufacture of other machine tools	0.22
34	23.19	Manufacture and processing of other glass, including technical glassware	0.21
35	28.99	Manufacture of other special-purpose machinery n.e.c.	0.21
36	29.32	Manufacture of other parts and accessories for motor vehicles	0.19
37	28.96	Manufacture of plastics and rubber machinery	0.19
38	30.40	Manufacture of military fighting vehicles	0.18

The NACE classes that are IPR-intensive and have a CCMT-patent share above the overall, employment weighted average share of all industries with at least one CCMT patent are listed in table 53. The number of IPR-intensive industries which exceed the average CCMT-patent share of 8.9% is 19, which is significantly lower than the number reached if only the relative CCMT-patent intensity criterion is applied. In addition, it becomes obvious that industries with a high CCMT-share are often not the ones with the highest CCMT-patent intensity score. Together, these 19 industries account for 32.4% of all European CCMT patents considered.

Table 53:
Industries with CCMT-patent share above average

RANK	NACE code	NACE description	CCMT-patent share
1	24.46	Processing of nuclear fuel	73,7%
2	27.20	Manufacture of batteries and accumulators	58,0%
3	07.29	Mining of other non-ferrous metal ores	46,4%
4	28.11	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	22,9%
5	20.11	Manufacture of industrial gases	22,8%
6	30.30	Manufacture of air and spacecraft and related machinery	21,7%
7	28.25	Manufacture of non-domestic cooling and ventilation equipment	19,1%
8	06.20	Extraction of natural gas	18,2%
9	29.10	Manufacture of motor vehicles	16,1%
10	23.11	Manufacture of flat glass	14,0%
11	23.65	Manufacture of fibre cement	12,1%
12	71.20	Technical testing and analysis	12,1%
13	27.11	Manufacture of electric motors, generators and transformers	11,7%
14	29.31	Manufacture of electrical and electronic equipment for motor vehicles	11,6%
15	20.13	Manufacture of other inorganic basic chemicals	11,4%
16	25.30	Manufacture of steam generators, except central heating hot water boilers	10,6%
17	28.96	Manufacture of plastics and rubber machinery	10,5%
18	27.90	Manufacture of other electrical equipment	10,0%
19	46.12	Agents involved in the sale of fuels, ores, metals and industrial chemicals	9,9%

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