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OECD Patent Statistics Manual

Chapter 5

Classifying Patents by Different Criteria

5.1. Introduction

Many uses of patent data for research and policy analysis require relating them to a meaningful unit of analysis or classifying them according to particular criteria. By relating or classifying patents in this manner, information can be obtained on these specific units or on the economic or social relevance of certain variables. Analysis may require relating patents to the entity that filed them, to the individual who made the underlying invention, to a particular field of technology, a particular industry, a particular region or a particular institutional sector.

This information is not provided in patent data in a way that allows for its immediate use. It has to be derived by "cleaning" the data (correcting mistakes and standardising the presentation) and by matching them to other data sources, such as lists of companies, lists of technology fields or concordance tables (between technology codes and industries, between city names and regions, etc.). These data sources will permit, in turn, the connection of the information contained in patents with other data. This work requires first identifying and then carefully processing the data provided in patent files.

This chapter summarises the main classifications used for patents – patents by technology field, industry, regions and institutional sectors – and briefly describes the methodological approaches commonly implemented for their development. General procedures for matching patent data to companies and for consolidation by inventor are also presented. These guidelines can serve as building blocks for future improvements in the area.

5.2. Technology fields

As patents cover mainly technical inventions, they are a natural source of data regarding technical change. In many cases, they are in fact the only reliable source. This is notably the case for investigating new, emerging technical fields, which are not yet stabilised (*i.e.* which do not yet have an operational definition), are not covered by business surveys, etc.

Because of their broad and long-term coverage, patent data are useful for examining how technologies behave over time and for identifying technology breakthroughs, cross-fertilisation between fields, etc. Figure 5.1 provides the example of patents related to fuel cell technology since the early 1990s. When

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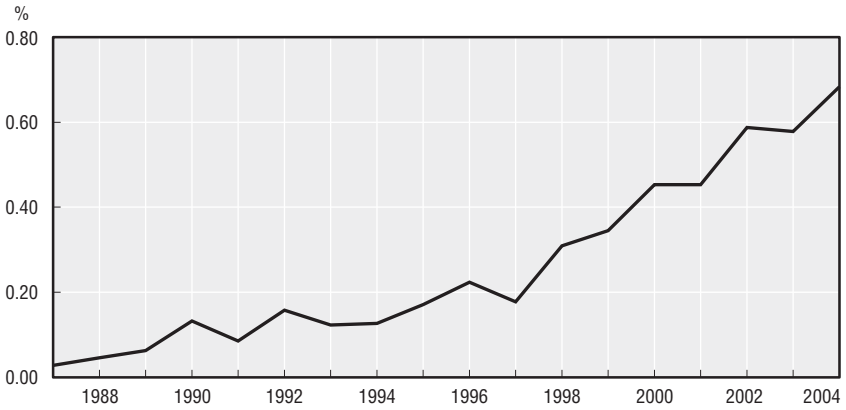
Figure 5.1. **Trends in patenting of fuel cells,[1] share of patents filed under the PCT,[2] 1987-2004**



Note: Patent counts are based on the priority date, the residence of the inventors and fractional counts.
1. Fuel cells patents are identified using IPC classes H01M8/00-8/24, and refer to patent applications filed under the PCT, at international phase, designating the EPO.

Source: OECD, *Patent Database*.

analysing technology development, patent data have been used for studies investigating issues such as:

- New technical fields (emergence and evolution), *e.g.* polymer-based semiconductors, wind energy technologies.
- Technology life cycles (maturity of technology), *e.g.* tracking annual growth rates of patenting over long periods of time to learn whether there is a reduction in the rate of new breakthroughs (mature technologies: farming, motor vehicles, etc.).
- Cross-technology fertilisation (how one technology influences others), *e.g.* the influence of plasma technologies on electronics (new generations of chips), environmental technologies (plasma lamps).

Patent documents contain several types of information which can be used for classifying patents in particular fields: a technical class code and textual information (title, abstract, claims and description). Sometimes other information is used, *e.g.* the applicant or references.

5.2.1. *The International Patent Classification system*

To facilitate the search of prior art, patent offices classify patents according to their subject matter. These codes are reported on the patent document's front page. These classifications have been established from a technical point of view in order to retrieve patent documents that reflect the state of the art in a particular field.

In view of the international dissemination of patent information, a common international system has proved useful. The International Patent Classification (IPC) system grew out of the Strasbourg Agreement of 1971 as an internationally acknowledged method of classifying patents for inventions, including published patent applications, utility models and utility certificates. Currently the IPC is used in more than 100 countries as the major or, in some instances, the only form of classifying these documents. The purpose of the IPC system is to group patent documents according to their technical field, whatever the language and terminology.

According to the IPC Guide (8th edition, 2006), an invention is assigned to an IPC class by its function or intrinsic nature or by its field of application. The IPC is therefore a combined function-application classification system in which the application takes precedence. A patent may contain several technical objects and therefore be assigned to several IPC classes. The IPC codes are published on the patent documents.[1] The IPC system is periodically reviewed in order to improve it and take technical and electronic developments into account. If necessary, it is amended. Prior to 2006, the amendments were not made retroactive, and this can create difficulties for studies that use past series. As of April 2007, over 140 million IPC8 classifications have been applied, approximately 92% of which have been applied retroactively to documents published prior to the entry into force of IPC8. The subgroups are hierarchical. The level of subgroup is indicated by the number of dots preceding the title. The IPC 8th edition introduces the core and advanced levels (see Table 5.1 for an example).

The EPO works with the ECLA (European Classification System), which is essentially a refined version of the IPC (140 000 categories instead of 70 000 for the IPC). The USPTO uses the US patent classification (USPC). The USPC contains over 160 000 subdivisions. A fundamental principle of the USPC system is that each class is created by first analysing the claimed disclosures of US patents and then creating various divisions and subdivisions on the basis of that

Table 5.1. **Main characteristics of IPC codes (example)**

Subdivision	Number	Symbol (code letter)	Title (code label)
Section	8	G	Physics
Subsection	20		Instruments
Class	118	G06	Computing; Calculating; Counting
Subclass	616	G06F	Electrical digital data processing
Main group	6 871	G06F-9/00	Arrangements for programme control
Subgroup	57 324	G06F-9/06	* Using stored programme
		G06F-9/46	** Multi-programming arrangements

Source: World Intellectual Property Organization (2006), *IPC Guide*, 8th edition.

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analysis. All similar subject matter is gathered together in large groupings to create classes. These classes are then subdivided into smaller searchable units called subclasses. In terms of depth of classification, USPC usually gives more information on the invention than the IPC. The first-listed USPC for a patent is hierarchical and is its primary classification, assigned according to a well-defined set of classification rules.

In addition to the IPC, the Japan Patent Office (JPO) implements an additional classification system, the FI (file index) classification and the F-term (file-forming term) system. The FI classification is an extension of the IPC and is similar to the ECLA. It consists of an IPC subgroup followed by a three-digit number called "IPC subdivision symbol" and/or by one alphabetical letter called the "file discrimination symbol". IPC subdivision symbols and file discrimination symbols are unique to the FI classes and are structured hierarchically. The F-term system works from multiple technical viewpoints, unlike the IPC which classifies documents mostly from a single technical viewpoint. Each technical field determined by the range of FI, which is called "theme",[2] has a unique F-term list structure containing multiple viewpoints subdivided by many F-term list structure, subdivided by many F-terms. Usually a plurality of F-terms is assigned as a set to each patent document. Both indexes are assigned by the patent examiners of the JPO.

One patent document can contain one or several IPC codes. In the EPO, IPC codes are not hierarchical, *i.e.* the first is not more important or more relevant than the others. In the JPO, the first IPC code is the main code (indicating technology class), or it is identified with the number one (1). Patent classes are attributed by examiners; when entering the patent procedure, an application is usually pre-classified (using both manual analysis and specialised software), so as to be channelled towards the correct examination unit. Then it is attributed to an examiner, who may refine, modify or complement the list of codes of the application. Fractional counts can be used to count patents by IPC classes (or technology areas: groups of IPC classes).

5.2.2. *The identification of technological fields*

The information provided by the IPC constitutes a first reference for identifying patents in a specific technical domain. It is not enough, however, for all uses of the data; for since analytical or policy interest are not factors that are assigned or easily identifiable in patent classifications, *e.g.* for ICT (information and communication technology), biotechnology or nanotechnology. Such aggregates have to be reconstructed, on the basis of the available information: the IPC code or the textual data available.

The first step is to have a clear and operational definition of the technical field of interest. This description will be complemented by keywords, which

reflect the content of the field and are used by engineers working in the field. The definition and keywords may evolve over time, as the technology evolves. One can then:

- Search for such keywords in the definitions of IPC (or other technical classification) codes, and consider as patents belonging to the field all documents which belong to one of the selected codes.
- Search for keywords in the text of patents (in the title, the abstract, etc.).
- Adopt a mixed solution, *e.g.* by looking for keywords in IPC codes or checking manually the relevance of the results.

A technology expert should confirm that the set of documents identified by these methods truly meets the intended criteria of the desired sample of patents.

For instance, at the EPO, the identification of nanotechnology patents involved a series of steps. First, a nanotechnology working group (NTWG) was created in 2003. At the beginning, it worked on the definition of nanotechnology in order to watch trends in nanotechnology patents. It then identified nanotechnology patents through keyword searches, consultations with nanotechnology experts at the EPO, and peer reviews by external experts. Patent applications from 15 countries or organisations were analysed and tagged to class Y01N.[3]

The OECD has designed definitions of various technical fields: ICT, biotechnology, space-related technologies, environmental technologies, etc. These definitions consist of: *i)* a textual definition of the technical field; and *ii)* a list of associated IPC classes. Reducing a technical field to a list of IPC classes has the advantage of simplicity of use (it suffices to identify the IPC code of a patent to attribute it to the relevant field). On the other hand, it does not allow discriminating within IPC codes, and thus increases the risk of misusing relevant documents or including irrelevant ones. The Y01N code for nanotechnology, which is attributed partly by examiners on an *ad hoc* basis, avoids such a drawback, but in view of the cost it cannot be extended to many other fields. Figure 5.1 displays trends in patenting related to fuel cell technology and Figure 5.2 reports the share of countries in this technological domain. As mentioned, patents provide information that makes it possible to track very specific technology areas at a very refined level. Figure 5.3 shows the share of related techniques (identified according to the main IPC code) in fuel cell patents.

A partition of technical fields has been proposed by OST-INPI/FhG-ISI *(Observatoire des Sciences et Technologies, Institut National de la Propriété Intellectuelle)* and the Fraunhofer Institute for Systems and Innovation Research). It consists of a list of 30 technical categories, which are groupings of IPC subclasses and cover the entire IPC classification. As compared with the IPC itself, this grouping is closer to the concerns of policy-oriented analysis.

Figure 5.2. **Share of countries in fuel cell patents,[2] 2000-2004**

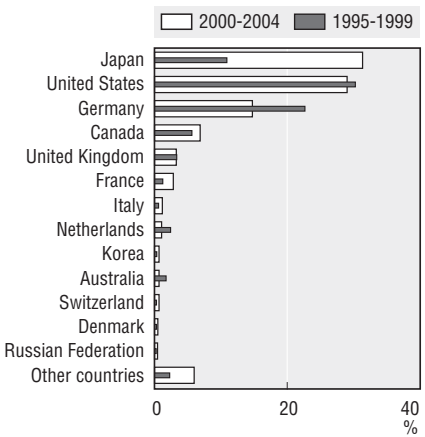
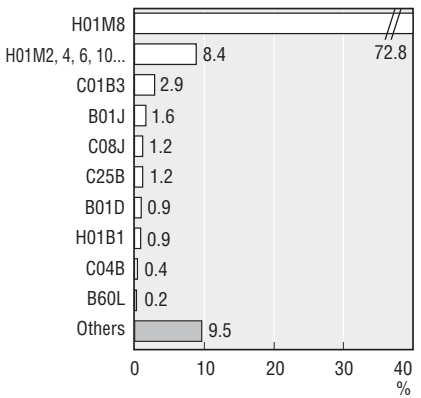


Figure 5.3. **Share of related-techniques[1] in fuel cell patents,[2] 2000-2004**



Note: Patent counts are based on the priority date, the residence of the inventors and fractional counts.

1. Fuel cells patents are identified using IPC classes H01M8/00-8/24, and refer to patent applications filed under the PCT, at international phase, designating the EPO.
2. Different techniques were identified according to the main IPC code of fuel cell patent: Separation (B01D); Chemical or physical processes (B01J); Electric equipment or propulsion of electrically-propelled vehicles (B60L); Hydrogen (C01B3); Lime, Magnesia, Slag, Cements (C04B); General processes of compounding (C08J); Electrolytic or electrophoretic processes (C25B); Cables, Conductors, Insulators (H01B1); Batteries – unclassified fuel cells (H01M2, 4, 6, 10, 12); Fuel cells (H01M8).

Source: OECD, *Patent Database*.

5.2.3. *The sectoral specialisation of countries*

The identification of technology domains and industries in patent data makes it possible to analyse the relative technological position of a country relative to others or to the world average. More specifically, the sectoral structure of countries' patenting activity can be investigated using patent indicators of specialisation (Soete and Wyatt, 1983). The most frequently used indicator is called the "specialisation index" or the "revealed technological advantage" (RTA) index and is defined as the share of a country *i* in patents in a particular field of technology *d* divided by the country's share in all patents:[4]

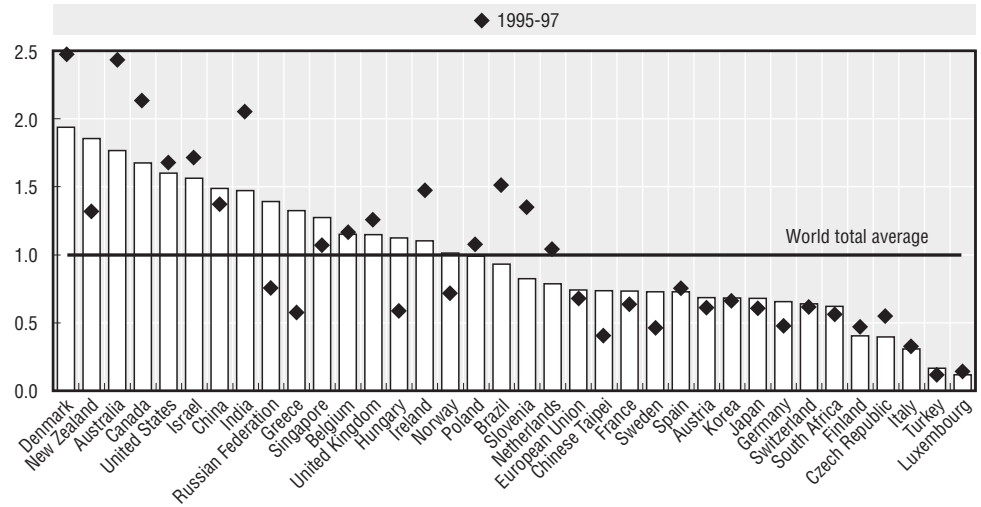
$$\text{RTA} = \frac{\left(P_{d,i} / \sum_{d} P_{d,i} \right)}{\left(\sum_{di} P_{d,i} / \sum_{d,i} P_{d,i} \right)}$$

The index is equal to zero when the country holds no patents in a given sector, is equal to 1 when the country's share in the sector is equal to its share in all fields (no specialisation), and grows rapidly (the upper limit will depend on the

world distribution used) when a positive specialisation is found. The logarithm of the index can be used to obtain a new indicator with a distribution ranging from –1 to +1. Figures based on RTA indicators must be interpreted with caution, especially for international comparisons. A country with a very large total patent output will tend to have all its RTAs in the neighbourhood of 1, whereas a country with a low output of patents will have a very high value for the fields in which its output is slightly higher than the average for the country.

Specialisation indicators can be calculated for different periods, to show how countries' specialisation patterns have evolved over time. It should be remembered, however, that such indicators are relative to the world sectoral distribution of patents; if one country holds its distribution of patents steady while others increase their activity in an emerging field, its specialisation index in that field will decline. Figure 5.4 displays the specialisation index in biotechnology patenting for countries with more than 150 EPO applications for the period 1995-2002.

Figure 5.4. **Specialisation index of biotechnology patents filed at the EPO,[1] 2000-2002**



Note: Patent counts are based on the inventor's country of residence, the priority date and fractional counts.
1. The graph only covers countries/economies with more than 150 EPO applications for the period 2000-02.
Source: OECD, *Patent Database*.

5.3. Industry classification

Patents can be used as indicators of the output of R&D, or inputs to innovation at the industry level. However, patent data cannot be directly attributed to particular industries, as patent documents do not explicitly include the information that makes it possible to identify the economic sector to which the technology embodied in the patent is associated. The association of patents to industries allows patent data to be matched with other industry

data, such as the OECD STAN database, and thus to analyse important policy issues, for example:

- The inventiveness of industries: estimating knowledge production functions at industry level, with inputs (notably R&D) on the right-hand side and outputs (patent-based indicators) on the left-hand side (*e.g.* Pavitt, 1984; Ulku, 2007).
- The industry specialisation of countries, in connection with trade and production specialisation (*e.g.* Dosi *et al.*, 1990; Malerba and Montobio, 2003).
- Cross-industry technology transfers (for example using patent citations associated with the source and the recipient industries).

The attribution of patents to industries can be made in the following ways:

- Direct attribution, by *ad hoc* examination of the patent.
- Attribution to the patent of the industry code of its applicant (company).
- Establishing *a priori* (with experts) a correspondence between IPC classes and industries, and integrating this into a concordance table.

In certain cases a mix of methods has been used to maximise the quantity of information integrated in the process.

Several methods have been developed over the last two decades. As explained by Schmoch *et al.* (2003), a reliable concordance should meet the following conditions: *i)* international comparability: it should be adaptable to other industry classifications; *ii)* adequate level of desegregation: it should allow backward breakdown of industries to technology fields; *iii)* strong empirical basis: it should be consistent with trends in countries' technological and production activity; and *iv)* it should be easily applicable to specific problems.

Two different criteria can be used to designate patents' industry affiliation: *i)* patents can be allocated to the industrial sector of origin (to the main economic sector of the inventing/applicant company), or *ii)* they can be allocated to the sector of use (to the main industry to which the product incorporating the invention belongs).

Nearly all available concordance tables have taken the first approach. However, these classifications encounter numerous difficulties as not all inventions can be allocated to a sector or, as in most cases, they can be pertinent to different industries at the same time. The classification by main economic activity of companies presents problems as well: large firms in particular patent in a variety of fields which do not necessarily correspond to their main economic activity. While small companies are likely to be more specialised, their field of activity might not be accessible from any database. As patent and industrial classifications change over time, concordance tables need to be regularly updated.

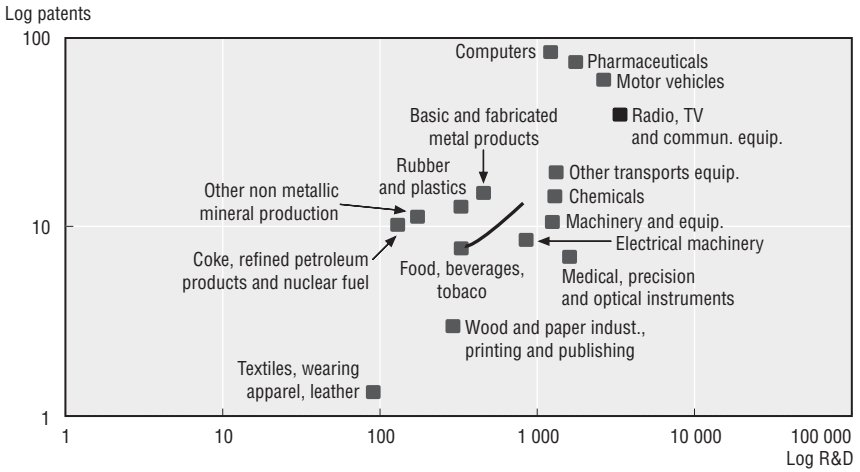
An early attempt to build an industry concordance table for patents was the "Yale Concordance" developed by Evenson, Putnam and Kortum (1991) on the basis of the industry classification implemented by the Canadian Intellectual Property Office (CIPO). Between 1972 and 1995, examiners from the CIPO assigned IPC codes along with an industry of manufacture (IOM) and sector of use (SOU) code to each of over 300 000 granted patents.

Another attempt was the "OTAF Concordance", the USPTO concordance between the US Patent Classification (USPC) system and the US Standard Industrial Classification (SIC) system, created in 1974. It relies on a manual review and mapping of classification categories in the USPC, which are associated with a limited set of industry-based product fields based on the 1972 SIC. These are high-level SIC classifications which are generally at the two- to three-digit SIC level (41 industrial sectors). The concordance is based on the industry of manufacture and is regularly updated, generally annually, to accommodate the changes and revisions that are made annually to the USPC. Efforts are being made to update this concordance to the recently adopted North American Industry Classification System (NAICS). Other work in this field includes the concordance proposed by Johnson (2002) based on data from the Canadian Patent Office. It includes linkages of technologies, based on probabilities of matching, to about 115 sectors of manufacture and use.

A more recent concordance table has been designed by Schmoch *etal*. (2003) from the Fraunhofer Institute for Systems and Innovation Research, the *Observatoire des Sciences et des Techniques* (OST) and the University of Sussex, Science and Policy Research Unit (SPRU). The authors rely on the economic activity of companies to relate technologies to industries.[5] Their methodology involves four steps. First, a set of industrial sectors, defined by NACE and ISIC codes (two-digit level), was selected as a basis. Second, technical experts associated 625 IPC subclasses to technological categories (44 fields) and to industrial categories according to the manufacturing characteristics of products. Third, the technical and industrial approaches were compared by investigating patent activities by technology-based fields for 3 400 large patenting firms classified by industrial sector (44 industrial sectors). This computation led to the elaboration of a transfer matrix or concordance between technology and industry classifications. Fourth, the adequacy and empirical power of the concordance were verified by comparing the resulting country structures (*e.g.* similarities in the distribution of a given technology across and within industries, by country and over time). This table was sponsored by Eurostat. It is used by the OECD for the ANPAT database, the patent segment of the STAN database (which also includes databases of value added, employment, R&D, etc., at industry level for 20 industries, starting in 1971).

Based on this concordance, Figure 5.5 displays the relationship between patenting and R&D expenditure (OECD averages) for manufacturing industries.

Figure 5.5. **Patenting by industry and business R&D,**[1, 2]
PCT applications 2002-04



Note: Patent counts are based on the priority date and fractional counts.

1. Patent applications filed under the Patent Cooperation Treaty, at international phase, designating the European Patent Office.
2. Average business R&D expenditure in 1999-2000, USD millions (2000) using purchasing power parities and patenting by industry in 2002-04 in OECD countries.

Source: OECD, *Patent Database*.

R&D-intensive industries, such as pharmaceuticals, computers, precision and optical instruments, are among those that patent the most. Inversely, weaker technological activity, in terms both of R&D and patenting, is frequently found in textiles, leather, and wood and paper-related industries.

5.4. Regional classification

Describing and understanding regional patterns of innovation is important both for regional and national policy makers; it provides regional policy makers with benchmarks and references, while for national policy makers it captures an important dimension of national innovation policies. Attributing patents to regions makes it possible to address important policy questions such as:

- The comparative technological performance and profile of regions.
- The importance of geographical proximity for innovation (Jaffe *et al.*, 1993; Audretsch and Feldman, 1996).
- The spatial distribution (or concentration) of innovative and productive activity across regions (*e.g.* Paci and Usai, 2000).
- Interaction and technological co-operation within and across regions (*e.g.* Breschi and Lissoni, 2001).

Information provided on the front page of a patent includes the address of the inventors and applicants. This information, which includes city, region and postal (ZIP) code, makes it possible to link patents to a particular region (of the inventor or of the applicant) with the use of lookup tables (postal codes, city names, etc.). Regionalisation of patent information depends on the details (and quality of information) given in the address. This information is not always consistent across patent offices and is not very detailed in some countries. As the information is often partial, and sometimes missing, sophisticated algorithms have to be run to identify the relevant information and match it to information given in specialised regional databases. For instance, USPTO patents usually do not include the ZIP code of the inventor, but only the city name and (not always) the state code.[6] For regionalising such patents the city name should be used, while recognising the need to deal with difficulties such as the fact that several cities may have the same name.

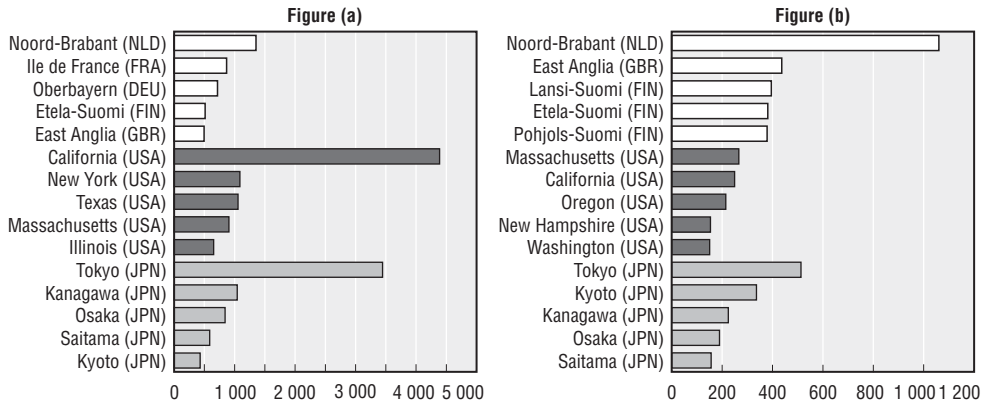
Regions are defined in standard ways. The OECD uses the TL ("territorial levels") classification, which has different levels of aggregation (TL 2 consists of about 300 macro-regions; TL 3 consists of 2 300 regions, *e.g.* the US Bureau of Economic Analysis (BEA) economic areas, Japanese prefectures, French *départements*). In EU countries, regions are defined by NUTS (*Nomenclature des Unités Territoriales Statistiques*), an official classification of the European Commission. The OECD has compiled databases of patents (PCT, EPO) at TL3 level (see Maraut *et al.*, 2008).[7] Figure 5.6 gives the example of the top patenting regions for ICT technologies.

When using regionalised patent data, two particular issues need to be kept in mind. First, regarding inventors, it is important not to use too detailed a level in certain large urban areas. The inventor may live in a different postal code from that of the laboratory (which will then be in a neighbouring area). Co-inventors of the same invention may live in different zones of the same (large) city but work at the same place. Hence, for large urban areas with several detailed sub-areas it may be preferable to work data at a more aggregate level (*e.g.* TL 2 instead of TL 3). In Europe, the Paris and London areas would be examples. Second, a patent application may be filed by an affiliate of a firm, or co-filed by the firm and one of its affiliates. The address of the affiliate will appear in these cases and may not reflect the location of the entity actually controlling the patent. Consolidation of company ownership by groups will solve that problem.

5.5. Institutional sectors

The institutional sector of a patent holder is determined by its legal status: it can be an individual, a company (business sector, a government entity, a university or a hospital). The identification of patenting by universities and

Figure 5.6. **ICT patents by region in Europe, the United States and Japan**[1, 2, 3]
The number of PCT applications (a) and PCT applications per million labour force (b) in 2004



Note: Patent counts are based on the priority date, the inventor's region of residence and fractional counting.
1. Only countries with more than 100 PCT applications in 2004 are included.
2. Countries in which 60% or more inventors' addresses are assigned to regions are included.
3. Only regions with more than 100 PCT applications in 2004 are included. ICT patents are identified by the International Patent Classification (IPC).

Source: OECD, *Patent Database*.

public institutions (government research centres) allows for the examination of issues such as:

- The impact of certain policies on university patenting (*e.g.* the Bayh-Dole Act in the United States and similar policies in other countries; see Mowery *et al.*, 2001).
- Patterns in co-operative research between universities and public research centres and private companies (*e.g.* Cassiman and Veugelers, 2005).

Patent data can be matched with other data, such as R&D, if the list of institutional sectors for the two data sources is compatible.

Methods for allocating institutional categories to patents rely on algorithms designed to identify relevant information from the name field of patents which can provide clues to the "sector" (see Table 5.1). Such clues can be parts of names, specific words (*e.g.* government) and/or terms signalling specific legal forms (*e.g.* Inc., Ltd.). If such clues can be identified in a systematic manner, they can be integrated into one script that allows for an automated allocation of sector codes.

Van Looy *et al.* (2006) have recently developed, for Eurostat, a methodology based on this approach (see Table 5.2). In line with the OECD *Frascati Manual* (2002),[8] this algorithm permits the allocation of patents to: *i)* individuals, *ii)* private enterprises, *iii)* government, *iv)* universities, *v)* hospitals or *vi)* private non-profit organisations.[9] Their analytical procedure combines both rule-based

Table 5.2. **Examples of keywords/clues used to identify patentee sectors**

Sector	Keywords
(1) Individual	"*DIPL.-ING.*"; "*PROF.*"; "*DR.*"; "DECEDE*", "DECEASED*"; "*DIPL. ING.*"; "*P.HD*"; "*DIPL.-GEOGR.*"; "*ING.*"; "*EPOUSE"*
(2) Private enterprise	"*SA*"; "*S.R.L.*"; "*HANDESLBOLAGET*"; "*ING.*" ; "*INC*" ; *LTD*; "*S.A.R.L."* "*BVBA*"; "*S.P.R.L. *" ; "*NAAMLOZE VENNOTSCHAP*"; "*AKTIEBOLAG*"
(3) University	"*UNIVERSI*"; "*UNIV.*"; "*COLLEGE"; "*SCHOOL;"*REGENTS*"; "*ECOLE*"; "*FACULTE*"; "*SCHULE*"; "*UNIVERISTY"; "*UNIVERSITY*";
(4) Hospital	"*HOSPITAL*"; "*MEDICAL CENTER*"; "*MEDICAL CENTRE*"; "*ZIEKENHUIS*"; "*CLINIQUE*"; "*NOSOCOMOIO*"; "*CLINICA*"; "*POLICLINICA*"; "*HOPITAL*"; "*HOPITAUX*"
(5) Public and private non-profit	"*GOUVERNEMENT*", "*MINISTRO*"; "*INSTIT*"; "*ÏNSTYTUT*" ; "*FONDATION*"; "*CHURCH*" ; "*TRUST*"*KENKYUSHO*" ; "*STIFTUNG*"

Source: Van Looy *et al.* (2006).

and case-based logic. The former works on the assumption that information incorporated in patentee names can provide keywords on institutional membership, which can then be translated into a set of rules for the allocation of sector codes. In practice, however, as the authors found out, such a rule-based approach is insufficiently complete and accurate. The absence of clues, as well as the simultaneous presence of several clues that suggest different sectors, are common features. In order to remedy this situation, a second, case-based, layer is introduced. Conditionality is introduced to minimise the number of multiple sector assignments.

The matching of name characteristics to the different categories is sometimes not clear-cut for certain types of organisation. For instance, hospitals can be classified as either "business enterprise", "private non-profit" or "higher education" depending on the governance mode under which they operate. The sector in which a given organisation should be classified is not always clear from looking solely at name field information found in the patent system. To deal with these issues, these authors introduced different types of rules; besides generic ones that relate several patentees to one sector, rules were added targeting specific organisations. This approach is implemented by Eurostat and by the OECD.

It should be noted that using universities as patent applicant for university-originated patents results in incomplete coverage. Inventions from university researchers are not necessarily patented by the university: they may be patented by the researcher, or by a company that funded the researcher. Searching this type of invention requires identifying the university inventors (inventors' names and addresses). By matching inventors to author names

(based on lists of researchers) it is possible to show that in many countries about 50% or more of the university-based patents cannot be identified by the use of applicants (Noyens *et al.*, 2003). Other strategies are to identify university or related institutions in the inventors' addresses; for some countries this has increased the share of patents coming from universities by around 10%.

5.6. Patents by companies

Attributing a patent to particular entities which own them is a key step in much statistical and analytical work based on patents. It allows reconstructing the patent portfolio of companies, which can be used to:

- Compile classifications of patents by industry, technical field, region, institutional sector, etc.
- Analyse the patenting strategy of firms (timing and orientation of their patent filings, in relation to competitors).

Matching patent information with other information at the firm level, such as R&D, innovation, stock market value, etc., makes it possible to relate the technology or patenting strategy of companies to other characteristics: What is the impact of patents on market value? What is the efficiency of R&D (in terms of patent numbers)?

The name and address of the patent holder are published in patent documents: however, the attribution of a patent to a particular entity is not so simple. There can be spelling mistakes; there is the fact that many companies are known under several different names (*e.g.* acronyms: IBM, International Business Machines); some qualifications can be added to the name (*e.g.* Siemens, Siemens AG); patents can be taken by affiliates, some of which are easily identified (*e.g.* Sony US is an affiliate of Sony), whereas others are more difficult (Citroen is part of the PSA group). It is not unusual for a large group to have an affiliate in charge of managing its intellectual property, and the affiliate files in its own name many of the group's patents (*e.g.* Philips).

Changes in the company's legal status, as well as changes in company names, affiliations, and mergers and acquisitions make the use of patentees' names in patent data an imperfect way to analyse company patenting and questions related to companies' patenting and innovation strategies. For instance, when aiming at harmonisation of a legal entity, all patents held by Hewlett Packard, Digital Equipment Corporation and Compaq might be considered as belonging to one and the same legal entity; likewise, "Andersen Consulting" would become harmonised to "Accenture" (name change).

Patent offices do some cleaning and harmonisation of names themselves. For instance, the USPTO deals with the name of the first applicant for any patent. The EPO attributes a standardised code to patent applicants, as does

the JPO for applicants filing electronically. This is not sufficient, however, to address the needs of statisticians. The cleaning and harmonisation of names may go through several steps (not all necessary or exclusive of each other):

- Basic cleaning (standardising abbreviations such as "Ltd", "GmbH", etc.) and standardisation of names.
- Matching the standardised name of applicants with a company database of reference (*e.g.* Amadeus for Europe, Compustat for the United States).
- Reconstructing the group structure by using information on the ownership structure (including affiliates) as reported in specialised databases (*e.g.* the "Who owns whom" database).

The first stage consists of identifying spelling variations in order to clean the names of applicants to obtain a standardised name in order to group companies. This is done with the aid of approximate matching techniques. Two approaches are used to group similar names and standardise. The rule-based approach involves the definition of rules to compare the similarity of names.[10] The second approach relies on the use of dictionaries, large collections of names which serve as examples for a specific entity class. Some examples are: USPTO and EPO standard assignee names file; Derwent Patentee Codes. It is also possible to build own dictionaries with a harmonisation procedure (*e.g.* Magerman *et al.,* 2006).

The second stage is to link the standardised names to the names contained in a company database (*e.g.* Amadeus, Compustat, etc.) directly or in combination with other methods to find as many potential matches as possible. For instance, other available information about the company (in addition to the name) can be used, *e.g.* addresses and searches based on related patentee names of priority patent filings or PCT applications. The matches obtained need to be validated and doubtful matches can only be solved by hand. Lastly, the companies identified can be legally consolidated using information on the ownership structure. These two stages, matching and legal consolidation, can also be carried out at the same time if the company data used already include information on the legal relationships between companies. However, data on ownership structure are rarely codified over time. As a result, most of the available information records only the most recent legal structure of companies. In consequence, further information is needed to track changes (*e.g.* mergers and acquisitions) over time and properly separate patenting activity by companies in different periods of time.

Major work done in this field includes the NBER database of USPTO patents, harmonised with Compustat (*www.nber.org/patents*), the KUL algorithms for Eurostat (Magerman *et al.,* 2006), and the work done by Thoma and Torrisi (2007) and Thoma *et al.* (forthcoming).

5.7. Patents by inventors

The proper identification of inventors in patent filings makes it possible to reconstruct the inventive record of the concerned individuals and to match this record with complementary data on these individuals available from other databases. A wide array of interesting and highly policy-relevant topics can be investigated with the aid of data on the harmonised names of inventors. For instance:

- The productivity of inventors – over time, across fields, countries, etc. (Hoisl, 2007).
- The mobility of inventors – across cities, regions, countries, sectors (*i.e.* shifts between the public and private sectors), and the resulting spillovers of such turnover (Kim *et al.*, 2005; Crespi *et al.*, 2005).
- The networking strategies of inventors – who invents with whom – and their impact on productivity (Singh, 2003; Breschi and Lissoni, 2003).
- Gender issues: Share and profile of genders among inventors (Naldi *et al.*, 2004).

Advances in this area have been hindered by the difficulties associated with the recording of names in patent data and the difficulty of recognising "who is who" in the population of inventors contained in patent data. Three fundamental problems have made the information on inventors relatively ineffective for investigation. First, the name of the same inventor can be spelled slightly differently across some of his/her patents (it may be with or without the middle name and/or initial, with or without surname modifiers, etc). Second, even if there are two exact names, it is not certain that the two names correspond to the same person (the "John Smith" problem). In other words, different inventors having exactly the same name may appear in various patents. Third, the transcription into the Latin alphabet of non-western names is imperfect and can create ambiguities ("Li" *vs.* "Lee").

Researchers have attempted to harmonise names using computerised matching algorithms which they have so far applied to specific subsets of patent data. For example, the methodology developed by Trajtenberg, Shiff and Melamed (2006), which has been used on USPTO patent data, can be summarised as follows:

- **Stage 1: grouping similar names.** In order to address the problem of the name of the same inventor being spelled slightly differently from patent to patent, a two-track approach is used. The first is to "clean up" and standardise the names as much as possible; the second is to complete the list of harmonised names with the aid of the "Soundex system" to encode names with similar pronunciation.[11]

- **Stage 2: comparing names and matching.** To deal with the problem of identifying a given individual among the "suspects" with the same name, the names are compared and matching criteria are imposed. Pair-wise comparisons can be made between any two "suspects" using a series of variables such as middle name, geographic location (*e.g.* postal codes, cities, etc.), the technological area (*i.e.* patent class), the assignee, the identity of the co-inventors, etc. If a data item is the same in two suspect records (*i.e.* if two records display the same address, or are in the same patent class, or share the same partners, etc.), then the pair is assigned a certain score. If the sum of these scores is above a predetermined threshold, the two records are "matched" and they are regarded as being the same inventor.[12]

Notes

1. The IPC is structured into sections, classes, subclasses, main groups and subgroups. The IPC divides patentable technology into eight key areas (A: Human Necessities; B: Performing Operations, Transporting; C: Chemistry, Metallurgy; D: Textiles, Paper; E: Fixed Constructions; F: Mechanical Engineering, Lighting, Heating, Weapons; G: Physics; H: Electricity). Within these areas technology is divided and subdivided to a detailed level, which allows the subject matter of a patent specification to be very thoroughly classified.
2. F-terms do not exist for all Japanese documents; the coverage depends on the field of technology.
3. The Y code is a "parallel tag". This means that an application can be in almost any technical IPC class area, but if the size is small so that it is nano, it gets a Y code. The EPO definition of nanotechnology is the following: "The term nanotechnology covers entities with a controlled geometrical size of at least one functional component below 100 nm in one or more dimensions susceptible to make physical, chemical or biological effects available which are intrinsic to that size. It covers equipment and methods for controlled analysis, manipulation, processing, fabrication or measurement with a precision below 100 nm."
4. The RTA index can be applied not only relative to world sectoral distribution but also to other comparison groups (*e.g.* national or regional distribution).
5. Other decisions in generating the concordance matrix are: only large patents are included, only manufacturing companies are considered, only the "principal" product group of a firm is considered (although some large companies are multi-product) and only first IPC class is considered.
6. Addresses provided in EPO patents are more complete than those of USPTO and PCT (WO): in most cases, both the town name and the postal codes are available in the address field of EPO patents. In USPTO patents, the postal codes are often missing and the regionalisation process is mostly based on town names.
7. The data sources of the Regional Patent Database (OECD) are EPO's Worldwide Statistical Patent database (PATSTAT): extraction of patents taken at the EPO, the USPTO and PCT filings (WO publications); and inventors and applicants records from EPO patents (data extracted from Epoline web services).

8. It should be noted that individual (private) applicants do not show up as a separate category in the Frascati classification; in addition, the "Abroad" category carries little relevance when classifying patentee names. In the OECD *Frascati Manual* (2002), five sectors are identified: *i)* business enterprise; *ii)* government; *iii)* private non-profit; *iv)* higher education; and *v)* abroad. Households are considered part of the private non-profit sector.
9. The USPTO uses a classification with seven categories: unassigned (those patents for which the inventors have not yet granted the rights to the invention to a legal entity), and assigned to: US non-government organisations, non-US non-government organisations, US individuals, non-US individuals, the US federal government, and non-US governments.
10. Two examples are the Levenshtein's "Edit Distance", which measures similarity by the number of operations to switch from one word to another; and the Jaccard Similarity Measure, which is token-based and accounts for differences due to the position of the same tokens between otherwise identical strings. Other algorithms – such as Token-based or N-grams, among others – may often use Jaccard-style indicators for the final computation of similarity.
11. Soundex is a *phonetic algorithm* for indexing names by sound, as pronounced in *English*. The goal is for names with the same *pronunciation* to be encoded to the same representation so that they can be matched despite minor differences in spelling.
12. Once that is done for all the pairs in the comparison set, the condition of transitivity is imposed, *i.e.* if record A is matched to record B, and B to C, then the three are regarded as the same inventor.

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Acronyms

AFA	Activity of Foreign Affiliates Database
ARIPO	African Regional Intellectual Property Organization
BEA	Bureau of Economic Analysis (United States)
CAFC	Court of Appeals of the Federal Circuit (United States)
CIP	Continuation-in-Part
CIPO	Canadian Intellectual Property Office
DPMA	Deutsches Patent- und Markenamt (Germany)
ECLA	European Classification System
EPC	European Patent Convention
EPLA	European Patent Litigation Agreement
EPO	European Patent Office
EU	European Union
FhG-ISI	Fraunhofer Institute for Systems and Innovation Research
GATT	General Agreement on Trade and Tariffs
ICT	Information and communication technologies
IIP	Institute of Intellectual Property (Japan)
INID	Internationally agreed numbers for the identification of bibliographic data
INPI	Institut National de la Propriété Intellectuelle (France)
IPC	International Patent Classification
IPRP	International preliminary report on patentability
ISA	International search authorities
ISIC	International Standard Industrial Classification
ISR	International search report
NACE	Classification of Economic Activities in the European Community
NAICS	North American Industry Classification System
NBER	National Bureau of Economic Research (United States)
NISTEP	National Institute of Science and Technology Policy (Japan)
NSF	National Science Foundation (United States)
NUTS	Nomenclature of territorial units for statistics (*Nomenclature des unités territoriales statistiques*)
OECD	Organisation for Economic Co-operation and Development
OST	Observatoire des Sciences et des Techniques (France)

PATSTAT	Worldwide Statistical Patent Database (EPO)
PCT	Patent Co-operation Treaty
SIC	Standard Industrial Classification
SIPO	State Intellectual Property Office of the People's Republic of China
SMEs	Small and medium-sized enterprises
STAN	Structural Analysis Database
TL	Territorial level
TRIPS	Trade-related intellectual property rights
USPC	United States Patent Classification System
USPTO	United States Patent and Trademark Office
WIPO	World Intellectual Property Organization
WOISA	Written opinion of the international search authorities
WTO	World Trade Organization

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Glossary

Appeal: A procedure by which the applicant or patent holder can request reversal of a decision taken by the patent office.

- *USPTO:* An applicant for a patent dissatisfied with the primary examiner's decision in the second rejection of his or her claims may appeal to the Board of Patent Appeals and Interferences (BPAI) for review of the examiner's rejection. The Board is a body of the USPTO which reviews adverse decisions of examiners in patent applications and determines priority and patentability of invention in interferences. Decisions of the Board can be further appealed to the *Court of Appeals for the Federal Circuit* (CAFC) or to a district court.
- *EPO:* Decisions of the first instances of the EPO can be *appealed* before the Boards of Appeal of the EPO, in a *judicial* procedure (proper to an administrative court), as opposed to an *administrative* procedure. These boards act as the final instances in the *granting* and *opposition* procedures before the EPO. In addition to the Boards of Appeal, the European Patent Office has an Enlarged Board of Appeal. This instance takes decisions only when the *case law* of the Boards of Appeal becomes inconsistent or when an important point of law arises.
- *JPO:* An applicant who receives a rejection can appeal. The panels consist of three or five trial examiners in the Appeals Department of the JPO. Decisions of the panels can be further appealed to the Intellectual Property High Court, a special branch within the Tokyo High Court.

Applicant: The holder of the legal rights and obligations on a patent application. It is most often a company, a university or an individual.

Application date: The date on which the patent office received the completed patent application. A unique number is assigned to a patent application when it is filed.

Assignee: In the United States, the person(s) or corporate body to whom all or limited rights under a patent are legally transferred by the inventor (equivalent to "applicant" in this context).

Citations: References to the prior art in patent documents. Citations may be made by the examiner or the applicant. They comprise a list of references which are believed to be relevant prior art and which may have contributed to defining the scope of the claims of the application. References can be made to

other patents, to technical journals, textbooks, handbooks and other sources. *USPTO:* Applicants before the USPTO are required to disclose prior art known to them that is material to patentability; *EPO:* No such obligation for the applicant; *JPO:* The requirement for disclosure of information on prior art documents was introduced as of 1 September 2002 and entered into full force on 1 May 2006.

Claim(s): Definition of the scope of the invention and the aspects of the invention for which legal protection is sought.

Continuation(s) *(USPTO)***:** Second or subsequent applications for the same invention claimed in a prior non-provisional application and filed before the first application is abandoned or patented. Continuations must claim the same invention as the original application to gain the benefit of the parent filing date. At the time of filing the claims are often the same but the claims may change during prosecution so that they are not exactly the same but not patentably distinct. There are three types of continuing applications: division, continuation and continuation-in-part.

Designated countries: In international and regional patent systems, countries in which patent applicants wish to protect their invention if/when the patent is granted. International application filing automatically includes the designation for all PCT contracting countries that are bound by the PCT on the international filing date (since 2004). A similar rule will apply to the EPO from April 2009, as European patent applications designate all contracting states as in the PCT procedure.

Direct European route (application): A patent application filed under Article 75 EPC (also known as an "Euro-Direct application"). With the direct European route, the entire European patent grant procedure is governed by the EPC alone while with the Euro-PCT route, the first phase of the grant procedure (the international phase), is subject to the PCT.

Division: If the patent office decides that an application covers too broad an area to be considered as a single patent, the application is split into one or more divisional applications, which may or may not be pursued by the applicant. A division can also be requested at the initiative of the applicant.

Equivalent: A patent that protects the same invention and shares the same priority application as a patent from a different issuing authority.

Euro-PCT route: A way to obtain a European patent by designating the EPO in a PCT application (Article 11 PCT). The first phase of the grant procedure (the international phase) is subject to the PCT, while the regional phase before the EPO as designated or elected office is governed primarily by the EPC.

- **Euro-PCT application** – international phase (or Euro-PCT application or PCT international): A PCT application designating the EPO [Article 150(3) EPC]. With

the Euro-PCT route, the first phase of the grant procedure (international phase) is subject to the PCT, while the regional phase before the EPO as designated or elected office is governed primarily by the EPC.

- **Euro-PCT application – regional phase (or PCT regional):** PCT application entering the European (or regional) phase once the applicant has fulfilled the conditions under Article 22 or 39 PCT, Article 158 and Rule 107 EPC.

Euro-PCT search (or PCT Chapter I): Search carried out by the EPO acting as International Searching Authority for a Euro-PCT application in the international phase (Article 16 PCT).

European patent: A European patent can be obtained for all EPC countries by filing a single application at the EPO in one of the three official languages (English, French or German). European patents granted by the EPO have the same legal rights and are subject to the same conditions as national patents (granted by the national patent office). It is important to note that a granted European patent is a "bundle" of national patents, which must be validated at the national patent office in order to be effective in member countries. The validation process may include submission of a translation of the specification, payment of fees and other formalities of the national patent office (once a European patent is granted, competence is transferred to the national patent offices).

European Patent Convention (EPC): The Convention on the Grant of European Patents was signed in Munich in 1973 and entered into force in 1977. It is a multilateral treaty instituting the European Patent Organisation and providing an autonomous legal system according to which European patents are granted. The EPC provides a legal framework for the granting of European patents, via a single, harmonised procedure before the European Patent Office. It enables the patent applicant, by means of a single procedure, to obtain a patent in some or all of the contracting states. As of January 2008 there are 34 EPC member countries. In addition, extension agreements exist with five countries, offering the possibility to extend European patents to those countries upon request. EPC member countries are Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Monaco, the Netherlands, Norway, Poland, Portugal, Romania, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom. EPC extension countries are Albania, Bosnia and Herzegovina, Croatia, Former Yugoslav Republic of Macedonia, and Serbia.

European Patent Office (EPO): The European Patent Office (a regional patent office) was created by the EPC to grant European patents, based on a centralised examination procedure. By filing a single European patent application in one of the three official languages (English, French or German), it is possible to

obtain patent rights in all EPC member and extension countries. The EPO is not an institution of the European Union.

Family: a set of patents (or applications) filed in several countries to protect the same invention. They are related to each other by one or several common priority numbers. There are different definitions of patent families (*e.g.* triadic patent families, extended families including continuations, etc.). Depending on the use sought, a different family concept can be chosen, *e.g.* equivalents, triadic family or trilateral family.

First to file: A patent system in which the first inventor to file a patent application for a specific invention is entitled to the patent. This law is increasingly becoming the standard for countries adhering to the Trade-related Aspects of Intellectual Property (TRIPs) guidelines. In the EPO and the JPO, patents are awarded on a first-to-file basis, whereas in the USPTO the patent is awarded on the first to invent basis.

First to invent *(USPTO)***:** A system in which a patent is awarded to the first person who made the invention, even if another person filed for a patent before the person who invented first.

Grant: A patent application does not automatically give the applicant a temporary right against infringement. A patent has to be granted for it to be effective and enforceable against infringement.

Grant date: The date when the patent office issues a patent to the applicant.

Infringement: Unauthorised making, using, offering for sale or selling any patented invention in the country in which the patent is enforceable or importing that invention into said country during the term of the patent.

Intellectual property rights (IPR): The exclusive legal rights associated with creative work, commercial symbols or inventions. There are four main types of intellectual property: patents, trademarks, design and copyrights.

International patent application: See "PCT application". A patent application filed under the Patent Cooperation Treaty (PCT) is commonly referred to as an "international patent application". However, international patent (PCT) applications do not result in the issuance of "international patents" (*i.e.* at present, there is no global patent system that issues and enforces international patents). The decision of whether to grant or reject a patent filed under PCT rests with the national or regional (*e.g.* EPO) patent offices.

International Patent Classification (IPC): The IPC is based on an international multilateral treaty administered by WIPO. The IPC is an internationally recognised patent classification system, which provides a common classification for patents according to technology groups. The IPC is a hierarchical system in which the whole area of technology is divided into eight sections broken down into classes, subclasses and groups. IPC is periodically revised in order to

improve the system and to take account of technical development. The eighth edition of the IPC entered into force on 1 January 2006.

International Searching Authority (ISA): An office with competence to carry out the international search for a PCT application. It may be either a national office (Australia, Austria, Canada, China, Finland, Japan, Korea, the Russian Federation, Spain, Sweden, the United States) or an intergovernmental organisation (EPO), (Article 16 PCT, Article 154 EPC).

Inventive step: At the EPO and JPO, an invention is considered to include an inventive step if it is not obvious to a person skilled in the art. Inventive step is one of the criteria (along notably with novelty and industrial applicability) that need to be fulfilled in order to obtain a patent. See also "non-obviousness"*(USPTO)*.

Inventor country: Country of residence of the inventor.

Japan Patent Office (JPO): The JPO administers the examination and granting of patent rights in Japan. The JPO is an agency of the Ministry of Economy, Trade and Industry (METI).

Lapse: The date when a patent is no longer valid in a country or system owing to failure to pay renewal (maintenance) fees. Often the patent can be reinstated within a limited period.

Licence: The means by which the owner of a patent gives permission to another party to carry out an action which, without such permission, would infringe the patent. A licence can thus allow another party to legitimately manufacture, use or sell an invention protected by a patent. In return, the patent owner will usually receive royalty payments. A licence, which can be exclusive or non-exclusive, does not transfer the ownership of the invention to the licensee.

National application: A patent application that is filed at a national patent office according to a national procedure.

Novelty: An invention cannot be patented if certain disclosures of the invention have been made.

Non-obviousness *(USPTO)***:** Something is obvious if the differences between the subject matter to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person with ordinary skills in the art to which said subject matter pertains. See also "inventive step"*(EPO, JPO)*.

Opposition: This is a procedure usually before the issuing patent office, initiated by third parties to invalidate a patent:

- *EPO:* Opposition to the grant of a European patent can be filed within nine months of the mention of the grant in the European Patent Bulletin.

- *JPO:* Opposition to a grant could be filed within six months of the issue of the grant before the reform of appeals for invalidation was introduced in January 2004.

Paris Convention: The Paris Convention for the Protection of Industrial Property was established in 1883 and is generally referred to the Paris Convention. It established the system of priority rights, under which applicants have up to 12 months from first filing their patent application (usually in their own country) in which to make further subsequent applications in each signatory country and claim the original priority date. There are 172 countries party to the treaty (March 2008).

Patent: A patent is an intellectual property right issued by authorised bodies which gives its owner the legal right to prevent others from using, manufacturing, selling, importing, etc., in the country or countries concerned, for up to 20 years from the filing date. Patents are granted to firms, individuals or other entities as long as the invention satisfies the conditions for patentability: novelty, non-obviousness and industrial applicability. A patent is known as a utility patent in the United States.

Patent Cooperation Treaty (PCT): As of March 2008, there were 138 countries party to the treaty, which was signed in 1970 and entered into force in 1978, enabling a patent applicant, by means of a single procedure, to obtain a patent in some or all of the contracting states. The PCT provides the possibility to seek patent rights in a large number of countries by filing a single international application (PCT application) with a single patent office (receiving office). PCT applications do not result in the issuance of "international patents". The decision on whether to grant or reject patent rights rests with national or regional patent offices. The PCT procedure consists of two main phases: *i*) an "international phase"; and *ii*) a PCT "national/regional phase". PCT applications are administered by the World Intellectual Property Organization (WIPO).

PCT international search: A search carried out by a designated office (international searching authority) for PCT applications.

Pending application: An application has been made at the patent office, but no decision has been taken on whether to grant or reject the patent application

Prior art: Previously used or published technology that may be referred to in a patent application or examination report. In a broad sense, this is technology that is relevant to an invention and was publicly available (*e.g.* described in a publication or offered for sale) at the time an invention was made, In a narrow sense, it is any technology that would invalidate a patent or limit its scope. The process of prosecuting a patent or interpreting its claims largely consists of identifying relevant prior art and distinguishing the claimed invention from that prior art. The objective of the search process is to identify patent and non-

patent documents constituting the relevant prior art in order to determine whether the invention is novel and includes an inventive step.

Priority country: Country where the patent is first filed worldwide before being extended to other countries. See "Paris Convention".

Priority date: The priority date is the first date of filing of a patent application, anywhere in the world (usually in the applicant's domestic patent office), to protect an invention. The priority date is used to determine the novelty of the invention, which implies that it is an important concept in patent procedures. Among procedural data, priority date can be considered as the closest date to the date of invention. In the United States the date of conception comes into play during interferences.

Priority rights: see "Paris Convention".

Processing time: Duration of a process in the patent procedure (*e.g.* search, examination, grant, and possible opposition and appeal).

Publication: In most countries, a patent application is published 18 months after the priority date:

- *EPO:* All patent applications are published in this manner, whether the patents have been granted or not.
- *JPO:* Patent applications that are no longer pending in the JPO, *e.g.* granted, withdrawn, waived or rejected, are not published. While official patent gazettes are only published in Japanese, the abstracts and bibliographic data of most of the unexamined patent applications are translated into English, and are published as the Patent Abstracts of Japan (PAJ).
- *USPTO:* Prior to a change in rules under the American Inventors Protection Act of 1999, USPTO patent applications were held in confidence until a patent was granted. Patent applications filed at the USPTO on or after 29 November 2000 are required to be published 18 months after the priority date. However, there are certain exceptions for the publication of pending patents. For example, an applicant can ask (upon filing) for the patent not to be published by certifying that the invention disclosed in the application has not and will not be the subject of an application filed in another country. Also, if the patent is no longer pending or subject to a secrecy order, then the application will not be published.

Renewal fees: Once a patent is granted, annual renewal fees are payable to patent offices to keep the patent in force. In the USPTO they are referred to as "maintenance fees". In most offices, renewal fees are due every year. USPTO-granted (utility) patents are subjected to maintenance fees which are due three-and-a-half years, seven-and-a-half years, and eleven-and-a-half years from the date of the original patent grant.

Request for examination: Patent applications filed at the EPO and JPO do not automatically enter the examination process. The applicant has to submit a request for examination within six months of the transmission of the search report at the EPO, and within three years of filing at the JPO. Patent applications filed at the USPTO are automatically examined by a patent examiner without the need for a separate request by the applicant.

Revocation: A patent is revoked if after it has been granted by the patent office, it is deemed invalid by a higher authority (appeal body within the patent office or a court).

Search report: The search report is a list of citations of all published prior art documents which are relevant to the patent application. The search process, conducted by a patent examiner, seeks to identify patent and non-patent documents constituting the relevant prior art to be taken into account in determining whether the invention is novel and includes an inventive step.

Triadic patent families: The triadic patent families are defined at the OECD as a set of patents taken at the European Patent Office (EPO) and the Japan Patent Office (JPO) and granted by the US Patent and Trademark Office (USPTO) which share one or more priorities. Triadic patent families are consolidated to eliminate double counting of patents filed at different offices (*i.e.* regrouping all the interrelated priorities in EPO, JPO and USPTO patent documents).

Trilateral patent families: A trilateral patent family is part of a filtered subset of patent families for which there is evidence of patenting activity in all trilateral blocs. It is then similar to a triadic family, except that it would also include applications filed in any EPC state that do not go to the EPO (in addition to going to the JPO and USPTO). Trilateral patent families are usually counted in terms of individual priorities, without consolidation.

United States Patent and Trademark Office (USPTO): The USPTO administers the examination and granting of patent rights in the United States. It falls under the jurisdiction of the US Department of Commerce.

Utility model: This type of patent, also known as a "petty patent", is available in some countries. It usually involves less stringent patentability requirements than a traditional patent, it is cheaper to obtain and it is valid for a shorter time period.

Withdrawal: Under the European Patent Convention, the applicant can withdraw an application at any stage of the procedure either by informing the office or by abstaining from one or more of the following: pay fees in due time, file a request for examination within the given time period, or reply in due time to any communication within the examination procedure.

World Intellectual Property Organization (WIPO): An intergovernmental organisation responsible for the administration of various multilateral treaties dealing with the legal and administrative aspects of intellectual property. In the patent area, the WIPO is notably in charge of administering the Paris Convention, the Patent Cooperation Treaty (PCT) and the International Patent Classification system (IPC).

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