# Chapter 1

# Background

Peter Hingley and Marc Nicolas

Controlling Office, European Patent Office, Munich, Germany

This book contains reports and a review of several projects that were undertaken during a research programme on the improvement of forecasting methods for patent filings at the European Patent Office (EPO). A typology appears in Chap. 2 of the various areas of study that were identified for the programme.

Figure 1.1 shows the annualised historical counts of patent filings at the EPO. There have been continual increases, except for short resting periods at the beginning of the 1990s and at the beginning of the 2000s. A rapidly increasing trend seems to have established itself since 1996. The fitted line in Fig. 1.1 represents a straight line regression that has been fitted to the total filings data from 1996 to 2005, but excluding years 2000 and 2001 where the development was a little aberrant. From the point of view of business planning, the EPO normally forecasts total patent filings over a six year horizon.

It is not our intention to provide more than a snapshot of current forecasts for future filings at this point of time (early 2006). Forecasts age rapidly. The studies therefore concentrate on the methodology for making forecasts. This should largely remain valid at whatever date you happen to be reading.

We provided most researchers with data on filings up to year 2000, which is why the results that are presented mostly take 2000 as the last actual filings year. Figure 1.1 shows that this was a challenging point of time to make forecasts, since there was then a pause in the upward development of numbers of EPO filings in 2002 and 2003. This was presumably caused by a reduction of investment in innovation after the collapse of the biotechnology/dot-com bubble of the late 1990s. Many of the forecasts presented here consequently over-estimate patent filings for the years beyond 2001. This is no more than can be expected of regression based models that have been fitted over a rapid growth phase. It illustrates the challenging nature of making forecasts, rather than any deficiency in the approaches that have been used.

It might be possible to construct a single large portmanteau model that could take account of the complete set of economic drivers of the patenting process. But this would be a difficult beast to control and could suffer in the presence of any degree of misspecification. According to the principle of parsimony, simplicity is a virtue to be pursued in modelling as long as the fitted data remain consistent with the general patterns of development. In Chap. 9, we will describe how we see modelling fitting in to the forecasting exercises that already underpin the overall EPO budget planning process.

Now, before we start, we would now like to introduce some relevant issues about the patenting process and the statistics that relate to it[1].

In order to apply for the intellectual property protection that is provided by the patent system, applicants may use the following types of procedures, or combinations of them:

- National patent procedures
- Supranational patent procedures, comprising: regional procedures[2] and the Patent Cooperation Treaty (PCT) procedure

The nature of patent rights differs to some extent between countries (Bainbridge 1992). For example, differences in the average numbers of claims included in one application is one reason why there are more patent applications in Japan than in Europe or US. The existence of differences in the scope of applicability of patent rights compromises to some extent the ability to compare patents from different countries.

The patenting concept involves a trade-off between inventor and society, in which the applicant discloses the content of the invention in return for the grant of a monopoly right to exploit that invention for a defined period of time. Disclosure is normally achieved by publication of the contents of the application and also of any resulting granted patent. The original patent application will be termed the first filing and is usually made in the inventor's home country. The applicant(s), who may or may not be the same as the inventor(s), can withdraw at any stage of the procedure. If she/he decides to keep the invention secret after all, the application can be withdrawn before publication, which normally takes place 18 months after the first filing.

---

[1] This is only a short introduction. For further details, please see information that is available from the EPO web pages at http://www.european-patent-office.org.

[2] Regional offices are currently: Eurasian Patent Office (EAPO), African Regional Patent Office (ARIPO), Organisation Africaine de Propriété Intellectuelle (OAPI) and EPO.

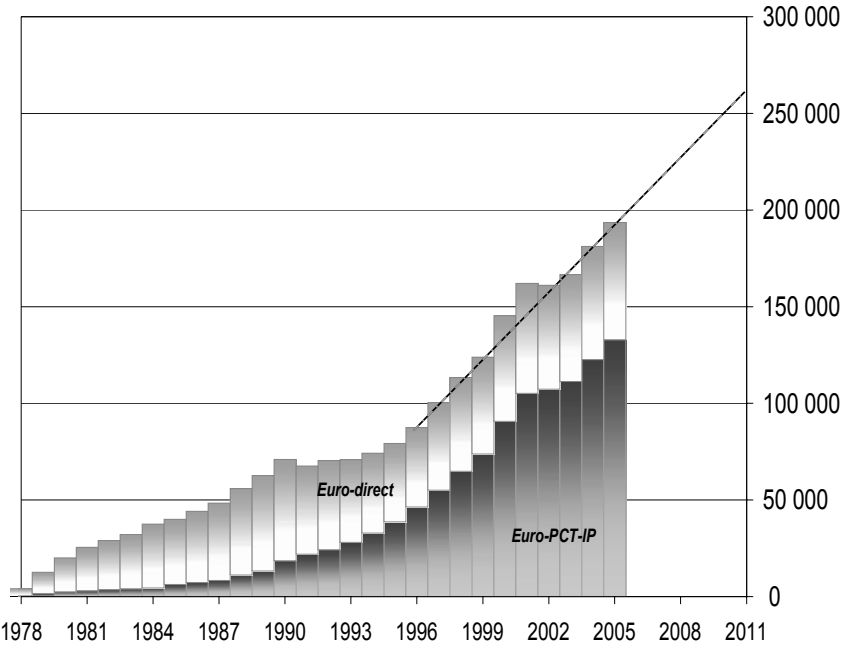


**Fig. 1.1.** Numbers of patent filings at the EPO per year from 1978 to 2005, with a breakdown by euro-direct and euro-PCT-IP. The trend line is fitted by straight line regression from 1996 to 2005 inclusive, but excluding years 2000 and 2001

For forecasting purposes, it is important to try to get hold of counts of all patent filings and not just those that lead to publications. However, pre-publication information tends to be restricted by patent offices, in order to ensure client confidentiality. Nevertheless each patent office has access to pre-publication data on filings within its own domain. Statistics can be shared between offices without compromising the interests of the clients.

The Paris Convention of 1883 (WIPO 2006a) allows subsequent filings, which claim the priority of the first filing, to be made at other patent offices within the following twelve month period. When patent protection is sought abroad in several countries for the same invention, the applicant is more likely to want to use a supranational procedure, rather than several national systems where he/she would have to replicate actions under several different administrative procedures. The decision regarding subsequent filings in each country is made by the applicant and depends on the expected returns to be made from external markets.

The EPO is a supranational organisation that has examined patents since 1977. It operates according to the terms of the European Patent Conven-

tion, or EPC (EPO 2002), and offers a centralised patent granting procedure on behalf of the constituent EPC contracting states. The system currently allows companies or individuals to make a single application for patent rights in 31 countries; and an extension of rights is also possible to five other countries outside the EPC area (as of 1.01.2006). The countries can all be separately designated in the patent application.

The granting procedure is made up of successive phases. Firstly, a search is made for relevant pre-existing documents. This enables the examiner to establish the position of the innovation with regard to the state of the art in its technological field(s). A substantive examination is then carried out to establish patentability in terms of novelty, inventiveness, industrial applicability and other factors. The successful European patent ceases to exist as a unitary whole, but can then become a bundle of national patents in all EPC contracting states for which it remains designated at the time of granting.

First filings are commonly considered as a reflection of efforts in innovative activity, while subsequent filings tend to measure to some extent the internationalisation and globalisation of world markets. As a supranational office, the EPO mainly attracts subsequent filings, although the proportion of first filings has increased in recent years and stands at about 9% of the incoming filings in 2005. It is tempting to extrapolate trends experienced in R&D expenditures and in first filings at various offices to forecast levels of future EPO applications. However, the forecasting problem is complicated by the existence of parallel patent systems in Europe. Applicants can use the national systems, the European system or the international system that has been established by the Patent Cooperation Treaty (PCT). The PCT is a supranational system that is administered by the World Intellectual Property Organisation (WIPO). One PCT application can be made for patent protection in more than 120 countries and 4 supranational organisations, including the EPO for applications designating the EPC area (WIPO 2006b). Before 2004, the applicant had to specifically request a designation for the EPC area, but from 2004 onwards the EPC and all other possibilities for designations in a PCT application are automatically selected. The PCT applications that designate the EPC area are considered as requests for patents to EPO and will be called euro-PCT-IP filings.

So, an application for a European patent can be made either as a direct application to the EPO (euro-direct filing), or as a euro-PCT-IP filing. Figure 1.1 shows the historical development of these two main constituents of EPO filings. Currently, nearly 70% of total filings are Euro-PCT-IP applications. In both procedures, there is an initial stage during which a search

is performed[3]. The search report helps the applicant to decide whether he/she wishes to proceed to substantive examination. This typically begins about one year after filing for a euro-direct application, or about one and a half years to two years for a euro-PCT-IP application. These times apply to typical subsequent filings, but are somewhat shorter in cases where the first filing itself is made directly to the EPO as a euro-direct filing. For PCT applications, entry into the substantive examination phase at EPO is termed as entry into the PCT regional phase (euro-PCT-RP) and at participating national patent offices as entry into the PCT national phase.

Our problem is to forecast total filings as the sum of euro-direct and euro-PCT-IP filings. Both types of applications consist of first and subsequent filings. While it is not particularly important to distinguish first and subsequent filings in the use of the forecasted figures, their inherently different characteristics mean that it can be advisable to forecast separately the four combinations of the 2x2 breakdown.

The book concentrates mainly on new suggestions, but the existing methods are reviewed in Chaps. 2 and 9. Chapter 9 also considers how the existing methods can be improved by taking account of the research results. New challenges will be described – for example a breakdown of the EPO planning procedure into technical areas known as joint clusters requires a more detailed approach to forecasting. Also, joint work with other patent offices leads to the possibility that simultaneous modelling of patenting flows across borders might allow for efficient forecasting at each office.

While we do not seek to forecast patent filings at the national offices of the EPC contracting states, there has clearly been a transfer effect over time, away from the national patent examination systems and towards the EPO, where a single application that results in a grant can lead to patent rights in all relevant EPC contracting states. This has to be taken into account in the forecasting process, although the EPO is now sufficiently well established that net transfer these days comes mainly from new contracting states as they join the EPC area.

Figure 1.2 summarises world wide patent filings in terms of the numbers first filings in each major bloc in 2002 and the subsequent filings flows between blocs in 2003, based on reported filings data from various patent offices. The real situation is a somewhat more complicated network of opportunities, since first filings and subsequent filings can take place at most possible pairs of patent offices and supranational systems. Subsequent filings can also be made at the same office that is used for the first filing.

---

[3] In the PCT system, the applicant may also request a preliminary assessment of the likelihood that the invention can finally result in the grant of a patent.

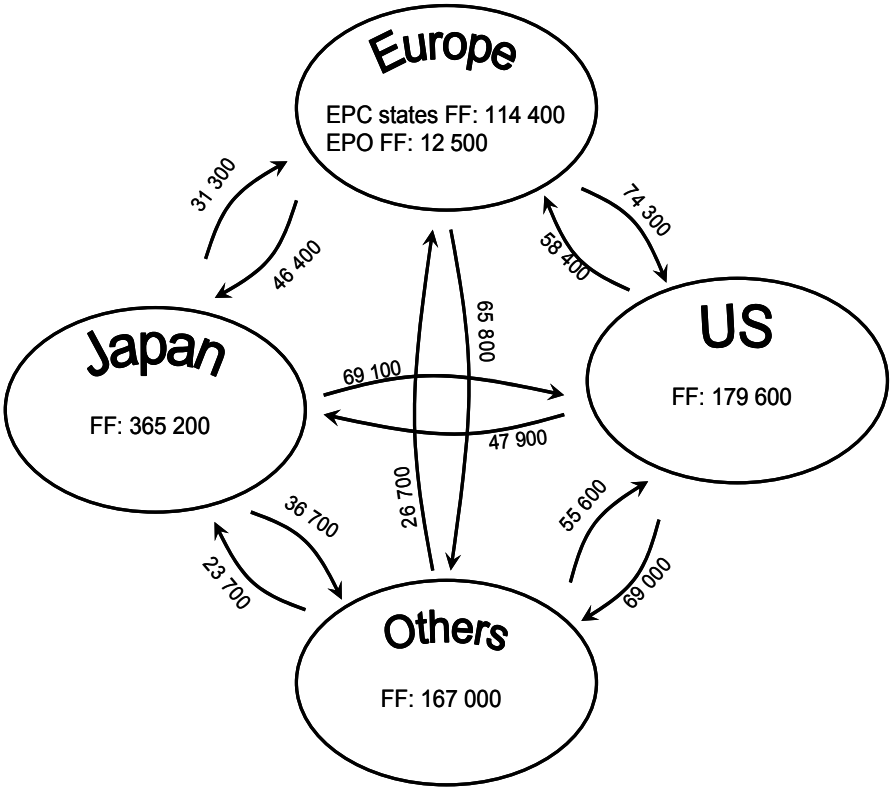


**Fig. 1.2.** First filings (FF) in 2002 in each main regional bloc: Europe (EPC contracting states), Japan, US and Other countries; and the flows of subsequent filings (SF) between the blocs in 2003. Note that the existence of more than one office in a bloc can lead to multiple counting of patent applications for the same invention. SF flows within each of the four blocs are not shown.

In order to navigate through the maze, it is useful to consider *patent families* data, in which individual priority forming first filings are identified and associated with the resulting world wide filings originating from that priority (see, e.g. EPO, JPO, USPTO 2005; Dernis and Khan 2004, Hingley and Park 2003). Various definitions of patent families are possible, but for us a patent family is the group comprising all patent filings that are made throughout the world and claim the priority of a single first filing, that is itself also included in the group. The set of distinct priority forming filings (that indexes the set of patent families) in principle constitutes a better measure for the set of first filings than the proxy set of aggregated domestic national filings added to first filings at the EPO and WIPO.

*Trilateral patent families* are a filtered subset of patent families for which there is evidence from published documents of patenting activity somewhere in all three major trilateral blocs: EPC contracting states, Japan and US (e.g. EPO, JPO, USPTO 2005). *Triadic patent families* are another filtered subset that is currently reported in OECD publications (e.g. OECD 2005a). These require an application to the EPO itself, rather than to any patent office in the EPC contracting states, as well as an application to the JPO and the achievement of a grant at the USPTO.

Both the trilateral and the triadic data sets represent only tips of the patent families iceberg. Counts of these underestimate the far greater numbers of first filings that exist throughout the world. This can lead to misconceptions if definitions are not carefully conserved. For example Niiler (2004) gives a table that shows 5 736 patent filings in Germany in 1998. While database sources indicate that there were indeed about 5 300 trilateral patent families arising from first filings from residents of Germany, the same sources indicate a total number of patent families from residents of Germany in 1998 of about 61 400. Regarding reported filing counts by patent offices, German residents made about 46 000 national filings at the German patent office in 1998 and about 20 000 EPO filings (euro-direct + euro-PCT-IP), as well as numerous filings at other patent offices.

We believe that it is not advisable to filter patent family counts when examining patent systems for forecasting purposes. As our main goal is to contribute to the planning of EPO activity, we are particularly interested in all (monolateral) patent families in the EPC area and in bilateral patent families that originate in other blocs and then flow to the EPC area. Within this total, we concentrate on the proportions of the flows that use the EPO rather than other national EPC contracting state patent offices. However, there are unfortunately some difficulties in processing patent families for forecasting, due to lack of timeliness of the recorded data and restrictions of currently available databases to published applications. Therefore we usually apply forecasting models mainly to the reported filings statistics from each individual patent office.

In forecasting patent filings, regression techniques are often applied to historical time series of patent filings. As well as self determining models, such as the straight line that is fitted in Fig. 1.1, it is possible to use prognostic variables that are based on causative factors for patenting that reflect the innovative process. Such variables include Gross Domestic Product (GDP), Research and Development expenditures (R&D) and other economic indicators.

R&D expenditure statistics can be considered at levels ranging from the micro economic level of the firm to the industry and whole country levels. The normal source for collected country based R&D statistics is the Main

Science and Technology Indicators (MSTI) series that is collected and published by OECD (OECD 2005b). Business related R&D (BERD) is often used for patent forecasting purposes, but MSTI also contains series according to several other definitions. Questions arise for analysis as to how to standardise the reported R&D data between currencies and how to discount them over the historical period under consideration in the regression models. It is valuable to collaborate with experts on R&D when attempting to forecast numbers of patent filings using these data. There seem to be at least as many ways to report and standardise R&D statistics as there are for the patent count statistics themselves.

Innovation and patenting take place at different rates in various industries. Classification of inventions is an important task for patent offices in order to support the search phase of the examination. An International Patent Classification system (IPC) has been developed to aid this process (WIPO 2005). Other schemes are also in use to classify company activities in terms of industrial areas, for example NACE (European Commission 2006) and ISIC (UN 2006).

For internal planning purposes, it is also interesting to look at forecasts for particular areas of technology within the whole. The EPO employs technical experts to work on each relevant area of innovation. In this respect the EPO is rather unlike a normal manufacturing environment, where standardisation of products is paramount. There could in fact even be a kind of fractal structure to the scaling pattern of innovations at various organisational levels, which might lead to difficulties in interpretation of forecasting results for patents at the EPO from one scale to any other.

A relevant activity is to watch for and to predict the levels of patent filings in emerging areas of technology. These often correlate closely to usage of the patent system, usually initially while the area is being established, then again after standards are agreed and more players start the development and marketing phase of products. In a sense however, the entire system is in a dynamic equilibrium, with innovations in older areas levelling off and dying as new areas come up. In the world of patents, areas come and go and diversity of topics is the norm. Technology trend watching is a fascinating topic, but it is usually limited to specific areas and it is not our aim to study it here. Rather, we assume a continuing flow of innovative enterprise into whatever areas emerge as ripe for exploitation via the resources of collective human imagination. A system has evolved in society that generates a stream of ideas behind the patent applications, so that in a statistical sense there should be a predictability that can be used in forecasting them. This is the main question that our experts have studied and that is reported on here.