

### Overview

A patent is a right of exclusion. A holder of a patent has the right to exclude others, for a certain time, from use of the invention on which the patent is based. Patents are national rights – they always apply within a particular jurisdiction.

To patent an invention, an inventor must submit a patent application with a description of the invention. To qualify for a patent, an invention must fulfill three conditions. It must be novel, it must be of a certain quality (must involve an “inventive step”) and it must have a commercial use. Normally, patent applications are reviewed in light of these criteria in a review process carried out by the competent patent office. For Germany, the competent patent offices are the German Patent and Trade Mark Office (DPMA) and the European Patent Office (EPO).

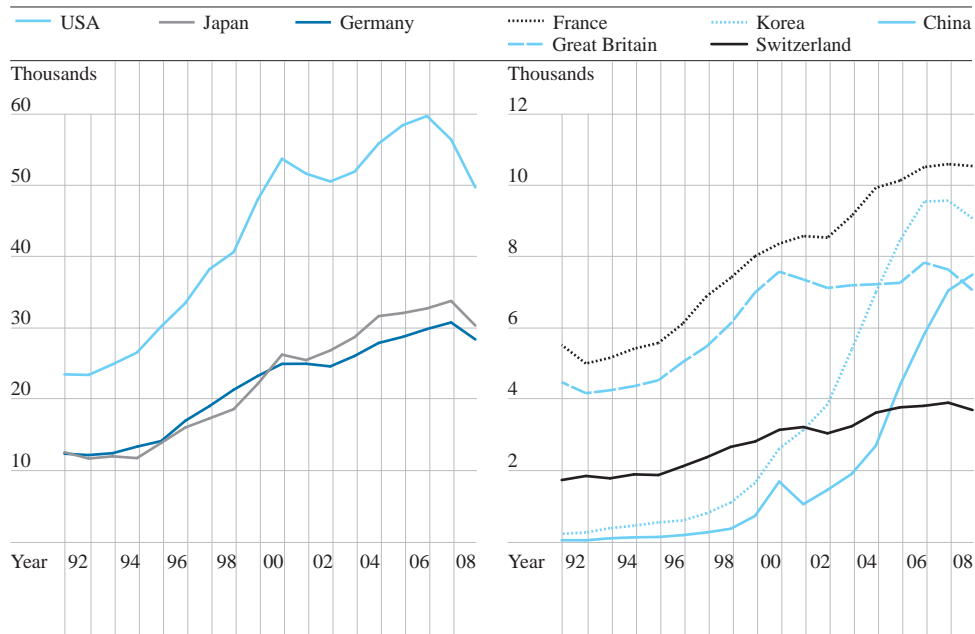
Along with detailed information about the invention involved, patents also contain information about the inventor and the applicant, a classification by time and place and a technical classification of the invention. Because patents contain such data, they are important sources of useful information for assessing the technological performance of a country, a region or a company. And yet there are a number of constraints that reduce the usefulness of patent data for R&I analyses. For example, not all inventions are protected by patents. In addition, the patenting process necessitates disclosure of the pertinent invention. In many cases, therefore, inventors and companies opt to keep inventions secret. Furthermore, patent law excludes certain areas from patenting, such as scientific theories and mathematical methods.

In its patent analyses, the Expert Commission relies primarily on “transnational patent applications”. That group consists of patent applications filed with the European Patent Office, for European countries, or filed as PCT applications<sup>364</sup>, for non-European countries. Transnational patent applications are filed in cases in which the invention is to be commercialised in a range of different national markets. For purposes of patent statistics, and pertinent indicators, use of data of the relevant international offices (EPO and WIPO<sup>365</sup>) offers two advantages. Firstly, transnationally filed patents are of greater relevance in this context. Secondly, such patents provide a better basis for comparison of national economies than does any set of national patent data.

### Indicators studied:

- Trends in transnational patent applications, in selected countries
- Numbers and intensity of, and growth in, transnational patent applications
- Patent specialisation in high technology
- Patent specialisation in cutting-edge technology

## C 5-1 DEVELOPMENT OF NUMBERS OF TRANSNATIONAL PATENT APPLICATIONS



Source: EPO (PATSTAT). Calculations of Fraunhofer ISI, December 2010.

Transnational patent applications are applications in the form of patent families<sup>366</sup> that include at least one application filed with the World Intellectual Property Organization (WIPO), via the Patent Cooperation Treaty (PCT) procedure, or one application filed with the European Patent Office.

### Financial crisis has marked impacts on patent applications

In terms of absolute numbers, the U.S., Japan and Germany, in that order, are the world's leaders in the area of transnational patent applications. Patent numbers grew in those countries after the economic crisis that took place at the turn of the millennium. The largest growth in recent years has been in Asia, however, especially in Korea and China. Over the past five years, for example, the numbers of patent applications from China have nearly quadrupled. In Korea, the corresponding numbers grew by nearly 70 percent.

The impacts of the global financial crisis are clearly apparent in the patent statistics for 2008, for all countries. While downward trends for international patents in priority year 2007<sup>367</sup> can be attributed largely to reduced internationalisation of patent applications, as companies sought to reduce their costs for international applications (international applications can be submitted with time lags of 1 to 2.5 years), the reasons for the effects seen in 2008 are more complex. For example, it is also true for that year that companies applied for international patents less frequently. At the same time, the crisis left visible impacts on R&D processes – and, thus, on indicators such as patent figures. That is clear in the decrease in applications filed with national patent offices such as the USPTO<sup>368</sup> and the German Patent and Trade Mark Office (DPMA).

TRANSNATIONAL PATENT APPLICATIONS IN HIGH TECHNOLOGY<sup>369</sup> 2008

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	Absolute	Intensity	Intensity, high technology	Total growth*, in percent	Growth* in high technology, in percent
<b>Total</b>	<b>190,456</b>	---	---	<b>155</b>	<b>153</b>
Switzerland	3,689	809	407	139	147
Sweden	3,592	736	356	170	163
Germany	28,354	697	373	133	131
Finland	1,783	673	315	119	121
Japan	30,304	475	273	163	160
Netherlands	4,140	459	237	212	215
France	10,537	380	214	142	153
Korea	9,067	346	208	830	771
USA	49,690	330	204	122	122
EU-27	71,156	306	159	146	144
Italy	5,712	242	105	155	148
Great Britain	7,051	225	121	115	107
Canada	3,187	176	98	222	201
China	7,487	8	4	2,102	1,884

\*Index: 1998=100.  
Source: EPO (PATSTAT), OECD (MSTI). Calculations of Fraunhofer ISI, December 2010.

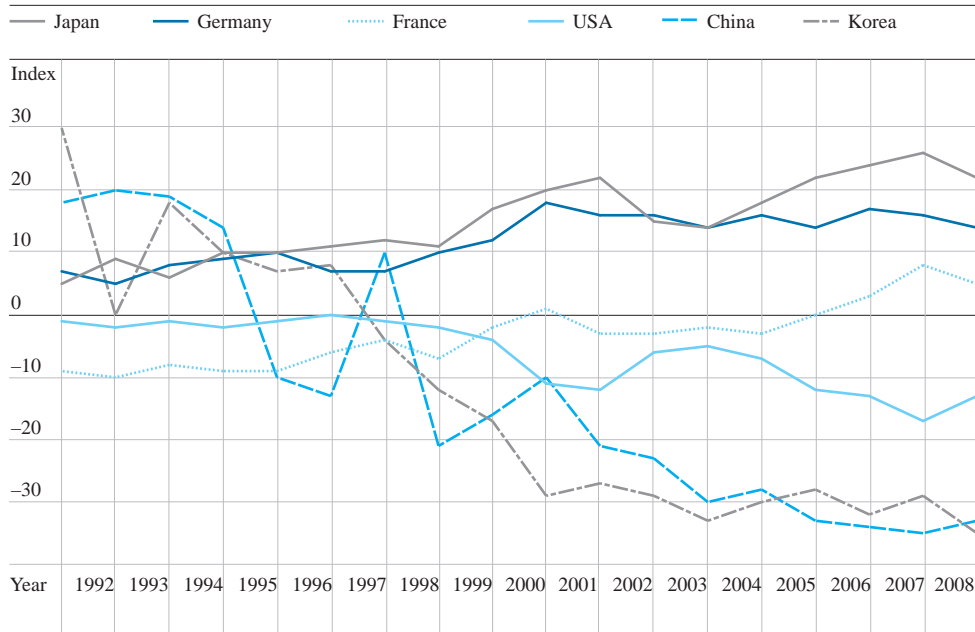
The high-technology industry sector comprises industry areas that invest more than 2.5 percent of their revenue in research and development. “Intensity” refers to numbers of patents per one million gainfully employed persons.

### High-technology patents more strongly affected by the crisis

The figure “number of patent applications per one million gainfully employed persons” (intensity) is an indicator of economies’ relative strength in innovation. Switzerland, with 809 patents, ranks first, followed by Sweden and Germany, which in this category rank ahead of countries such as Japan, the U.S., France and the Netherlands. In the area of high-technology patents, Germany ranks second, behind Switzerland. The rapid development of China and South Korea manifests itself in those countries’ enormous growth rates in high-technology patents during the period 1998–2008, although both still lag considerably behind Germany in terms of absolute figures.

All in all, the relative shares for research-intensive and for less research-intensive applications have remained quite stable over time. For high-technology patents, the share is 55 percent. On the other hand, some countries have experienced profound changes with respect to that breakdown over the same period. For example, in 1991 high-technology patents accounted for nearly 50 percent of Italy’s patents; now, the corresponding figure is only about 42 percent, which is considerably below the global average. Changes in this area have also occurred in China and Korea, which are now moving into the world’s technology markets with patents in less research-intensive areas (i.e. their patents are no longer exclusively high-technology patents). Overall, those countries are broadening their profiles, thereby developing structures more similar to those of established industrialised countries.

C 5-3 HIGH-VALUE TECHNOLOGY SPECIALISATION INDICES FOR SELECTED COUNTRIES<sup>370</sup>



Source: Questel (EPPATENT, WOPATENT), EPO (PATSTAT). Calculations of Fraunhofer ISI, December 2010.

The specialisation index<sup>371</sup> is calculated in terms of all transnational patent applications worldwide. A country’s score shows how active it is in comparison to the global average (positive score = above-average activity; negative score = below-average activity).

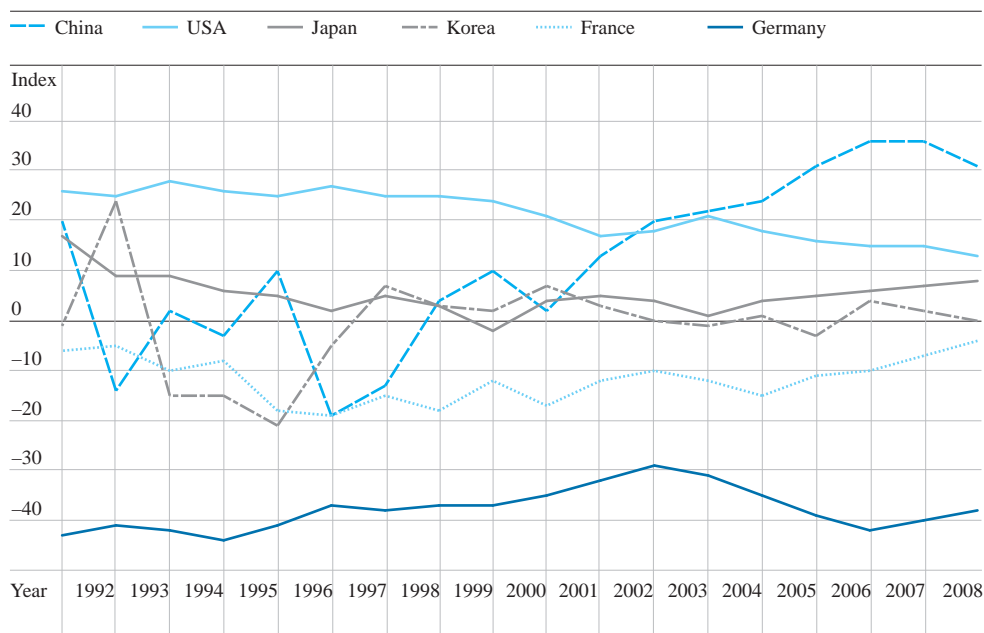
**Germany, Japan and Switzerland oriented to high-value technologies**

With its traditional strengths in the automotive, mechanical engineering and chemicals sectors, Germany has above-average specialisation in the area of medium-high technology. Japan’s profile in this category features electrical engineering and optics, along with auto-making and some chemical sector areas. China and Korea, two rapidly growing countries, are less strongly focussed on those areas. A similar situation prevails in the U.S.

When one differentiates in terms of cutting-edge technology, high-value technology and less research-intensive technology, one obtains polarised profiles for many countries. “Polarised”, for a given country, means that the country has a large share of patents in cutting-edge technology, in areas such as biotechnology, pharmaceuticals or information and communications technologies, a large share of patents in less research-intensive areas, and a relatively small share of patents in the area of high-value technology. Germany has a large share of patents in high-value technologies, but a relatively small share in cutting-edge technology. The same is true, in part, for Switzerland – in spite of its many pharmaceutical companies. In that regard, those countries’ profiles differ markedly from those of the majority of innovation-oriented industrialised countries – such as the U.S., whose profile is somewhat complementary to that of Germany. This insight makes it possible to protect German technologies efficiently in Germany’s U.S. export market.

## CUTTING-EDGE TECHNOLOGY SPECIALISATION INDICES FOR SELECTED COUNTRIES<sup>372</sup>

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Source: Questel (EPPATENT, WOPATENT). EPO (PATSTAT). Calculations of Fraunhofer ISI, December 2010.

The specialisation index<sup>373</sup> is calculated in terms of all transnational patent applications worldwide. A country's score shows how active it is in comparison to the global average (positive score = above-average activity; negative score = below-average activity).

### Cutting-edge technologies are among the most dynamic areas

In comparison to the rest of the world, the U.S. has a disproportionate orientation to cutting-edge technology, as is apparent in its patents in life sciences (including medical technology) and in computer technologies. China's orientation to cutting-edge technology is even more pronounced, although in its case the orientation is based exclusively on information and communications technologies.

Among the major industrialised countries, Germany has the lowest orientation to cutting-edge technologies, although its primary technology areas, which are high-value technology areas, are enhanced by cutting-edge technology. German companies continue to be competitive especially in high-value technologies. And yet it is the cutting-edge technology areas that are especially dynamic in terms of growth of patent applications. That also holds for Germany, where information and communications technologies are among the country's fastest-growing technology areas.