– It must be made attractive for car buyers to turn their backs on the heavy, high-powered vehicles of the fossil-fuel era. Users of electric cars should not only be offered financial stimuli but also additional benefits, e.g. the use of bus lanes in urban areas, or special E-lanes on main highways around the city.

B 5 CURRENT DESIGN OF THE PATENT SYSTEM

The Expert Commission draws in its analyses on patent information and statistics as summarised in Section C 5 of this report. But the patent system is also an important institution of R&I policy-making, and it has been the subject of controversial discussions in recent years. In Section B 5-1, the Expert Commission therefore comments on recent developments in the national and international patent systems, focusing in particular on the behaviour of the patent applicants. In Section B 5-2, the use of patent data in R&I studies is discussed against the background of these changes.

B 5 –1 ON THE INSTITUTIONAL ORGANISATION OF PATENT SYSTEMS

Innovation and patent protection

Patent systems should provide incentives for R&D activities. The patent holder is entitled to exclude other parties from the use of patented inventions. In extreme cases, this means that patent protection can establish a monopoly. The theory is that the right of exclusion improves the patent holder's prospects of making a profit and thus strengthens their willingness to invest in R&D. At the same time, the publication of the patented invention should then make it easier to develop related innovations. Whether the current systems satisfactorily fulfil this purpose has increasingly been called into question in recent years. Numerous studies in the USA analysed the developments there and were reticent in their assessment of the extent to which the US patent system promoted innovation.[155] It is now generally accepted that patent systems only create a strong positive incentive for innovation in a limited number of technologies or industries.[156] In particular, patent protection has a positive effect on R&D activities in the chemical and pharmaceutical industries. However, patents can also impede innovations and competition in various ways.[157]

The extent to which incentives or dysfunctional effects are generated depends to a considerable extent on the patent system itself, so that it is not meaningful to make generalisations. In particular a comparison of the American and European patent systems shows many important institutional differences. In its evaluation, the Expert Commission assumes that a suitably organised patent system can provide incentives for research and innovation and thus create economic benefits. But what are suitable adjustments to this system?

The development in the USA

In the USA there has been a considerable increase in patent activities since the mid-1980s. Following the creation of the Court of Appeals for the Federal Circuit (CAFC),[158] the rights of patent holders were strengthened considerably. In particular it became much easier to enforce patents in court. Over time, the CAFC also extended patent protection to cover software and business methods. Patent applicants responded to these changes with an increased demand for patent protection. The number of applications increased significantly, and the US Patent Office also had a very high approval rate in an international comparison. Competition escalated between companies for more and more patents.[159] In most sectors there was also an increase in litigation. Patents were also used to exert pressure to pay licence fees by so-called patent trolls, who do not carry out any research or production, but acquire patent rights in order to conduct aggressive patent infringement lawsuits.[160]

The developments in the USA have been criticised in a series of studies, including a comprehensive investigation by the Federal Trade Commission (FTC 2003). The call for reforms has meanwhile resulted in various bills being put before the Senate and the House of Representatives. However, the attempts at reforms have failed to date as a result of disagreements between key actors in the political parties and in various industrial associations. The United States Patent and Trademark Office has begun to apply its rules more restrictedly in an attempt to limit supposed abuse of the system by the applicant. In addi-

tion, a number of developments have been reversed by decisions of the Supreme Court, e.g. concerning the use of injunctions (eBay Inc. versus Merc Exchange, L.L.C.).[161] An important on-going case could change the applicability of patent protection to business methods.[162]

Quantity and quality of patents in Europe

In a globalised world, in which the TRIPS Agreement[163] and other international agreements have led to considerable harmonisation of the patent systems, no system can completely disengage from the developments in the patent systems of other countries. Against this background, the question arises whether the European patent system has been affected by developments similar to those in the United States, and whether the patent system in Europe is also in need of reorientation.[164]

In Europe, the increase in patenting only began in the 1990s. Patent applications and approvals at the European Patent Office (EPO) increased much more quickly than the national R&D expenditures or R&D in the OECD countries. Between 1990 and 2000 the annual number of applications filed with the EPO rose at twice the rate of R&D expenditure. The patent applications have also become much more complex. Submissions are increasingly linked with other applications[165] and applicants are tending to build up extensive patent portfolios and patent 'thickets'.[166] According to EPO research reports, there has also been a continual increase in the proportion of applications for which there was a novelty-destroying prior art, and which are therefore examined particularly closely for the patentability.[167] The average quality of the applications filed with the EPO has been steadily declining over a long period.[168] Despite the rising numbers of applications and despite the falling quality of applications the patent grant rate at the European Patent Office remained constant at about 65 percent over the period 1978 to 2000 (year of application).[169]

A detailed study[170] of the workload and motivation structures of EPO patent examiners cites a series of factors which lead to distortions in the decision-making process in favour of patents being granted.[171] The growing obscurity of the patent system has increased the uncertainty of all users and to a general rise in transaction costs. Patent applicants, for their part, have increased the numbers of applications. This creates the overall impression of a system whose checks and balances are out of control. The self-interest of the patent offices in growth or increasing their income from fees may have supported this development. Like the other major patent offices of the world, the EPO now finds itself facing a large number of unexamined applications. Applicants have to wait several years before the start of the patent examination.

Quality assurance measures

Patent offices have meanwhile adopted a series of measures in order to limit quality problems and the unrestrained granting of patents. A bundle of measures have meanwhile been introduced to raise the bar for patenting at EPO. The grant rate has plunged according to the EPO. Increased requirements for the inventive step are a key precondition for an improvement of the system.[172] As William D. Nordhaus put it in 1972: "[…] The best way to prevent abuse is to ensure that trivial inventions do not receive patents. […]" [173] The Expert Commission warmly welcomes these measures.

The steps taken so far will in all probability still not be sufficient. The fee structure of the patent offices should be structured so that opportunistic behaviour is sanctioned (e.g. an excessive number of claims or multiple applications). In addition, patent examiners should be given the possibility to terminate the examination of marginal patent applications rapidly with a rejection.

Problematic governance structures

The national offices represented in the Administrative Council of the EPO and the EPO itself each receive half the extension fees for the patents granted by EPO. These receipts are a very important source of income for most national patent offices and for the EPO, because as a rule the charges for research and examination do not fully cover the costs actually incurred. Many representatives of national patent offices in the Administrative Council would therefore find it difficult to agree to measures which reduce the numbers of patents granted. The governance

structure of the EPO has also proved to be problematic when it comes to deciding on the division of labour between national offices and the European office. Since the national offices in the Administrative Council of the EPO have the final say on all important matters concerning the European office, national interests often dominate. In the on-going discussion about the European Patent Network (EPN), some contributors are more interested in ensuring that the national offices are retained than in seeing the formation of an efficient European structure. In the course of a rational development of the European Union's internal market, very small national patent offices will no longer have any significant economic role to play.

Carefully developing patent institutions in the European single market

There are currently a number of fields in which progress seems possible towards the further development of the EU institutions. For example, plans have been presented to introduce a European Union patent which would be valid in all member states. The European Commission under various Council presidencies has presented proposals for a unified patent jurisdiction. On 4 December 2009, the EU Competitiveness Council meeting unanimously approved the measures for an enhanced patent system in Europe.[174]

However, there are still important aspects to be clarified, e.g. the question of language and translations. The details of the agreement will also be debated in the European Parliament. An agreement on a European Union patent and unified jurisdiction will therefore involve further negotiations between the EU member states. It is vital that the efficiency and quality orientation of the future systems should not be watered down by questionable compromises. The Federal Government should draw attention to the undisputed advantages of the German patent jurisdiction, and aim to ensure that the central Court of Justice in the new legal system is anchored in Germany. Already almost three-quarters of all patent disputes are conducted in Germany, because legal clarification can be obtained quickly here, cost-effectively and with a high level of expertise. A new, unified system must also offer these advantages, because otherwise it would not be possible to achieve any significant improvement. Above all, the new jurisdiction must become a guarantor for the high quality of patents.[175] National German interests and those of the European Patent system are therefore very similar – they should be pursued skilfully and forcefully in negotiations.

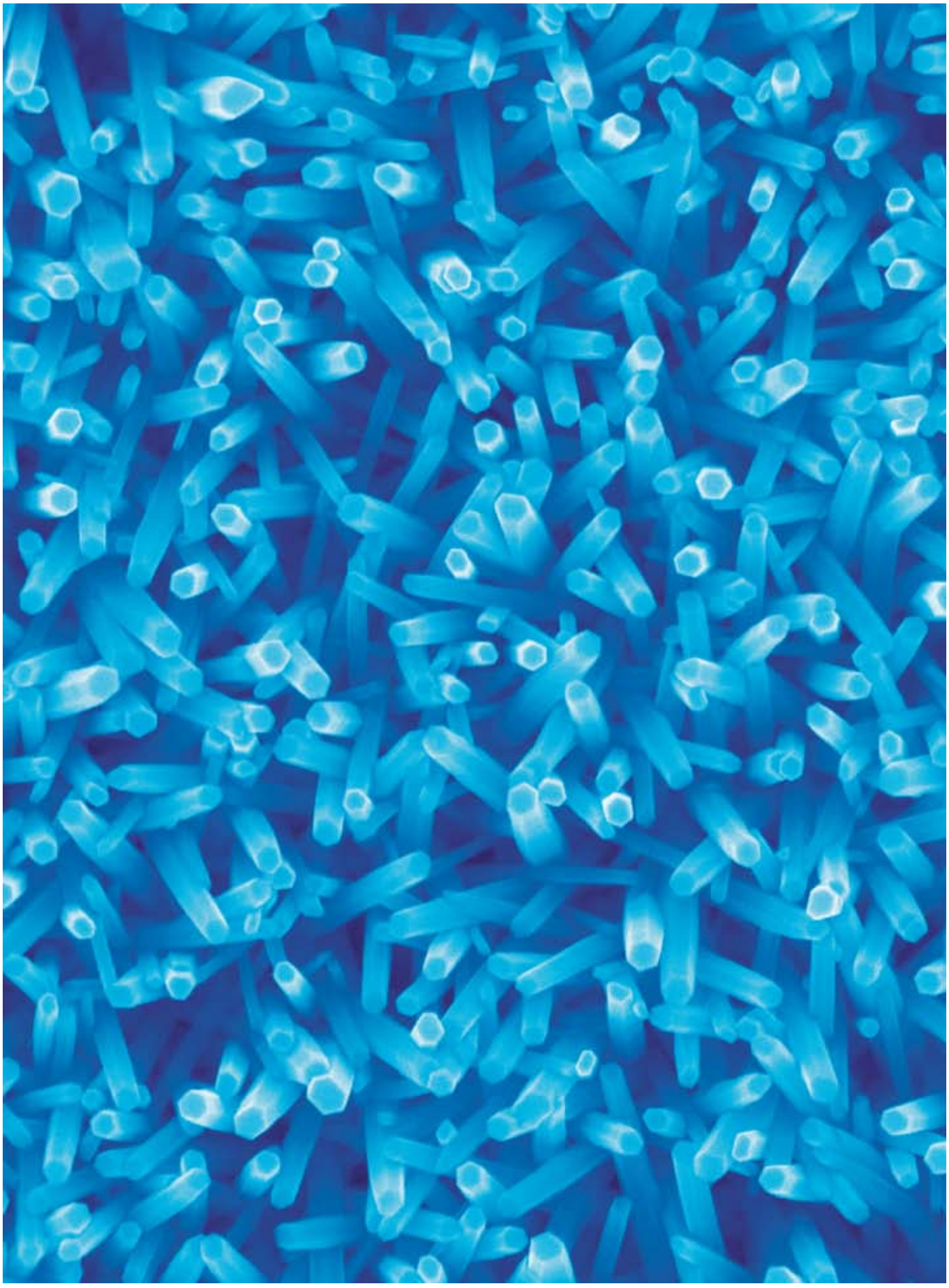
Recommendations

- The quality orientation in the European Patent offices should be upgraded. Policy-makers must ensure that patents are only granted for inventions which show a sufficient inventive step. A patent system which opens its gates for marginal contributions can become an obstacle to innovation.
- Patent examiners must be enabled and encouraged to reject marginal patent applications. They should also be allowed to penalise malicious application behaviour.
- The Federal Government should support the formation of European institutions in the patent system, with a uniform court system and an EU patent. It will not be possible to develop the European Single Market fully if these institutions are nationally fragmented. Efforts should be made to ensure that the new European institutions bring further improvements with them in comparison with the existing system. Harmonisation is not an end in itself.

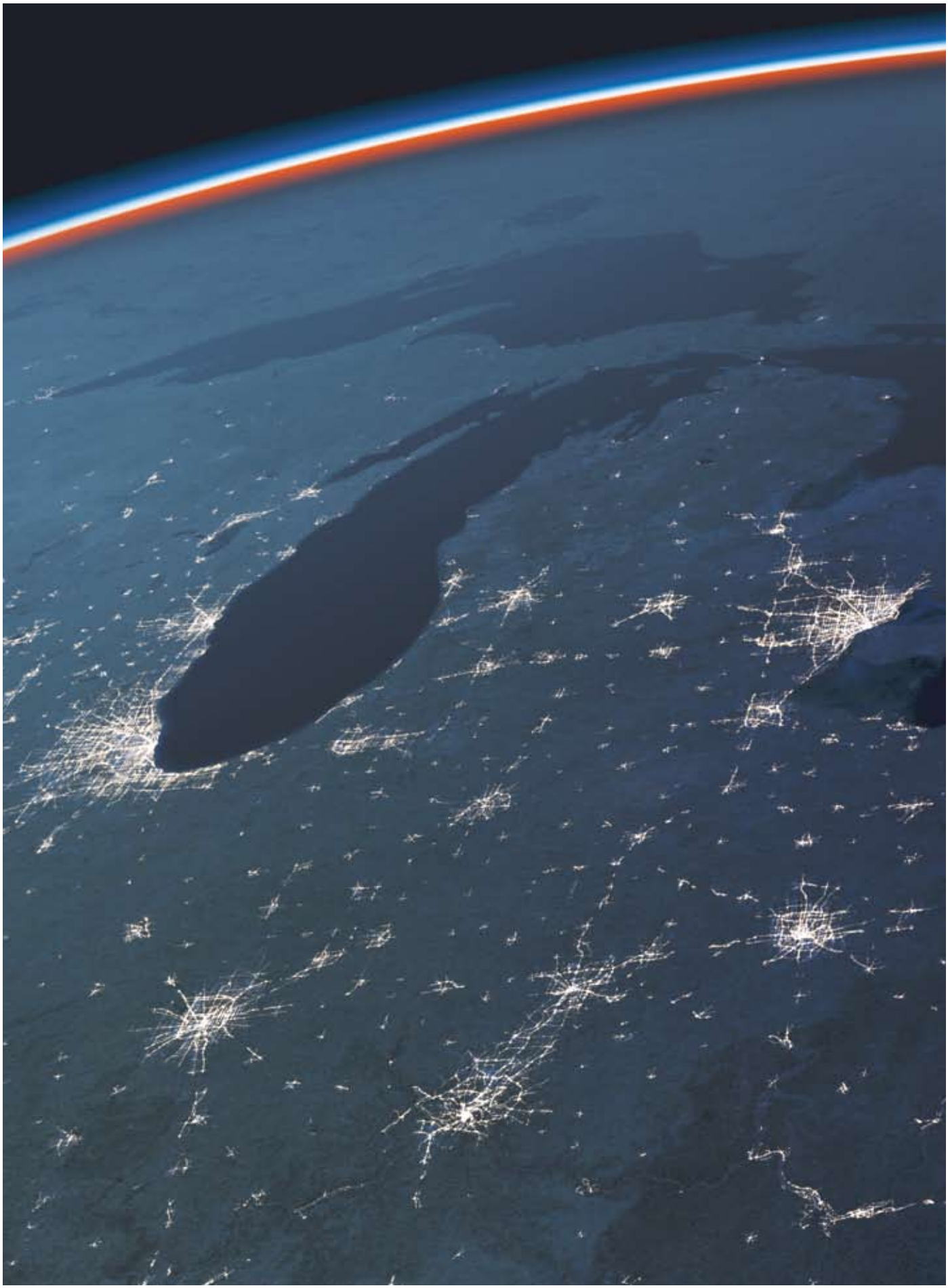
PATENTS AS A PARAMETER OF TECHNOLOGICAL POTENTIAL B 5 – 2

The empirical registration of the innovation processes still presents problems for scientists and policy-makers. In recent years it has been possible to develop and test a series of indicators, but these are subject to changes, which are being carefully monitored by the Commission of Experts for Research and Innovation. They include the changes in the motives of patent applicants mentioned above.

For R&I analyses, patent offer both advantages and disadvantages. The advantages include that datasets are readily available and, because of their legal significance, they are very reliable. In addition, the actors (inventors and applicants) are readily identifiable. The patents can be assigned to a place of origin and a field of technology. It is also possible to iden-



Nanowires of zinc oxide



USA at night

tify the various groups of applicants, e.g. research institutions, universities and private companies. This makes it possible to carry out further analysis. Cross-sectional data[176] for patents correlate highly with input measures such as R&D and innovation expenditure. The innovation process is also correlated with profits, exports and company growth. They thus represent an interesting and attractive parameter for innovation research. On the other hand, there are also disadvantages. Patents only register about half of all inventions – the rest are kept secret. And the role of patents in the innovation process is not always clear. In innovation research, patents are often interpreted as a final quantity, but it would be better to treat them as an interim product in the innovation process.[177] They do not mark the start of an innovation, but they are not the outcome either. And in some sectors of the economy patents are particularly important, whereas in others they tend to be less significant. These aspects have to be taken into consideration when interpreting patent data.

Using patent data in R&I analyses

When analysing innovation processes, patents are generally used in three ways. In some cases, changes in the numbers of applications (e.g. at the German Patent Office) are considered as a reflection of the dynamics of inventive or innovative activity. This approach can be used for various countries, sectors, or institutions. For example, the data on patent applications from German universities can be used in order to assess the removal of the inventor's privilege for university staff in 2002. It is important in these analyses that any distortions in the numbers of patent applications do not change over time. Secondly, countries are often compared in terms of their patent applications in order to draw conclusions about their technological capacity. The comparisons are reliable, provided the patent data from the countries under comparison are subject to the same distortions. Thirdly, patent data can be used to analyse national und regional specialisation patterns. In this case it is not the absolute numbers or growth rates which are considered, but the extent to which various fields of technology are represented in each patent portfolio. Here too it is important to ensure that the units being compared with one another are not subject to different distortions.

Possible distortions in patent analyses

Due to the change in the motivation of patent applicants it is no longer possible to equate the increase in the numbers of patents with an increase in innovations. This means that the fact that the number of application has increased by a certain percentage does not necessarily mean that there has been an increase in inventive activity. Changes in the costs of patenting, in the patent office regulations, or in the motivation of the applicants can have relatively strong effects, which are not necessarily related to a change in inventive activity. Therefore it is also necessary to define suitable control groups.

Comparisons of patent portfolios of countries or regions also require a detailed evaluation, and here too there may in principle be distortions. For example, it is known that the distribution of the value of patents is highly skewed, with the most valuable ten percent of patents in a portfolio accounting for some 90 percent of the overall value. If the patent value distributions of two countries are different, then a straight comparison of the patent numbers can easily lead to a misinterpretation of the technological or economic values of the national patent portfolios.

Results of an investigation

In 2009, the Expert Commission commissioned a study of possible distortions.[178] The results allow a number of conclusions to be drawn. It turns out that patents are still closely linked with export volumes, so that they can reflect the technological standing of a country relative to competitors. The study also shows that weighting patent applications with various indicators hardly leads to any changes in the relative positions of countries. However, when considering individual fields of technology, then weighting can lead to slight shifts of the countries compared with one another. The investigation confirms that the strategic use of patents and the associated increase in numbers of applications is about the same across various countries and fields of technology. Therefore it still makes sense to continue the comparison of "transnational patents" (Section C 5). Nevertheless, the Expert Commission advises paying careful consideration to the possible influence of distortions when interpreting patent data.

Conclusion on the use of patents as indicators

Despite various distortions and weaknesses, patents are useful in analyses intended to contribute to the formulation of R&I policies. In certain cases it will be appropriate to use quality-weighted patent data, above all when considering measurements of technological potential. With specialisation measures, the use of weighted patent data will only result in slight changes.[179] The results previously presented retain their relevance – Germany has a clear specialisation profile with a focus on classic automotive technology, mechanical engineering, electrical engineering and chemistry. The sectors of cutting-edge technology are less well represented in the patent portfolio of German applicants – even when the patent indicators are weighted with the importance of the patents.