

# Patents and Innovations for Growth and Welfare

## Summary and Policy Recommendations of a Government Policy Study<sup>1</sup>

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## **1 The study's commission, background, frame of reference, design and method**

### **1.1 The directive for the study**

The Swedish Government decided on 15 April 2004 to appoint a special investigator to survey the economic aspects of patenting for corporate growth and development. According to the directive (Dir. 2004:55), patent protection is of great importance for entrepreneurship and growth, and the investigator is to:

Make an analysis of how protected intellectual capital can contribute to export and trade. The inquiry must procure opinions from both industry and other actors.

The directive further specified that the inquiry must include an analysis of how<sup>1</sup> Swedish companies deal with patenting as a means of competition, especially in comparison with companies in other European countries and the rest of the world, as well as how patenting is distributed among companies of different sizes. Here, the latest developments in the EU region were to be considered. The study was also tasked with

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<sup>1</sup> The full report is in Swedish, authored by O. Granstrand, with reference: SOU (2006:80), Patents and Innovations for Growth and Welfare (Patent och innovationer för tillväxt och välfärd), Fritzes Publishing Co., 462 p., Stockholm, 2006.

including a Nordic comparison and identifying problems and opportunities on the Nordic patent market.

According to the directive, the commission's remit was to:

- lead to proposals that can create understanding and insight, particularly in small knowledge-intensive firms, about the economic profits – and costs – of patenting;
- lead to proposals of how knowledge-intensive firms can be stimulated to patent their innovations to a greater extent;
- illuminate the relationship between patenting and economic growth;
- contain an analysis of the decline of the patenting frequency in Sweden and the most important causes of this trend.”

## 1.2 Interpretations for carrying out the commission

At an early stage, the following interpretations and plans were made in regard to the commission:

1. Direct collection of new empirical primary data can be limited to Sweden. For other countries, available secondary material can be used. An evidence-based approach for policy design should be sought; that is, a policy analysis should be based, as far as possible within given resource limits, on empirical and theoretical evidence (rather than on different interest groups' opinions).<sup>2</sup>
2. Concerning the concept of intellectual capital, the focus lies upon patents and neighboring rights, such as trade secrets in licensing.

The expression “*Swedish patent application*” is ambiguous and can refer partly to a patent application submitted by a Swedish company (regardless of where the inventors happen to be located) or by an inventor who is Swedish (regardless of where he happens to be located) or by an inventor active in Sweden (regardless of his precise nationality), as well as to a patent application submitted to the Swedish PRV. The expression will be defined more precisely in its context.

The concept of a *patent* is used in its accepted sense. Formal definitions of a patent vary somewhat internationally, but in general a patent on an invention refers to a time-limited, transferable exclusive legal right to use the invention commercially, *i.e.*, an exclusive right to the invention's commercial utility. This exclusive right entitles the holder to act through a court procedure to prevent others from manufacturing, using or selling the invention, and in some jurisdictions from importing infringing products as well.

3. Export and trade will refer to both products and services, as well as technology and shares in technology-based firms. 2

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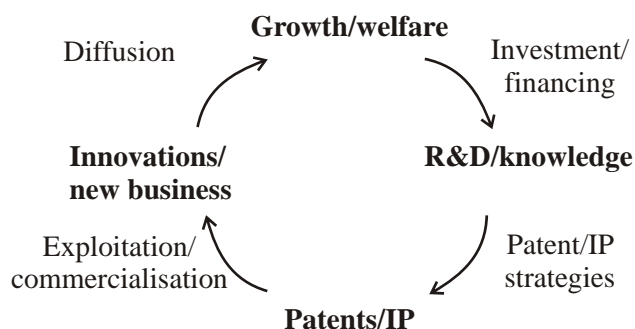
<sup>2</sup> A review of just over twenty SOU reports in the area shows that research-based material has traditionally been collected to a rather small though growing extent – especially regarding primary material, *i.e.* material collected via studies made during the inquiry's time framework. (See *e.g.* SOU 1977:64, SOU 1983:52, SOU 1993:84 and SOU 2003:66.) The possibilities of carrying out an evidence-based approach must, however, be adapted to the state of knowledge and the access to resources, including time. A good time margin in policy research is advantageous here. Such a margin has not existed regarding economic aspects of patenting, *i.e.* within patent economics, due among other things to the rapid progress in the patent field and to economists' traditional lack of interest in patent issues.

4. The concept *industry* is to be interpreted widely and correspond to the *business sector*, thereby including, *e.g.*, the service industry.
5. The concept *Swedish companies* is to comprise companies with Swedish majority ownership, multinational companies with a clear Swedish nationality or bi-nationality (*e.g.*, ABB, Akzo Nobel, AstraZeneca, Stora Enso), and foreign-owned companies located in Sweden. Unless stated otherwise, *large companies* have at least 500 employees and *small companies* fewer than 50 employees, with *medium-sized companies* falling between these ranges.
6. The concept of *competitive means* will also refer to means for exploitation and growth when appropriate.
7. The concept of *the Nordic patent market* will refer to the Nordic market for technology trade, *i.e.*, trade with patent licenses, know-how licenses, R&D services and R&D companies, or corresponding activities.
8. The expression *decline of the patenting frequency in Sweden* is to be interpreted as the decline in national first filings (*i.e.*, priority filings) submitted to PRV (Swedish Patent and Trademark Office).
9. The commission's third task, illuminating the reciprocal relationship between patenting and economic growth, can be broadened to include patent-related recommendations for increasing growth. The increasing of growth is also a means of generating resources for R&D and thereby increasing patenting in knowledge-intensive companies. The connection between patenting and growth is thus reciprocal. Clarification of this reciprocal relationship is a main task of the inquiry. Growth, which then will chiefly refer to growth in turnover, is therefore made central to the inquiry.

### **1.3 The commission's frame of reference, design and method**

A frame of reference for the inquiry, in the form of a so-called "patent/growth spiral," has been developed in several steps for studies of diverse links between patenting and growth; see, Figure 1. Intermediate variables related to R&D and innovations have been introduced, and the mutual influence between different companies has been taken into account. The frame of reference has also been broadened into a model of the Swedish system of innovation and entrepreneurship.

Figure 1 The patent/growth spiral with intermediate variables



A relatively large number of substudies have then been designed with different levels and units of analysis (countries, sectors, companies, innovations, technologies and patents), with different methods of data collection (e.g., interviews, case studies, questionnaires, and/or statistics). For reasons of time and space, a basic sampling principle has been to choose units of analysis which, in some sense, represent high growth levels or high patenting and R&D levels. Several substudies with relatively small selections have been preferred to a few with large selections. A large questionnaire study of large companies has, however, been conducted. Totally, around 75 persons have been visited for long interviews, in addition to a large number of short telephone interviews and conversations, and around 200 companies have been approached with survey questionnaires. Further, there has been participation in 14 conferences, mostly international. The inquiry's substudies have involved around 10 project assistants. The substudies are fundamental to the inquiry, in accordance with an evidence-based approach for policy design. The most important results are presented in summary in Section 3 below, as well as in special appendices and background reports to the main report.

## **2 Introduction to the economics of knowledge, patents, innovation and growth – and relationships between patenting and growth**

### **2.1 Emergence of an increasingly knowledge-based economy with a new IP regime**

While few observers nowadays question the emergence of an ever more knowledge-based economy, the expression ‘the new economy’ can be questioned. “New” is the fact that the economy has come to be dominated by intellectual capital in different forms – defined as non-physical, non-financial capital. At the same time, fundamental old capitalistic institutions have survived. Intellectual property (IP) and legal rights to it (IPRs) have consequently become much more important, and a new IP regime, including a “pro-patent era,” has developed since the 1980s. Its effects are pervasive on diverse levels, not least internationally. Countries and companies arm themselves with strengthened IP rights as competitive means, at present with the USA and Japan in the lead. Patent and IP issues, once obscure secondary questions for specialists, have thereby become strategic and risen to high levels of political and industrial management. On the other hand, difficulties are created in integrating these issues with other economic policies and company strategies – although these difficulties appear by and large to be temporary. A trend toward more aggressive patenting policy can be expected in countries such as China, Taiwan and Korea, which are thus further increasing their technology-based competitive power and, therefore, should be watched closely.

### **2.2 Economics of innovation and patents – a brief introduction**

The economics of patents and innovation must be seen from the perspectives of both business and society. Basic concepts are inventions and innovations of different kinds (technical, organizational, financial, product and process innovations, etc.) and size (large/small or radical/incremental), and different kinds of diffusion of innovations, especially diffusion among buyers and sellers, during which imitation usually occurs to some extent, e.g. partial imitation of a new technology. Basic models include the product life-cycle model and interactive innovation-activity models. Generic strategies for investment in new technologies and in their exploitation in a business economic perspective include in-house R&D, production and marketing; acquisitions and spin-offs; different types of collaborations; joint ventures and external partnering; in- and out-licensing and residual types of in- and outflows of technical information and knowledge (i.e. technology). These strategies

are becoming ever more common and have important effects on growth and financing.<sup>3</sup> There are also several generic forms of financing.

The patent system's structure and processes are designed to stimulate invention, innovation and diffusion by giving the inventor/innovator a sufficiently strong and long-lived competitive advantage against imitation in return for public disclosure of information about the invention. The patent system has advantages and disadvantages on diverse levels and there are several theories underlying the system. In this connection, much customary as well as new criticism of the patent system's drawbacks have been voiced. The customary criticism of the patent system concerns its costs for society in the form of static limitations on competition and monopolistic pricing, administrative costs and transaction costs, including high costs of disputes, distorting effects, and opportunities for abuse. This is reinforced by the more recent criticism that too many patents, also of poor quality, are granted in too many sectors where they hinder progress more than promoting it, for example, in the electronics and telecommunications domain, especially the software sector. Further, critics argue that there is unfair treatment of small companies, and of developing countries which are becoming too dependent on the technology of large companies and developed countries. In addition, the system as it has evolved during the pro-patent era is criticized for paying excessive attention to big industry's interests in the developed world, notably in the USA. Society's interest in, for example, open access to R&D results has been deferred in this respect. In sum, the recent criticism implies that not only static competition, but also dynamic competition, is restricted by an overly strong patent system, which thereby counteracts its fundamental aim of promoting dynamic competition – that is, innovation-based competition – partly at the expense of static competition. Of course, these critics acknowledge that each individual patent right expires completely after 20 years, and, therefore, focus their criticisms on the active 20-year period.

### **2.3 Economic growth – general description**

Growth studies of different kinds (empirical, theoretical) have rather unambiguously indicated the decisive role of technological and organizational development for economic growth on the macrolevel, in the form of different kinds of innovations. Here, the patent system, historically weak, especially in Europe, has traditionally played a secondary role, with certain important exceptions.

On the microlevel, the links are more varied and unclear. No general results exist that point to a single size group of companies as being most important for growth. Rather, the synergies between companies and their strategies in an innovation system are of great importance. Studies during recent years have shown, for instance, the significance of technology diversification, generic technologies and convergent technologies, and “creative accumulation” for technology-based companies' growth – companies which thus become multi-technological. Structural changes in the form of company acquisitions and spin-offs also have high growth potential.

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<sup>3</sup> Note that these strategies represent different degrees of organizational integration or “openness” (with the current notion of “open innovation” as a special case). The more open strategies for technology exploitation are usually associated with lower company growth compared to in-house production and marketing, everything else equal.

Finally, it can be demonstrated theoretically that innovations of different kinds usually contribute to companies' growth – but not always, and especially not for process innovations even if these have perfect patent protection or secrecy protection.

## **2.4 Previous studies and other inquiries**

The state of knowledge about the role of patenting in company growth and development is generally vague. This fact is connected with a formerly weak patent system and a low interest among economists in patent issues, which traditionally have been handled by lawyers and licensing executives. However, foreign and Swedish studies have revealed certain positive links, although weak, between patenting and corporate growth. These studies have also revealed a related “patenting paradox” – the fact that companies, especially in chemistry and pharmaceuticals, nonetheless do considerable patenting despite uncertainty about the economic value of any given patent. That growth generates R&D, which in turn generates patents, has been shown more clearly across industries, albeit again with variations. Thus, growth generates patents while the opposite relationship is weaker and less clear.

Still, the state of knowledge will very probably be strengthened in the future, just as the links between patenting and economic development have probably been strengthened by the pro-patent era's emergence. At the same time, the fact remains that the variations in economic importance between different patents are very large, and this hinders or sometimes totally frustrates statistical inference with reasonable confidence.

A major Swedish study conducted by the Royal Swedish Academy of Engineering Sciences (IVA) and PRV during the early 1990s pointed to the Swedish “growth paradox” of strong R&D development and weak growth development. At the same time, the development of Swedish patenting was quite weak, especially in comparison with Japan. Further, the study identified a number of weaknesses regarding exploitation of technology in the Swedish system of innovation and entrepreneurship.

Abroad, numerous inquiries and reforms have been carried out after the advent of the pro-patent era. The investigative work on many issues in Europe, regarding, *e.g.*, the proposal for a community patent, common policies for patent dispute resolution, proposals to reduce the number of translations, and common policies for computer-related inventions, has made little progress, whereas strong measures have been introduced in countries such as Japan and Korea. A concerted patent reform effort began in the USA in 2000 and has been ongoing ever since, via continual implementation of a series of small changes. The ultimate shape of the reforms in the USA is still emerging and somewhat unknown as the reforms ultimately involve the competing interests of major economic players. National economic aspects play a great role in all this reform work. The situation in China and India is less clear, although both countries have experienced substantially increases in domestic patent filings, and they must be kept under surveillance via preparation of comparative studies. IP questions, especially in China, have been raised to the highest political level – largely because of America's international activism against pirate copying, but also due to Chinese actors' growing self-interest in patenting.

## 3 The inquiry's empirical studies

### 3.1 Patents, innovations and growth in Sweden – a description and analysis

The many substudies in the inquiry have been performed in order to illuminate the often complex connections between R&D, patents, innovations and growth in Sweden. The results shed light on many disparate connections that do not readily lend themselves to summarization. A substudy of the principal Swedish innovations pointed to several structural problems in the Swedish innovation system. These were the low overall frequency and proportion of innovations in SMFs (small and medium-sized firms), large companies' low frequency of radical innovations in new business areas, and the rapidly increasing foreign ownership of innovative Swedish companies, especially in the pharmaceutical industry. The interplay between large and small companies, as well as that between companies and universities was important in the processes of innovation and diffusion, while the growth rate and the speed to international markets did not differ much between large and small companies. Another substudy, of how exploitation has occurred for important Swedish patents, indicated once again the dominance of large companies and how seldom they arise from small companies, even from those small companies that have good patent protection. Here, too, foreign ownership of important Swedish patentees has increased markedly.

Fast-growing small companies in general grow for many different reasons, and patents could not be proved to play any role in this group of companies. However, their patent awareness was strikingly low and the selection very small, with a large share of service companies. This result suggests further investigation of the role of patenting for fast-growing companies in general. On the other hand, and not surprisingly, patents had a clearer connection with growth in fast-growing small technology firms, which were also patent-aware even if their patent know-how was low. In these firms, patents also had great significance for attracting risk capital. The study of small companies in the IT sector, including software companies, demonstrated the great importance of product innovations for software companies' growth, although patenting was less important for growth. The proportion of IT companies that engage in license trading was comparatively high. A major part of the software companies believed that legal patent protection should be extended to pure software, as did nearly all the patent bureaus asked in a separate substudy. A number of short case descriptions provided more situation-specific clarifications. Further, one should remember that several of the substudies' sample sizes were relatively small, which calls for caution in their interpretation.

A large questionnaire survey of 50 large companies in Sweden, of which 38 answered, showed in sum what importance patents and patenting possibilities have for their R&D, innovations and growth.<sup>8</sup>

The companies' product development rate is high in a Nordic comparison. Much of the companies' sales, and most of their inventions in both products and processes, are protected by patents. Patenting in order to delay or prevent competition by imitations is also the most important commercialization strategy for new products, and is now considered more important in big Swedish companies than previously, as well as by comparison to companies in the USA.



The relative strength (elasticity) in different variable relationships in the companies' patent/growth spirals is also clearly and consistently positive.

The companies' own R&D also often grows through other companies' patenting, which causes extra work in order to circumvent blocking patents. At the same time, although much less often, one's own R&D is reduced through others' patents and patent information, since duplicate work is avoided but one's own R&D is obstructed so much that it is discontinued.

Finally, the patent system itself has great influence on large companies' inventions, new products and R&D efforts, which would be reduced by roughly one third – and product sales by a fourth – if the possibilities of patenting were to disappear.

The study of large companies also concerned the question of reasons for the decline in patent applications to the PRV. This part of the study of large companies is reported in Chapter 9. A questionnaire survey of 12 respondents from 14 large patent bureaus with a similar focus, however, was reported in this chapter. This patent bureau study confirmed, on the whole, corresponding parts of the picture reported in Chapter 9 – i.e. that the PRV's share of first, or priority, filings is decreasing, mainly due to greater use of PCT and EP applications, and that the primary reasons for the decreasing number of first filings to the PRV are more selective patenting and more emphasis on quality instead of quantity. The turnover in the patent bureau business, though, did not decrease during 2001–2004.

A survey of the IP education offered in Sweden indicated, among other things, that fewer than 10 % of the graduate Master's students in technology, economics, and law have been given any course in IP; that almost no qualified education exists in IP economics; that qualified advice is scarce throughout the IP sector's range of competence, despite the abundance of actors in the area of innovations and entrepreneurship; and that business managers in Swedish technology-based companies do not receive any substantial education in IP issues. Moreover, there is a great shortage of certified patent specialists in Sweden. These conditions are far from consistent with the dominance of intellectual capital in an ever more knowledge-based and IP-oriented economy.

### **3.2 Has Swedish patenting declined, and if so, why?**

As one of the inquiry's four main tasks, a description and analysis have been made of changes in Swedish companies' patenting frequency and in numbers of patent applications received by the Swedish PRV, especially priority application filings. The patenting frequency as a concept can then refer to both patent-application frequency and patent-granting frequency, where as a rule "frequency" refers to number per year. Various factors lie behind companies' patenting frequency and patent propensity – that is, the propensity to patent a given patentable invention – as well, as the frequency of filing patent applications at PRV. When counting patent applications, it is important at least to separate the four main paths by which a first filing can be submitted: as a national application in Sweden or in some foreign country, and as an EPO or a PCT application. These paths can then be combined in several ways, *e.g.*, a patentee could co-file an application with the EPO and the UK Patent Office, with the intention of receiving an early search report from the UK Patent Office to show to investors or others but with the intention of ultimately protecting the invention via the EPO.

Large multinational companies such as Nokia, with large and internationalized R&D and large patent portfolios, are to an increasing extent internationalizing their patenting work and their application procedures. This leads, all things being equal, to a decline in the number of patent applications received by the national patent offices of small countries that have many large multinational companies, such as Sweden. But this does not necessarily mean a decline in the number of EPO applications designating Sweden, *e.g.*, the application will be reviewed by the EPO and not the PRV. The statistics also show that a decline occurred for national filings in Sweden, Norway and Finland during the last five years, simultaneously with a steady rise on the whole throughout the pro-patent era in filings in the USA, Japan, and the PCT. The decline in Sweden was attributable mainly to Swedish applicants and, to a greater extent, to large companies' patenting. The percentage decline, though, was roughly similar for the two groups of patent-seeking companies and individual inventors, which were about equally large in 1998. The turnover in the population of applicants was moreover very high. Of the applicants who, at least in some year during the seven-year period 1998–2004, submitted a first filing to PRV, only around 5 % had submitted further first filings during each of four or more of the seven years – *i.e.*, around 95 % of the applicants submitted first filings less often than every other year. The flow of patentable inventions for an actor to consider is thus of great significance. This flow's size depends mainly on R&D resources and patenting resources.

The decline in Sweden also varied a good deal according to the area of technology in question, with a striking drop in the electrical and electronics sector from 2000 until 2004. The large companies in this sector – Ericsson, ABB and TeliaSonera – dominated the decline both in this sector and among the 20 companies which were largest in terms of numbers of first filings to PRV during the period 1998–2000. This indicates that the decline owed much to a business recession within the IT and telecom sector, although not solely in view of other specific problems, chiefly at Ericsson and ABB.

To simplify, one can say that the IT bubble burst and, with it, a patent bubble. At the same time, companies sensitive to business cycles within the mechanical engineering sector, such as Volvo, Scania, Sandvik, Electrolux and Atlas Copco, increased their patent-application frequency. If Ericsson and ABB are counted out, the increase among these companies roughly compensates for the decline among other companies on the top-20 list of most frequent patentees at PRV.

A questionnaire study among the largest R&D-intensive companies, with a control group among SMFs, then showed that changes in R&D resources and patenting resources are important factors behind changes both upward and downward in patenting frequency for both large and small companies, in line with previous studies. Besides these factors, a main explanation given for a decline in patenting frequency is a decline in patent propensity, in the form of a more selective and quality-oriented patent strategy which, in several companies, followed a period of quantity-oriented patenting during the 1990s. This view was generally confirmed by a questionnaire study among the largest patent bureaus in Sweden. Further, for SMFs, patents played a much smaller role in financing after the IT bubble burst, when access to risk capital decreased sharply as a whole in Sweden.

The quality and cost-efficiency of PRV services were considered satisfying by most of the large companies, even though a substantial potential for improvement of customer satisfaction could be noted. The PRV's share of the Swedish large companies' first filings was also generally constant during the period 1998–2004, while the

USPTO's share of Swedish large company priority filings dropped greatly, according to the study. The share of PCT applications has also grown among the large companies during the period, and most of these applications went to the PRV as the international receiving office. However, the PRV's share of the PCT applications as international receiving office has declined on the whole. More Swedish applicants are also electing either the European Patent Office or the WIPO International Bureau as their international receiving office.

Swedish large companies did not, on average, decrease their patenting in the USA to any substantial extent during the period 1998–2004 in absolute numbers, although they did so proportionally. Sweden has also, on the whole since 1994, retained its tenth place on the top-20 list of most frequent patentees in the USA. On the other hand, several countries in Asia have climbed up this list – Taiwan, South Korea, China and Singapore – and dominate, together with Japan and Hong Kong, over the European countries on the list, in terms of numbers of patents in the USA.

## 4 The inquiry's recommendations

### 4.1 Discussion and general recommendations

The inquiry's general recommendations are largely concerned with the wider context of patenting – R&D, innovations, business development and growth, and the mutual relationship between patenting and growth. The more specific recommendations address the inquiry's first two tasks – to increase understanding and insight in patent economics and to increase companies' patenting. Since this patenting, in turn, tends to increase when growth increases, the general and specific recommendations are intimately related to each other. A number of common principles also underlie these recommendations.

An economy that increasingly evolves in the direction of being ever more knowledge-based, IP-oriented and globalized creates greater and different opportunities, but also problems of control. These in turn require changes of roles for, and interplay between, the state and the business sector in order to achieve high goals of growth and welfare.

Sweden's economy has several good possibilities for developing favorably toward an increasingly knowledge-based economy through good knowledge resources in the form of good education and high R&D intensity, highly diversified and internationalized industry, and so on – but also through good access to natural resources per capita, which is lacking in economies such as those of Japan and South Korea. To take better advantage of these possibilities, for example, in the form of synergies between knowledge resources and natural resources, a national culture for IP and business development, including entrepreneurship, should be built up and strengthened in diverse ways. Here, focusing on patent and IP issues is no end in itself. On the other hand, such a focus is instrumental for creating more economically efficient innovative activity in business and government, similarly to how focusing on quality issues and lead times was previously instrumental for broader aims in the business sector's vitalization and transformation.

The Swedish entrepreneurial system, including the Swedish innovation system, should be strengthened by reinforcing both state (public) and private entrepreneurship. That the state directly acts as an entrepreneur, and does not just indirectly promote entrepreneurship, illustrates a changed role in a changed economy. This role is especially strong in a small country with a large and important technology-based service sector, which to a great extent is public. This sector is heterogeneous and includes the university and college sectors, the telecom and energy sectors, the financial sector, the defense and security sector, the medical and health sector, and others. These technology-based service sectors have considerable innovation potential and business oppor-<sup>12</sup> tunities. Their patent and IP orientation is in general weakly developed, however.

Private entrepreneurship should be strengthened in various ways. The innovation-based entrepreneurship in small and medium-sized companies needs to be made stronger, as does the will and ability of Swedish large companies to create new business areas and radical innovations – activities beyond merely renewing their existing business areas, which has historically been a strength for these companies. Further, collaboration between the innovation activities in Swedish large and small companies needs to be maintained and strengthened. A divergence between technology-based new

firms and large firms can be feared, for instance, as well as a thinning in other respects of the domestic network of buyer/seller relations. Moreover, regional entrepreneurship should be strengthened by taking better advantage of the growth opportunities in already strong, entrepreneurial regions and along geographical axes of growth.

The economic competence should be raised in the Swedish entrepreneurial system, just as the Swedish appropriation of growth should be increased. For example, growth is created in the R&D sector (which is a service sector) at the same time as technology sales of licenses and shares in R&D companies occur to foreign buyers and manufacturing abroad does not generate other domestic growth to a sufficiently great extent. It is not credible that a knowledge-based economy in international competition can be based merely on a dominant R&D service sector.

A number of general recommendations for the IP sector can then be formulated, such as continuing to work for (a) Nordic collaboration; (b) English as the language for business, patents and IP; (c) further implementation and development of the international patent system in differing old and new respects, for example, regarding international harmonization and rationalization, development of the PCT system and the enforcement system – as well as change in patentability judgment, mainly in the form of raising the requirement of inventiveness and reformulating the requirement of technical character; and (d) offensive transformation of the PRV toward greater internationalization, diversification and rationalization. In this context, a change of law is proposed so that patent applications to PRV are allowed to be written in English without requiring later translation (in other words, accepting the London Protocol without requiring its full ratification throughout Europe). The PRV should also test the issuing of non-binding examinations of validity and infringement, according to the British model.

A final recommendation, due to the future importance and generic character of these questions, is the creation of an interministerial Strategy Council for IP and innovations, directly under the Prime Minister's office. Active, clear support from leaders in the business sector and in government is of decisive significance for implementation of the above recommendations.

#### **4.2 Special recommendations for increasing patent awareness, insight and propensity to patent**

A basket of specific recommendations has been designed, partly in order to increase companies' understanding and insight in patent economics, and partly to increase their possibilities and will to patent. Greater understanding of patent economics can be assumed to increase patenting propensity, which in turn increases the patenting frequency, all things being equal. The patenting frequency, however, is influenced by a number of additional factors within and beyond both the compa-<sup>13</sup> nies' and the state's control, factors which also have been basic to structuring the recommendations.

Understanding patent economics involves some fundamental difficulties. Patent issues are complex and interdisciplinary, with many interwoven economic, legal and technical aspects. The costs and earnings are long-term and therefore of investment character, while the patent costs are much clearer than the patent earnings. In addition, patent earnings have such a highly skewed distribution that the simple counting of patents is often misleading. A number of primary deficiencies in the patenting compe-

tence of Swedish companies were also reported, such as deficient competence in business strategy and business economics, with consequent deficiencies of integration and interplay between business strategies and IP strategies in companies. Additionally, there is a widespread lack of basic patent awareness within the business sector, especially in SMFs, as well as in the academic and the political spheres.

The problems of raising awareness and understanding of patents and patent economics are neither new nor solely Swedish, but have been accentuated by the pro-patent trend, which has led to efforts of different kinds in different countries. Experiences indicate that patent disputes, large awards of damages, and aggressive patent behaviors of competitors have great importance for raising patent awareness and patent understanding – as do good examples of new business opportunities and national studies with competitor comparisons (“benchmarking” studies). State and/or state-supported programs and efforts for advice and support can play a great role here, e.g. to reduce expensive learning within companies.

A number of state-supported programs and measures, partly for increased patent awareness and patent advice, and partly to increase patent understanding, are proposed. A series of programs, campaigns, prizes, studies, and media efforts for greater awareness (“awareness programs”) should be specified, purchased, conducted and evaluated through the Ministry of Industry, Employment and Communications. These programs should be coupled with programs and efforts for business development, innovations and entrepreneurship in general. They should also be coupled with patent-advice efforts in the form of subsidized but qualified advice, and subsidized application fees for first- and second-time applicants within a five-year period. A number of positions, corresponding to 15–20 full-time positions at first, should be established for IP and business development, and placed at national competence centers, including the PRV, and regional development centers. A system for quality assurance that sufficient patent and license competence is available in state-supported R&D programs and R&D collaboration should also be designed.

The overall responsibility for these measures should rest upon the Ministry of Industry, Employment and Communications, in co-operation with other ministries which are involved. The Ministry of Industry, Employment and Communications should be strengthened in this regard, especially with competence in patent, IP and innovation economics.

The measures proposed to increase understanding of patents and patent economics – although once again in a wider context of business development and entrepreneurship – are to establish 3–4 national competence centers for education, advice and research; 3–4 new professorships in IP and innovation economics with responsibility for teacher and postgraduate education; diverse specialized and differentiated Master’s programs for technologists, economics and lawyers; obligatory “conscript education” in patent economics (including licensing economics), patent law and patent technology in the<sup>14</sup> university and college education, and in all education for entrepreneurship, innovation issues and the like; and financial support to companies’ internal and further education in IP, including support for IP executive training and IP trainees. Moreover, two concentrated educational efforts should be carried out as soon as possible: one to cover an educational need for the IP advisers mentioned above, and one to educate patent specialists for certification as European Patent Attorneys – a category of specialists in which Sweden has a serious and increasing shortage. All of these educational efforts

should be quality-assured, and a certification system for IP specialists should be developed in addition to certification of European Patent Attorneys.

The overall responsibility for these measures should rest upon the Ministry of Education, Research and Culture in close co-operation with the Ministry of Industry, Employment and Communications.

The direct measures proposed to increase companies' possibilities and will to patent comprise, besides the above measures, also giving special state support for investments in patents and patent education coupled to other state support for R&D; giving special stimulation to employment of internal patent and IP specialists; supplementing companies' own stimulation measures with special reward systems; supporting the design of guidelines for company boards' and business managers' handling of patents and IP; and a number of specially directed efforts, particularly to technology-based service sectors with a large public part. Special inquiries into issues of business development and IP within the military and medical sectors should be carried out, for instance to judge potential and forms of technology procurement and technology trade.

For those measures above which can be coupled to other current state measures for supporting and increasing the R&D resources in the Swedish R&D system, an earmarking should be done in the form of a 4 % goal for costs of patent and IPR work as a share of the R&D costs, with variations of  $\pm 1$  % depending on the sector and type of company.

Also proposed are better financing opportunities for investments in patents in SMFs, especially in early phases, where leverage can be obtained for financing via private risk capital. For this purpose, the proposals are special patent loans with advantageous conditions, reduced fees for first- and second-time priority applications to PRV, the possibility of faster, prioritized handling by PRV, and stronger advisory assistance, including language assistance. This requires a change in the PRV's rules and operating directives.

In other respects, methods for IP evaluation need to be improved and quality-assured, not least in connection with the utilization of new accounting rules for immaterial assets, that is, IP. At the same time, there is a need to increase the Swedish damages for patent and IP infringement and to improve the grounds for calculating damages. A review of these matters together with tax issues that bear upon patents and the licensing trade should be made. Likewise, a review of the patent system's regulations, including rules for the area of patentable inventions, needs to be performed and coordinated with corresponding work in the EU.

In good time, before a review of rules within the EU, which hopefully will come soon, preparations should be made for a widening of the patentable area through a reformulation of the requirement of technical character – in order to take better account of the need to balance and coordinate investments in innovation in general, and thereby also investments in innovation within the service sector. Regardless of how this re-<sup>15</sup>quirement is formulated, a raising of the requirement of inventiveness should take place.

Finally, it is proposed that there be an increased use of patent information and patent analyses for design of patent policies and their coupling to policies of R&D, innovation and growth. Examples of important areas in this respect are nanotechnology and biohealth technology.

## 5 Summary of the recommendations

A short summary of the commission's recommendations is given below.

### 5.1 General Recommendations

1. Change the roles of, and the interplay between, state and industry in an economy which is ever more knowledge-based, more internationalized, and more IP-oriented
2. Build up a national culture for IP and business development / entrepreneurship
3. Strengthen the Swedish entrepreneur system by
  - 3.1 Strengthening state (public) entrepreneurship, especially within the technology-based service sector, and in particular
    - the university and college sector (university entrepreneurship)
    - the telecom and energy sector
    - the financial sector
    - the defense and security sector
    - the medical and health sector
  - 3.2 Strengthening the innovation-based entrepreneurship in small and medium-sized firms (SMFs), with adaptation to the conditions for
    - SMFs outside the seats of universities and colleges
    - SMFs connected with universities and colleges
  - 3.3 Safeguarding Swedish large companies' will and ability to create new business areas in addition to renewing the existing ones
  - 3.4 Strengthening the collaboration between innovation efforts in Swedish large and small companies
  - 3.5 Strengthening the regional entrepreneurship
  - 3.6 Raising the economic competence in the Swedish entrepreneur system and refining its financial support institutions
4. Safeguard the Swedish growth appropriation
5. Strengthen the Nordic cooperation within the IP sector and in business development
6. Promote English as an international language parallel with Swedish
7. Strive for greater effectiveness of the international patent system, especially regarding
  - Harmonization of the international patent system
  - Rationalization of the international system of patent offices
  - Support for development of the PCT system
  - Support for development of a unified patent system in Europe
  - Support for development of a unified European court system specialized in patent cases
  - The assessment of patentability in some respects, namely

16



- Raising the inventive step requirement
  - Reformulating the requirement of technical character and supplementing it with economically and ethically motivated requirements
  - Developing economic principles for patenting therapeutic methods within an ethical framework
8. Transform the Swedish Patent and Trademark Office (PRV) offensively towards internationalization, diversification and rationalization. PRV should thereby be commissioned to investigate the legal situation and need of legislation and changed instructions in order that:
- a. PRV can handle applications in English without requiring translation into Swedish
  - b. PRV can use price differentiation and subsidy of application costs in line with the present inquiry's recommendations
  - c. PRV can make non-binding assessments of validity and infringement according to the British model
  - d. The requirement of technical character can be replaced by a reformulated interpretation of the concepts "industrially applicable" and "investment character."
9. Create an interministerial Strategy Council for IP and innovation policies at the highest political level.

## **5.2 Special recommendations to increase understanding, insight and propensity with regard to patenting**

1. Raise the awareness of patents and the contribution of advice.
- 1.1 Raise awareness of patents by
- Conducting state-supported programs for raising IP awareness ("IP-awareness programs")
  - Carrying out a special "patent year"
  - Establishing competitions and prizes
  - Procuring broad national studies and inquiries which also in themselves yield increased awareness of patenting
  - Providing media support for IP-oriented publication
  - Carrying out special program measures directed to "under-aware" company types and sectors
- 1.2 Increase advice by
- Subsidizing advisory activities
  - Establishing and locating about 15–20 positions for advisers in IP and business development
  - Coordinating the efforts with EU efforts
  - Ensuring patent and license competence for contract agreements and promoting Swedish jurisdiction

17

2. Improve the understanding of patents by
  - Building up education in IP and innovation economics by means of:
    - Master programs
    - Graduate and teacher education
    - Obligatory minimum education (“conscript training”)
    - Procurement of teaching aids and information material
    - Specialist education for EPO certification
    - Education of IP advisers and IP managers
    - Continued education
    - Company-internal training
  - Establishing 3–4 national competence centers for education, advice and research in IP and innovation economics
  - Establishing 3–4 new professorships in IP and innovation economics, coupled to national competence centers
  - Developing and introducing a certification system for IP competence
3. Stimulate companies’ possibilities and will to patent by
  - Creating greater awareness of patents and understanding of patent economics as specified above
  - Introducing a special state patent-fund for investments in patenting and patent education, coupled to other state R&D funding
  - Giving special stimulation to employment of internal patent specialists
  - Supplementing companies’ internal stimulation measures and reward systems
  - Supporting the design of guidelines for handling of patents and IP by company boards and business managers
  - Carrying out specially focused measures
    - Increasing the resources for R&D
  - Improving the financing possibilities for patenting in SMFs, particularly during early innovation phases
  - Improving the patent economy in cases of dispute
  - Striving to expand the area of patentable inventions in the long run
  - Integrating active patenting policies with general R&D, innovation and growth policies, for example through better utilization of patent information
  - Earmarking 4 % ± 1 % of state R&D for patent and IPR efforts