Proliferation of patents

Different factors have contributed to the proliferation of patents over the past few decades. While a greater number of patents can be beneficial for innovation by potentially providing a wider stock of knowledge for future innovations, the proliferation of patents can also impose barriers to further research and development (R&D), and, thus, to the innovation process. Different policy options can help address the potential negative impacts of the proliferation of patents on innovation.

What is meant by the proliferation of patents?

Patent proliferation refers to the phenomenon of increased levels of patenting activity, which most countries have experienced over the last few decades. These changes have contributed to a rapid increase in patenting activity, notably in high-technology fields such as information and communication technology (ICT) and biotechnology (Martinez and Guellec, 2004). Patent offices have experienced a surge in patent applications since the 1980s, with the largest contribution to such growth being made by new technologies and to some extent originating in economies that have recently gained a significant position in the international technological landscape, such as Korea and Chinese Taipei (OECD, 2004). Furthermore, the rise in the number of applications has been accompanied by increases in the number of claims and the length of patent applications (Archontopoulos et al., 2006).

What are the causes behind the proliferation of patents?

Various factors have contributed to an increase in the number of patented inventions over the past few decades:

Some of these changes can be seen as responses to new challenges, such as the emergence of new technology areas or the globalisation of economic activity. In a knowledge-based economy, intellectual property (IP) contributes more directly to competitive advantage and innovation, and even more so in a global environment where competition is increasingly international, and emerging areas of economic activity are more closely linked to new scientific and technological knowledge (e.g. ICT and biotechnology) (Martinez and Guellec, 2004). Scientific and technological advances have provoked significant shifts in innovation trends (notably in intensive high-technology research sectors, such as ICT and biotechnology), and innovation processes themselves have become less centred on individual firms and more dependent on interactions among global networks of actors in the public and private sectors (OECD, 2004). A stronger focus on basic and applied research (rather than development activities) is associated with more active patenting behaviour. Likewise, there is a positive relationship between the patent portfolios of firms and an outward-oriented innovation strategy characterized by R&D partnerships with external organizations (scientific institutions and competitors in particular) (Peeters and van Pottelsberghe de la Potterie, 2006).

Patent regimes have also known important changes, most of them in the direction of strengthening patent rights by reinforcing the exclusive rights conferred to patent holders and expanding their coverage (Kortum et al., 1998; Kortum and Lerner, 1999; Gallini, 2002; Martinez and Guellec, 2004):

- Most countries have experienced an upward harmonisation, mainly led by requirements set out in international treaties, and decisions taken at major patent offices and courts (Martinez

and Guellec, 2004).

- Countries have designed policies and adopted legislation to encourage patenting by universities and public research organisations (PROs) (OECD, 2004; Zuniga, 2011; see Bayh-Dole Act [1]).

- Patents have been made available to new types of subject matter, such as software, biotechnology and business methods (Martinez and Guellec, 2004; Park, 2008; Westmore, 2013). The expansion of the domain of subject matter protected by patents has been instrumental in the recent waves of innovation that have occurred in the biotechnology and ICT fields (OECD, 2004).

- In addition to the introduction of the World Trade Organization (WTO) Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) in 1995, which extended the term of patent protection to up to 20 years in all WTO Member States, periods of data exclusivity, as well as supplementary protection certificates for certain products, have also been introduced.

- Legislative changes have enhanced the ability of patent holders to enforce their patents, both via the creation of specialized patent courts and via various procedural changes (Hall, 2004; Martinez and Guellec, 2004). More easily enforceable patent rights encourage inventors to use patents to protect their inventions and help them capture returns from their investments in innovation.

- Filing procedures are also increasingly flexible and less costly, making patents a more attractive and affordable means of protecting intellectual property in most countries (Martinez and Guellec, 2004; Westmore, 2013). In particular, patent regimes have increasingly gained in flexibility following the introduction of a number of mechanisms that enable applicants to postpone filing and examination at the patent office, while keeping priority rights (e.g. later filings by the same applicant will be treated as if they were filed on the same day as the first application). One of the main advantages of increased flexibility at the initial stages of the application process is that it provides applicants an opportunity to revise expectations about the costs and benefits of patenting a specific invention, and enables them to withdraw applications before the examination is initiated. On the other hand, longer periods of time spent in the initial phases of the application process increase the legal uncertainty associated with “pending” patents, which might be harmful for competition.

- In many instances, patent authorities have also been taking a less strict approach in the application of patent law requirements towards novelty, inventiveness (non-obviousness) and industrial applicability (utility) (Martinez and Guellec, 2004; Correa, 2012). The situation is more striking in new breakthrough technology sectors, like software and life sciences (Lemley, 2012). Moreover, in such high-technology areas, it is not difficult to find that broad protection is granted to inventions whose claims do not correspond with actual utility. Patent claims in new areas are often broader than in mature areas, especially when they concern pioneer inventions rather than follow-on innovations. In this regard, some patenting practices, such as the use of “reach-through claims” (claims to future inventions based on currently disclosed inventions) in biotechnology, can extend protection to a broad range of applications unknown at the time of patenting. Moreover, the explicit adoption of the doctrine of equivalents for infringement litigation (by which an invention that performs the same function, in the same way, with the same result, as a patented invention, would be judged to infringe, regardless of literal differences with what is claimed in the patent) may have also contributed to a general broadening of patent scope in some countries.

How is the proliferation of patents affecting innovation?

Many of the policy and legislative changes that have encouraged patenting across different industries and actors have helped the patent system cope with changes in innovation systems (OECD, 2004). To the extent that patenting reflects such adjustments and contributes to a wider stock of knowledge for innovation, it is not harmful for innovation.

However, if not adequately evaluated and addressed, patent proliferation can be detrimental to innovation in different ways:

- The proliferation of patents of excessive breadth that are neither new, inventive, or industrially applicable can allow patent holders to extract undue rents from competitors and customers for inventions that have no value to society. Low-value patents do not often hold up in courts; however, they can block others from innovating. Patents of low quality and excessive breadth also encourage such strategies as pre-emptive patenting to keep competitors out of the market and the emergence of the so-called “patent trolls” (entities that accumulate patents for the sole purpose of collecting rents from competitors). These issues have been of particular concern in the fields of software, biotechnology and business methods, where patent offices and courts have had the most difficulties in responding to rapid changes, building up institutional expertise, evaluating prior art and determining correct standards for the breadth of granted patents (OECD, 2004).

- The growing number of patents also raises issues of access and information dissemination. In particular, increasing patenting of basic (upstream) research in certain fields (e.g. new technologies such as genetics and software), especially by universities and other public institutions, may impose barriers to knowledge access and diffusion. Upstream research usually concerns breakthrough inventions (including research tools) that can lead to important innovations downstream. Thus, the need to obtain licenses from an increasing number of patent owners in order to access basic technologies upstream might discourage future inventors from investing in research and deter subsequent innovation (Heller, 1998; Heller and Eisenberg, 1998).

- The proliferation of patents has also resulted in notable growth in the number of patents covering a single technology, giving rise to a phenomenon described as “patent thickets”. A patent thicket can be defined as a “dense web of overlapping intellectual property rights that a company must navigate its way through in order to actually commercialize new technology” (Shapiro, 2001). When thickets emerge, they can cause regulatory blockage and impose constraints on new innovators wishing to enter the market. For example, patent thickets facilitate situations of patent holdup, where the patent owner refuses to grant licenses or does it in exchange for very high fees (Lemley and Shapiro, 2007; Geradin et al., 2008). They can also provoke royalty stacking, when the royalty fees paid by the developer of a new product in order to cut through a patent thicket finally make the product itself unprofitable. Furthermore, patent thicketing also encourages strategic or defensive patenting, with the sole aim of extracting higher benefits from competitors (Hall and Ziedonis, 2001; Ng, 2009).

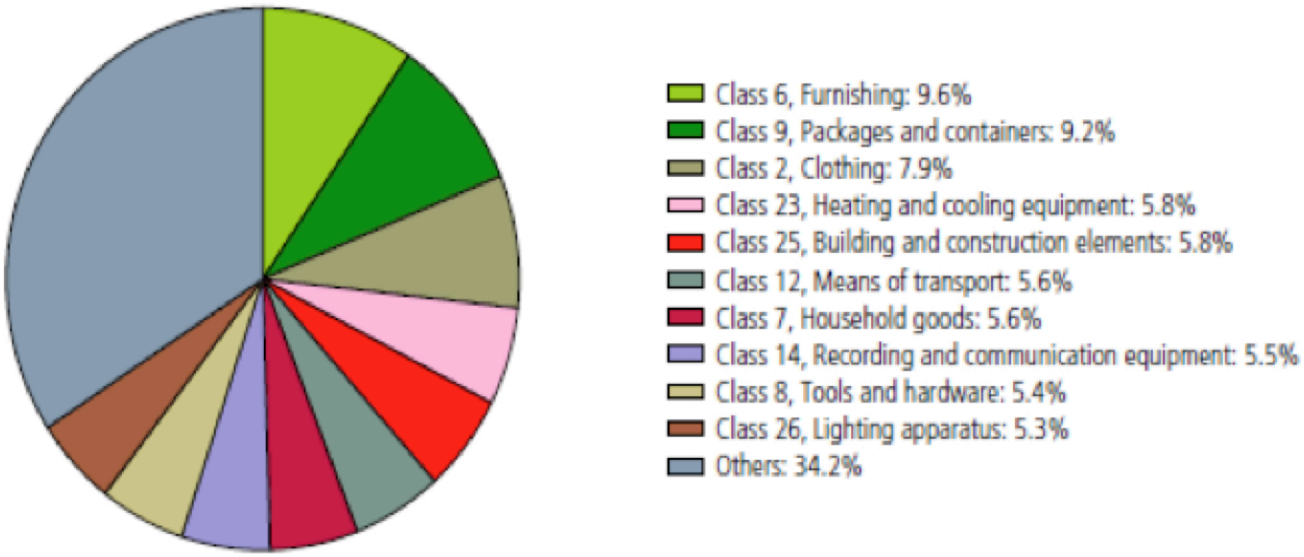
- The joint evolution in the number and size of patent applications raises serious concerns about the ability of the patent system to master the workload that it imposes on patent offices, in particular with respect to the efficiency and timeliness of search and examination procedures (Archontopoulos et al., 2006). Increases in patent filings are not always accompanied by increases in the number of examiners. Thus, the proliferation of patents also adds additional processing costs to the patent system, since the examination process can be delayed for important inventions. Furthermore, if higher workloads cause examiners to dedicate less time to each patent application, there may be a decline in the quality of patents finally granted. Finally, patent proliferation generally leads to more litigation, which also impose significant costs on competitors.

What is the evidence on the proliferation of patents?

The graphic below depicts the number of Patent Cooperation Treaty (PCT) applications filed since 1990, along with annual growth rates. An estimated 194,400 PCT applications were filed worldwide in 2012, representing an increase of 6.6% over 2011. This was the third consecutive year of annual growth. The growth rate for 2012 is lower than that observed in 2011, but similar to that seen in 2004 and 2007 (WIPO, 2013).

Examples of key policy tasks	Centralised	Decentralised	Intermediate
Determine the overall S&T strategy	Establish agencies that represent national policy	Devolve responsibility to the regional level	Devolve responsibility to the regional level but guide strategies
Allocate funding	Allocate funding on the basis of projects	Allocate portions of innovation budget to regional level authorities	Develop a framework by which regions contribute to the elaboration of innovation policy
Provide business support services	Focus on generic instruments (e.g. R&D tax credits or subsidies)	Devolve responsibility for enterprise support to the sub-national level	Regions implement some national and own programmes

The number of PCT applications for the top five origins (US, Japan, Germany, China, and Republic of Korea) also shows a similar trend.



The number of applications in the three major patent offices (USPTO, EPO and JPO) has also increased in the last few years. In the USPTO , the number of total patent applications between 2000 and 2012 increased by more than 240,000, with more than 50% of those applications coming from foreign applicants (USPTO, 2012). Patent filings at the EPO grew for the third year in a row in 2012. Filing volumes from Europe and the US increased moderately, whereas filings from China, Japan and Korea continued to grow at a fast pace and accounted for almost 60% of the increase in filings between 2011 and 2012 (EPO, 2012). Although the annual number of patent applications filed in Japan remained high (at more than 400,000), the number has been gradually decreasing since 2006, with patent applications dropping sharply in 2009. The total number of patent applications in 2011 was 342,610 (a year-to-year decrease of 0.6%) (JPO, 2012). However, in China, the patent office received about 390,000 applications in 2010, compared to around 200,000 applications in 2006 (SIPO, 2006; SIPO, 2010).

What are the policy implications?

The impact of new patentable subject matter on innovation has yet to be systematically evaluated. In particular, the quality and breadth of patents concerning such new patentable technologies as software and biotech need to be monitored in order to assess their effect on the innovation process (OECD, 2004; Hargreaves, 2011).

It is also important to ascertain the real burden of patent proliferation in practice, and evaluate its impact on R&D and innovation.

Various attempts to tackle the issue of patent thickets have been made within the market, such as cross licensing, patent pools and open technology standards (USPTO, 2000; OECD, 2002; Overwalle et al., 2006; Lampe and Moser, 2009). In order to limit potential negative effects of patent thickets, policies to encourage the use of some of the available options, including the use of research exemptions, have also been adopted (Eisenberg, 1989).

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