E

WIPO
WORLD
INTELLECTUAL PROPERTY
ORGANIZATION

PCT/WG/5/4
ORIGINAL: ENGLISH
DATE: MAY 21, 2012

Patent Cooperation Treaty (PCT)
Working Group

Fifth Session
Geneva, May 29 to June 1, 2012

THE SURGE IN WORLDWIDE PATENT APPLICATIONS

Document prepared by the International Bureau

INTRODUCTION

1. At the fourth session of the Patent Cooperation Treaty (PCT) Working Group, the Office of the Chief Economist presented a report on "The Surge in Worldwide Patent Applications" (PCT/WG/4/4). A number of delegates welcomed the report and found it to be comprehensive and useful. However, other delegates expressed concern that the study failed to address the root causes for the surge, notably issues relating to so-called strategic patenting behavior (paragraph 7, PCT/WG/4/16).

2. The Working Group requested the Office of the Chief Economist to "prepare a supplement to, or revision of, the study, for consideration by the Working Group at its next session, taking on board the comments made during the session and any further literature references subsequently submitted by delegations" (paragraph 8, PCT/WG/4/16).

3. In January 2012, the International Bureau invited Group Coordinators to submit literature references to be considered for the supplement report. In response, the delegations of Australia and the United Kingdom provided one reference.[1]

[1] Both delegations submitted the same report, namely London Economics (2010). "Patent Backlogs and Mutual Recognition: An Economic Study," London Economics for the UK Intellectual Property Office.

DISCUSSION AT THE FOURTH SESSION

4. Based on literature review, the original study (PCT/WG/4/4) identified a number of factors that could explain the growth in patent filings. The study focused on the influences most commonly mentioned in the economic literature: policy reforms, strategic patenting, patenting in new technology areas, changed management of R&D and economic integration. In addition, the study sought to provide new empirical evidence on what may drive the growth in patent filings, looking more closely at the contributions of multiple filings, changes in R&D productivity and patenting trends in specific technology fields.

5. As mentioned above, a number of delegations felt that the study was a good starting point (paragraphs 72 to 95, PCT/WG/4/17), but by limiting the focus of the empirical analysis on three factors, the study did not sufficiently address all relevant issues. In particular, delegations asked for a fuller treatment of key driving forces, including strategic patenting, patent filing trends of companies, patent thickets, patent portfolio races, and defensive patenting. At the same, time delegations re-emphasized that the study should be "fact-based" (paragraph 77, PCT/WG/4/17). Furthermore, "evergreening" was referred to by some delegations in informal discussions with the Chair.

REPORT OBJECTIVES AND STRUCTURE

6. To fulfill the request of the Working group, as stated in paragraph 2 above, this report is a supplement to the earlier study for the consideration of the Working Group. Following the guidance of Member States and drawing primarily on the economic literature, this report elaborates on several factors that were outside the scope of the previous empirical analysis. It will also discuss how the findings of the economic literature on these matters relate to the evidence presented in the earlier study.[2]

7. The supplementary report will first focus on the considerations associated with strategic patenting behavior, on which a large number of Member States comments centered. It will then turn to several other factors not discussed in the earlier study, in particular so-called "evergreening" strategies in the pharmaceutical industry and the role of the TRIPS Agreement.[3]

STRATEGIC PATENTING

8. There is no commonly agreed definition of strategic patenting behavior.[4] In the economic literature, the terminology appears to refer most frequently to a broad set of patenting practices and business strategies that arise in industries commercializing so-called complex technologies.

9. Economists define complex technologies as those that consist of numerous separately patentable inventions with possibly widespread patent ownership. (Discrete technologies, by contrast, describe products or processes made up of only a few separately patentable inventions.) Complex technologies reflect the cumulative nature of many innovation processes.

---

[2] This report draws, in part, on the discussion on strategic patenting in WIPO (2011).

[3] The delegation of South Africa asked for the study to elaborate on patent filing trends of multinational companies. Unfortunately, patent data do not contain information on the ownership structure of company applicants. As such, one cannot easily identify the patent applications of multinational companies and separately analyze their trends. While some researchers have matched patent data to firm-level performance statistics, no study appears to exist that would offer insights into how the patenting behavior of multinational companies differs from other applicants.

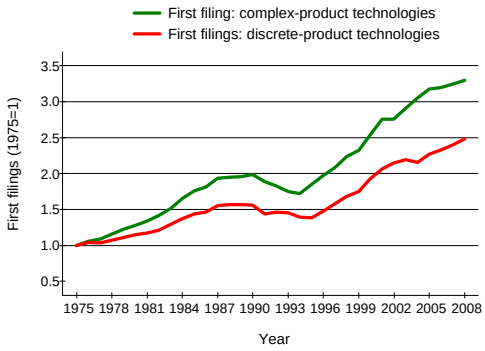
[4] Harhoff et. al. (2007) define strategic patenting as "strategic use of the patent system [that] arises whenever firms leverage complementarities between patents in order to attain a strategic advantage over technological rivals. This behavior is anti-competitive if the main aim and effect of strategic us of the patent system is to decrease the efficiency of rival firms' production efforts." However, the authors state that the definition is not taken from any literature source and subject to modification.

Innovation seldom happens in isolation; one firm's solution to a problem typically relies on insights gained from previous innovation. Similarly, in competitive markets, firms innovate simultaneously and develop technologies that may complement each other.

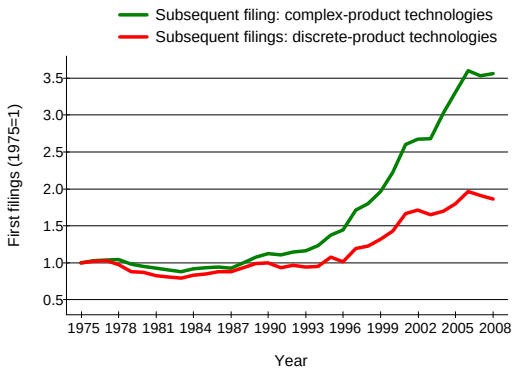
10. Figure 1 (which updates Figure 8 in PCT/WG/4/4) depicts the growth in patent applications worldwide for complex versus discrete technologies. The figure on the left compares patenting growth for first filings, approximating new inventions; it shows consistently faster filing growth for complex technologies since the early 1970s. The figure on the right focuses on subsequent filings – made up mostly of filings outside the applicants' home country; it reveals equally faster filing growth for complex technologies, though only starting from the mid-1990s.

Figure 1: Complex technologies see faster patenting growth

First filings



Subsequent filings



Source: WIPO Statistics Database

11. An important question is whether the faster patenting growth in complex technologies is due to a "technological boom" – reflected in greater investments in innovation and increased productivity of innovation – or due to companies seeking out more patents for the same level of innovative activity. One key reason for the latter may precisely be a shift in the strategy of companies towards patenting specific to industries with complex technology landscapes. In particular, lawyers and economists have identified the following strategic uses of patents:[5]

- *Ensuring freedom to operate*, for example by building "patent fences", allowing firms to develop their technologies without fear of violating other firms' patents;
- *Blocking rivals' patents on related innovations*, enabling firms to gain an edge over competitors;
- *Building up large patent portfolios*, to (i) establish a credible threat of suing competitors and thereby preempting litigation and (ii) strengthen a firms' bargaining power to negotiate cross-licensing arrangements.

These patenting strategies are not mutually exclusive. Indeed, a firm may pursue several strategic goals in filing a patent for a particular invention.

12. A consideration often related to strategic patenting is the filing of "low-quality" patents – or patents that do not meet the legal requirements of patentability. Even if patent offices eventually reject those patents, they may affect economic outcomes before patent offices reach such decisions. Accordingly, companies may speculatively file patents, possibly motivated by the strategic considerations outlined above.

5 See, for example, Jung and Walsh (2010), Arundel and Patel (2003), Harhoff et al. (2007).

EVIDENCE ON STRATEGIC PATENTING

13. Different types of evidence exist that shed light on the prevalence of strategic patenting behavior, as outlined in paragraph 11.

14. Anecdotally, press reports and commentary have in recent years discussed the build-up of substantial patent portfolios in certain industries. In particular, the purchase of large patent portfolios in the information and communications technology (ICT) industry has drawn attention to an ongoing "patents arms race" among competitors (see Box 1). In addition, statements by companies in the context of such purchases provide some indications of their strategic motivations. For example, when Google Inc. bid for the patent portfolio of Nortel Networks Corp, the company's General Counsel explained:

> "[…], one of a company's best defenses against […] litigation is (ironically) to have a formidable patent portfolio, as this helps maintain your freedom to develop new products and services. Google is a relatively young company, and although we have a growing number of patents, many of our competitors have larger portfolios given their longer histories."[6]

Box 1: Patent portfolios and the so called "patent arms race"

Over the past few years, several large ICT firms have invested considerably in purchasing patents from other companies. Most of the documented trading in patents appears to be in the smartphone segment of the industry (which has also seen a large number of suits involving almost all major developers of smartphones, as illustrated further below). For example, press reports have documented the following transactions:

Apple Joins Microsoft, RIM in $4.5 Billion Buy of Nortel Patents (Bloomberg)
"Apple Inc., joined with rivals Microsoft Corp., and Research in Motion Ltd., to outbid Google Inc., for a patent portfolio from Nortel Networks Corp. and gain rights to technologies for mobile phones and tablet computers. The group, which also includes Sony Corp., Ericsson AB and EMC Corp., agreed to pay $4.5 billion in cash for the assets, Ontario-based Nortel said in a statement. The companies aim to complete the sale this quarter pending approval from U.S. and Canadian courts, it said. The purchase will give Apple, RIM and their bidding partners control over more than 6,000 patents and applications that cover wireless and Internet technologies."

Facebook Buy 750 IBM Patents to Boost Defenses (Bloomberg)
"Facebook acquired 750 patents from IBM Corporation for an undisclosed figure, which is thought to be in the hundreds of millions of dollars according to Bloomberg. It will more than double their current patent portfolio, which currently has at least 56 issued patents as well as 503 patent applications filed with the US Patent Office."

Google's $12.5 Billion Gamble (The Wall Street Journal)
"Google Inc. forged a $12.5 billion deal to buy Motorola's cellphone business, a move that could reshape the Internet giant's fortunes in the mobile world while also giving it an arsenal of patents for legal warfare with Apple Inc. and others. […] The Motorola deal also gives the search giant a trove of more than 17,000 patents to defend itself against a rash of lawsuits against its Android software."

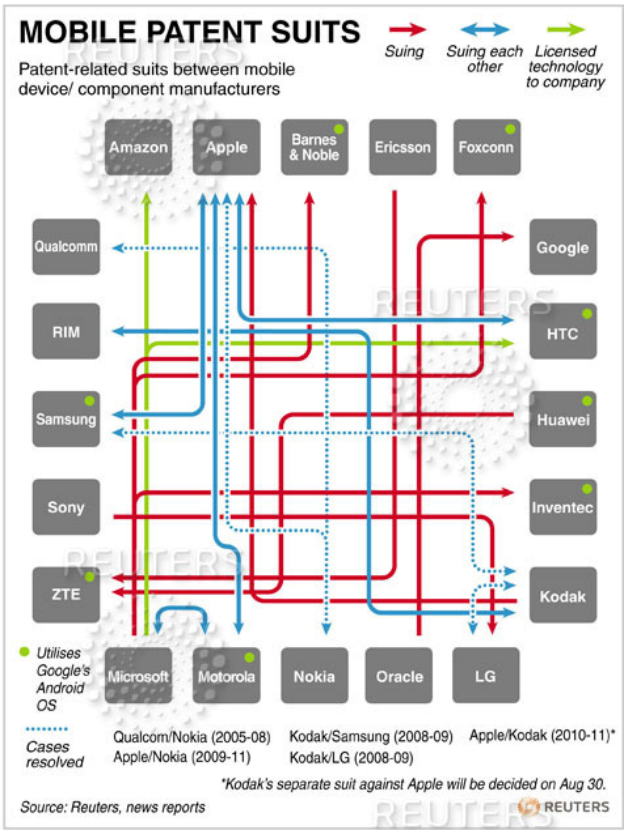
Battle set for Kodak's Patent Portfolio (Financial Times)
"Eastman Kodak's bankruptcy is set to trigger a battle between some of the largest smartphone makers and other technology groups for control of a patent portfolio that is considered core to digital photography. However, several patent experts said that Kodak may struggle to attract the sort of frenzied bidding that was seen after the bankruptcy of Nortel Networks which eventually pushed the price for the Canadian networking equipment group's assets to more than $4bn."

Sources:
www.bloomberg.com/news/2011-07-01/nortel-sells-patent-portfolio-for-4-5-billion-to-group.html
www.bloomberg.com/news/2012-03-22/facebook-is-said-to-buy-750-ibm-patents-to-boost-defenses.html
http://online.wsj.com/article/SB10001424053111903392904576509953821437960.html
http://www.ft.com/intl/cms/s/2/0ac1dcc0-42d0-11e1-b756-00144feab49a.html#axzz1qiMJjCWS

6 See "Patents and innovation" by Kent Walker, Senior Vice President & General Counsel, entry on Official Google Blog, April 4, 2011.

15. Press reports have also documented patent-related lawsuits between different technology companies. Figure 2, drawn from Reuters, offers an overview of the extent of litigation involving patents on smartphone technologies. It illustrates the complexity of relationships among different types of ICT companies from a large number of countries. While the patent disputes by themselves do not attest to strategic patenting behavior, they demonstrate that companies frequently sue each other – consistent with the motivation for defensive patent portfolios described above.

Figure 2: Mobile patent suits



Source: Reuters

16. While offering a window into company strategies, the anecdotal evidence from press reports is invariably fragmented and biased towards high profile transactions and disputes in the ICT industry. They do not offer systemic evidence on the patent filing strategies of firms across different industries; in addition, from press reports alone, one cannot reliably quantify to what extent patenting strategies may have shifted over the past three decades.

17. Academic studies offer insightful additional evidence on patenting strategies. One of the first studies to have rigorously analyzed patenting behavior is Hall and Ziedonis (2001), focusing on the US semiconductor industry. They first recall evidence from firm surveys that suggests that patents are among the less effective mechanisms for appropriating returns on R&D in the semiconductor industry; because of short product cycles, semiconductor firms mainly rely on lead time advantage and trade secrets to recoup their investments in innovation. Paradoxically, however, the US saw a sharp increase in semiconductor patenting from the mid-1980s to the mid-1990s. Moreover, semiconductor patenting grew at a faster pace than real R&D investment, leading to a doubling of the so-called patent yield.

18. Hall and Ziedonis (2001) relate the increase in semiconductor patenting to shifts in the US legal environment that proved favorable to patent owners. Relying on econometric analysis of firm-level data and interviews with semiconductor firms, they conclude that these shifts promoted firms to proactively build up large patent portfolios, along the lines described above. In fact, the study finds that the large-scale and capital-intensive manufacturers most vulnerable to holdup due to patent infringement litigation invested most proactively in securing patent rights.

19. Other studies have documented patent portfolio races for other complex technologies – especially, telecommunications, software, audiovisual technology, and optics.[7] Cohen et al. (2000), and Sichelman and Graham (2010) provide survey evidence on the importance of patent ownership for negotiating cross-licensing arrangements. Some studies find that when negotiating cross-licensing agreements with competitors, the details of the individual patents matter less than the fact that one possesses a large portfolio that can threaten an opponent (Hall, 2009; Noel and Schankerman, 2006). Finally, the survey evidence in Jung and Walsh (2010) reveals that blocking competitors was a major determinant of the decision to patent for nearly three-quarters of surveyed inventors.

20. While most of the available literature focuses on US firms, there is also evidence suggesting that electronics firms in other countries – especially in East Asia – have also accumulated large patent portfolios for strategic purposes.[8] According to Lee and Kim (2010), a 1986 lawsuit by Texas Instruments against Samsung – which led to a settlement worth more than USD 1 billion – proved to be a catalyst for Korean firms to proactively build up their patent portfolios. Blind et al. (2006 and 2009) and Nagaoka and Walsh (2009) document the strategic motives for patenting in the case of German and Japanese inventors, respectively. By contrast, no systemic evidence appears to be available on the strategic motivations for patenting in low- and middle-income countries.

EVALUATING THE EVIDENCE ON STRATEGIC PATENTING

21. The available evidence suggests that strategic patenting, along the lines defined above, is an important phenomenon in certain industries – especially in ICTs. This raises two important questions. First, to what extent has strategic patenting been a “root cause” of the worldwide patent surge? And second, what is the effect of strategic patenting on welfare and innovation?

22. Answering the first question is not straightforward. To begin with, to the extent that there has been a significant shift in patenting strategies, it is not clear whether this shift really represents a root cause – or, in economic terms, was an “exogenous” influence. Policy reforms, as suggested by Hall and Ziedonis (2001), the nature of technological progress, and shifts in competitive market forces may have prompted firms to adjust their patenting strategies. In economic terms, the latter may be an “endogenous” response to the former. Ideally, one would want to quantify the various exogenous “root causes”; however, they are in practice difficult to disentangle, and economic history does not offer many clean “experiments” that could generate reliable empirical insights.

---

7 See Harhoff et al. (2007) and Noel and Schankerman (2006).

8 See Cohen et al. (2002).

23. A related aspect is timing. Elements of strategic patenting behavior can be traced back to the 19th century.[9] Studies of patenting activities in the 1980s – before the most recent surge in patent applications (PCT/WG/4/4) – highlight the different strategic uses of patents discussed above.[10] Whether a root or intermediate cause, the influence of strategic patenting has likely evolved continuously over time, rather than changed discretely. The benchmark against which a shift in patent strategies should be compared is therefore not obvious.

24. A second difficulty is that patent data alone do not reveal the strategies of applicants behind filing a patent for a particular invention. Conceptual consideration and available evidence indicate that strategic patenting behavior is more pronounced for complex technologies. However, the faster growth in patenting for such technologies, as shown in Figure 1, does not by itself suggest that this growth is entirely due to shifting patenting strategies. Indeed, complex technologies, including ICTs, have experienced some of the most rapid advances over the past decades. In other words, even if there had not been any shift in firms' patent strategies, one would have expected fast patenting growth in the relevant fields of technology.

25. A more promising approach is to look at patenting trends relative to underlying innovative activity. As mentioned above, the study by Hall and Ziedonis (2001) documented a doubling of the so-called patent yield – defined as the number of patent applications per real dollar of research and development (R&D) spending – in the US semiconductor industry. Again, an increase in the patent yield may be due to widening technological opportunities or more effective R&D activities. However, identifying that firms file more patents for every dollar they invest in R&D is a useful first indication that patenting strategies may have shifted.

26. The study presented to the fourth session of the PCT Working Group (PCT/WG/4/4) presented similar data at an economy-wide level. In particular, it calculated trends in R&D productivity – defined as first patent filings by residents over constant dollar business sector R&D expenditure. The study found that for the world, R&D productivity has been on a continuous downward trend since the 1970s. This finding suggests that the shifting patent strategies identified for particular industries and countries may not be representative for the world economy as a whole. However, such a conclusion should be drawn with due caution. Economy-wide R&D statistics have many drawbacks and have not always been recorded consistently over time.[11]

27. The earlier study also presented R&D productivity trends for selected countries (see Annex A5 of PCT/WG/4/4). It confirms the declining R&D productivity trend for most countries. The US is one notable exception, having seen a continuous upward trend in R&D productivity since the mid-1980s. Once more, imperfect R&D statistics call for caution in interpreting this result, and increasing economy-wide R&D productivity does not necessarily suggest strategic patenting as the (only) root cause behind the increase in US patent filings. At the same time, the diverging US trend is consistent with arguments in the economic literature that strategic patenting behavior has, in part, been prompted by changes in the US legal environment.[12] It is

---

[9] See, for example, Mass (1989).

[10] See, for example, Kotabe (1992). The 1980s also saw high profile patent litigation, notably the Polaroid-Kodak dispute and the lawsuits of Texas Instruments against rival semiconductor firms; Hall (2005) argues that these lawsuits sharpened firm's awareness about the strategic uses of patent portfolios.

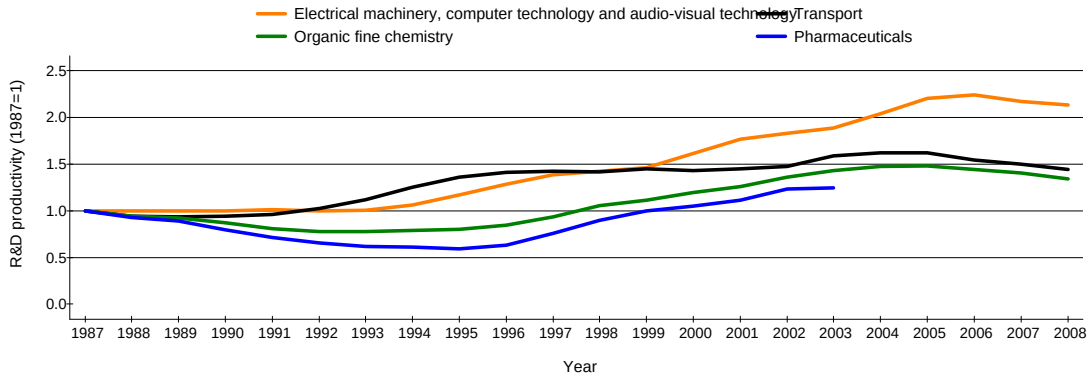
[11] Countries generally collect R&D statistics following the OECD's Frascati Manual (http://www.oecd-ilibrary.org/science-and-technology/frascati-manual-2002_9789264199040-en). However, technological progress, changing business models, and the growing importance of R&D in services, among others, complicate the straightforward application of the Manual's definitions. In addition, differences in accounting rules and practices may affect the comparability and consistency of reported statistics (see, for example, http://www.nsf.gov/statistics/seind06/c4/c4s3.htm).

[12] See Hall and Ziedonis (2001) and Jaffe and Lerner (2004).

also consistent with the findings of Hall (2005) that the growth in US patenting is essentially due to firms operating in complex technology sectors – especially electronics, computing, instruments and electrical equipment.

28. Looking at R&D productivity trends across industries is more difficult, as patent data are broken down by technology fields which do not easily match definitions of different industries. Using the same data described in the earlier study (PCT/WG/4/4), Figure 2 depicts R&D productivity trends for four sectors for which it was possible to "approximately" match patent data by field of technology with R&D data by industry. The comparison is based on data from 12 countries. All four categories show an upward trend in R&D productivity starting from the late 1990s. The fastest growth in R&D productivity occurred in the electrical machinery, computer and audio-visual technology category, followed by transport technology. Both of these categories are associated with so-called complex-product technologies.[13] Clearly, Figure 3 focuses on industries with an increasing R&D productivity trend. Since the trend across all industries is negative (see Figure 7 in PCT/WG/4/4), the trend must also be negative for at least some of the industries that, due to data limitations, could not be included in Figure 3.

Figure 3: R&D productivity in selected industries



Note: The IPC-technology concordance table (available at: www.wipo.int/ipstats/en) was used to convert IPC symbols into corresponding fields of technology. The graph includes the following countries: Australia, Canada, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Spain, the UK and the US. China and the Republic of Korea, two large patent filing countries, were not included due to insufficient data. Generally, there is no one-to-one match between fields of technology and industrial sectors. The four industries included in the figure have a close, but not perfect, correspondence between patents and R&D.

Source: WIPO Statistics Database and OECD STAN Database

29. What is the effect of strategic patenting behavior on innovation and welfare? On the one hand, as already pointed out, many complex technologies have seen rapid advances over the past decades. While the counterfactual scenario remains unclear, it is thus not obvious that strategic patenting behavior has slowed innovation. In addition, studies have pointed out that many complex technology industries have seen the entry of specialized R&D firms. Such firms have relied on patents, both to attract venture capital finance and to generate revenues through licensing income.[14]

[13] Figure 3 shows an increasing R&D productivity trend for pharmaceuticals, starting in the mid-1990s. This contrasts with Hall and Ziedonis (2001) who find a declining trend in this industry. However, their study only focused on the US. In addition, it employed a different methodology in matching patent to R&D data; in particular, it identified the companies behind the patent applicants and then collected R&D data for these companies.

[14] See Hall and Ziedonis (2001), Harhoff et al. (2007), Harhoff (2009), Graham and Sichelman (2008), and Sichelman and Graham (2010).

30. On the other hand, econometric evidence suggests that dense webs of overlapping patent rights – so-called patent thickets – can indeed slow or even forestall cumulative innovation processes.[15] Shapiro (2001) defines a patent thicket as "an overlapping set of patent rights requiring that those seeking to commercialize new technology obtain licenses from multiple patentees". There is an ongoing debate on the effects of patent thickets on innovation. Studies have documented how large transaction costs have made it difficult for some – especially small – firms to obtain the licenses necessary for prior and complementary technologies (Eisenberg, 1996; Heller and Eisenberg, 1998; Murray and Stern 2006). Researchers have proposed solutions such as cross-licensing, patent pools, joint ventures and other cooperative mechanisms for minimizing transaction costs and holdup problems associated with patent thickets.[16]

31. Strategic patenting practices also affect the nature and intensity of competition in product markets. This has implications for price setting and consumer welfare as well as the competitive pressures firms face to continuously innovate. WIPO (2011) provides a more detailed discussion of these inter-linkages.

"EVERGREENING" IN PHARMACEUTICALS

32. Much of the focus on strategic patenting – particularly as a factor behind the worldwide increase in patenting – has focused on complex technology industries. However, patent practices have also shifted in discrete technology industries. One phenomenon that has received particular attention is the strategy of "evergreening" in pharmaceuticals.

33. Survey evidence from different countries has shown that patent rights play a more central role in appropriating firms' R&D investments in pharmaceuticals than it is the case for complex technology industries.[17] This results from the long and expensive R&D process for new pharmaceutical products, combined with the fact that such products are easily imitated once introduced to the market. Only a small minority of initially promising compounds reach the stage of market introduction and, typically, a relatively small number of "best-selling" patented drugs account for the bulk of the revenues of research-based pharmaceutical firms.[18]

34. In this context, "evergreening" refers to patenting strategies aimed at extending the life of a pharmaceutical product's market exclusivity status. It involves the filing of patents on derivative inventions associated with the same active ingredient. Such derivate inventions may relate to new formulations, clinical uses, treatment methods, manufacturing processes, and other attributes. It is important to note that national standards of patentability determine to what extent derivate inventions can receive patent protection; important differences exist across countries in this respect.[19]

---

15 See Cockburn et al. (2009).

16 See Chapters 2 and 3 in WIPO (2011).

17 See Chapter 2 in WIPO (2011).

18 For example, a report by the European Commission (EC, 2009) noted sales of Pfizer's product Lipitor accounted for around 30 percent of the company's global turnover.

19 For example, Section 3(d) of the Indian Patent Act expressly limits the scope of patentability of derivative inventions.

35. "Evergreening" strategies have provoked significant controversy. Critics argue that they are primarily rent-seeking, artificially delaying generic competition at the expense of consumers; they also contend that derivate inventions are often of low quality and should not receive patent protection.[20] Defenders – who may already object to the term "evergreening" – argue that derivate inventions offer significant benefits to consumers and patent protection is critical for incentivizing continuous R&D investments in improving pharmaceutical treatments.[21]

36. For the purpose of this report, two questions are particularly relevant. First, how widespread are "evergreening" strategies and have they become more important in recent history? Second, to what extent could such strategies have contributed to the worldwide increase in patenting?

37. Evidence on the extent of "evergreening" and its importance over time is limited. An inquiry by the European Commission in 2007 documented a variety of patent filing strategies aimed at extending the breadth and duration of market exclusivity.[22] It concluded that such strategies have become more important in recent years. In addition, the inquiry found that the average effective exclusivity period of products increased from less than 10.5 years with first generic entry occurring in 2000 to 14 years for such entry occurring in 2007. Faced with the expiry of patents on many best-selling medicines, research-based companies were found to have employed a variety of "tools" to extend market exclusivity times; asserting patent ownership features prominently among these tools.

38. By contrast, a recent study on the U.S. pharmaceutical market concluded that the effective market life of pharmaceutical products with first generic entry occurring between 2001 and 2010 has remained stable at an average of 12 years.[23] The study further finds that the effectiveness of "evergreening" strategies was offset by a greater number of patent challenges initiated by generic companies, serving to maintain the historical baseline of effective market life.

39. To what extent could "evergreening" strategies have contributed to the worldwide increase in patenting? As shown in the earlier study (Table 8 in PCT/WG/4/4), pharmaceuticals has indeed been a technology field seeing fast patenting growth since the early 1970s. From 1995 to 2007, patent filings in pharmaceuticals grew at an average annual rate of 10.7 percent – the second fastest after digital communications. However, pharmaceuticals account for a small share of total patents filed worldwide – around 4.0 percent in 2008, having reached a peak of 4.4 percent in 2005.[24] Pharmaceutical patenting thus has made only a minor contribution to the overall increase in patenting worldwide.

40. Figure 4 depicts the pharmaceutical patenting share for selected offices. It shows that this share has increased for most offices over the 1985-2008 period. In three middle income countries included (Brazil, China, and the Russian Federation), the pharmaceutical share is significantly above the world average mentioned in the previous paragraph. However, it is still below 10 percent, suggesting a somewhat stronger but still modest role of pharmaceuticals as a driver of overall patenting growth.

---

20 See, for example, Chalmers (2006), Bansal et al. (2009), and Dwivedi et al. (2010).

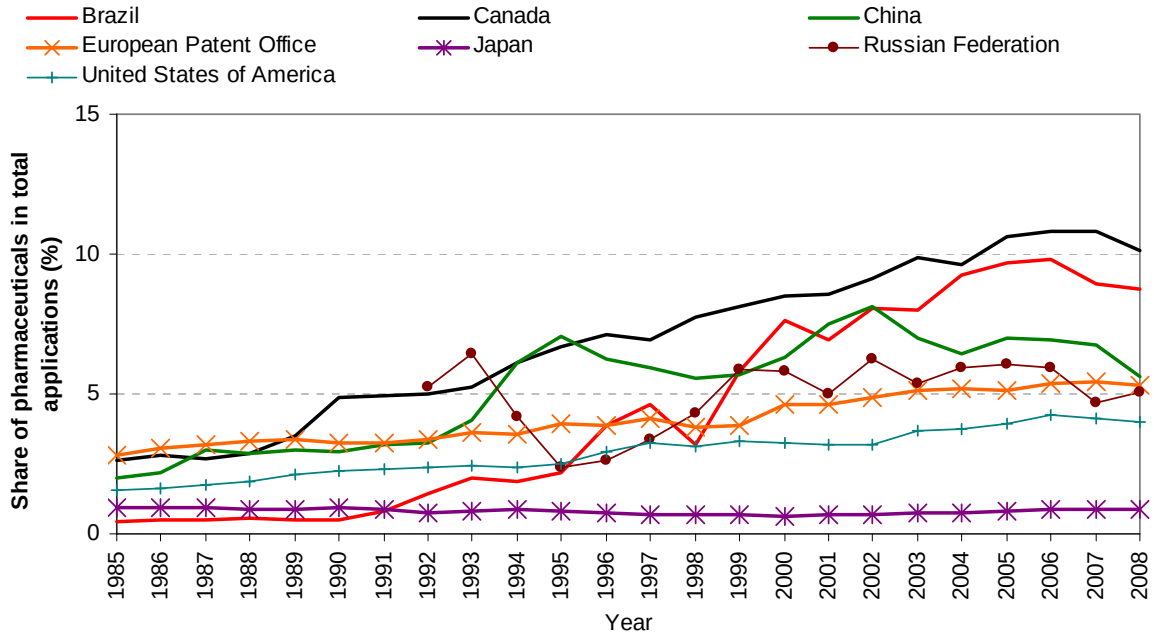
21 See, for example, Thomas (2009).

22 See EC (2009). See also the evidence on portfolio optimization strategies in Harhoff et al. (2007).

23 See Hemphill and Sampat (2012).

24 These shares are calculated from the same data underlying Table 8 in PCT/WG/4/4.

Figure 4: Pharmaceutical patenting in selected countries



Source: WIPO Statistics Database

THE ROLE OF THE TRIPS AGREEMENT

41. Analyzing patent filing data starting in the early 1970s, the earlier study (PCT/WG/4/4) identified two "patent surge" periods; the first one from 1983 to 1990 and the second one from 1995 to 2007. Since the beginning of the second surge coincides with the coming into force of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) on January 1, 1995, a natural question to ask is whether there is any causal relationship.

42. One may distinguish between two possible channels of causality. First, those countries that did not conform to the Agreement´s obligation had to reform relevant laws and regulations. Typically, this implied a strengthening of patent rights, possibly inducing more filings. Second, the coming into force of TRIPS meant that national patent laws and regulations were bound under international law, enforceable through the World Trade Organization´s dispute settlement system. Users of the patent system may have perceived this development as promoting legal stability and reducing the risks of policy reversals.[25] If so, they may, again, have reacted by filing more patents.

43. No study appears to exist that would offer empirical evidence to evaluate these hypotheses. Indeed, such a study would face nontrivial methodological challenges. Regarding the first channel of causality, it is important to keep in mind that the TRIPS Agreement foresaw several transition periods for the full implementation of all obligations. WTO members reformed their patent laws at different times and those reforms may have included other elements, not strictly required by TRIPS.[26] Assessing the empirical relevance of the second channel of

[25] The potential for trade agreements to promote policy credibility is well-recognized. The WTO explains that "[s]ometimes, promising not to raise a trade barrier can be as important as lowering one, because the promise gives businesses a clearer view of their future opportunities" (http://www.wto.org/english/thewto e/whatis e/tif e/fact2 e.htm).

[26] See Hamdan-Livramento (2009). In addition, some countries may have reformed their patent laws prior to the coming into force of TRIPS, partly in anticipation of the Agreement´s obligations.

causality would require controlling for other, confounding influences that may have coincided with the coming into force of TRIPS. Given the large number of such influences, this would be a difficult task.

44. Notwithstanding these methodological challenges, the descriptive evidence presented in the earlier study can at least offer a perspective on the potential relevance of the TRIPS Agreement. Table 1 in PCT/WG/4/4 shows that China, the US, the Republic of Korea, the European Patent Office, and Japan accounted for 73.0 percentage points of the 83.7 percent increase in patent filings worldwide from 1995 to 2007. Aside from China, the patent laws of most other jurisdictions largely met the TRIPS requirements when the Agreement came into force in 1995. China only joined the WTO in 2001. It enacted its second amendment to its patent law – aimed at TRIPS compliance – in the same year. Studies of China's patenting growth suggest that this legal change strengthening patent rights contributed to faster filing growth in the post-2000 period. But they also point to other important growth drivers, notably the R&D intensification of the Chinese economy.[27]

45. Taken together, these considerations suggest that the legal reforms prompted by TRIPS may only have only played a modest role in explaining the growth in patenting worldwide. However, more detailed investigations are necessary to more confidently assess the role of TRIPS, including through promoting stability in patent policies. In addition, the TRIPS Agreement likely had a more pronounced impact on patenting activity in those countries that had to bring their laws into conformity with the Agreement´s obligations – especially in the area of pharmaceuticals.

CONCLUSION

46. At the fourth session of the PCT Working Group, delegates raised a number of questions on the Secretariat study ¨The Surge in Worldwide Patent Applications¨ (PCT/WG/4/4). This supplementary report has aimed at addressing these questions by elaborating on the earlier study's analysis. In particular, it has sought to clarify what may be considered as strategic uses of the patent system, summarized evidence on different forms of strategic patenting behavior, and evaluated to what extent strategic patenting has been behind the increase in patenting worldwide. It has also discussed "evergreening" strategies in the pharmaceutical sector and their role in explaining patent filing growth. Finally, the report has explored the role of the TRIPS Agreement as an additional potential driver of filing growth.

47. In concluding, it is worth pointing out that no single factor can fully explain why the number of patent filings worldwide has markedly increased. In addition, some explanatory factors may be more important for some countries than for others. Clearly, certain driving forces are better understood than others. Unfortunately, the methodological challenges outlined in this supplementary report will continue to constrain the generation of new empirical evidence. Notwithstanding this constraint, progress in collecting richer patent datasets and combining patent data with economic performance statistics will, over time, enable new research on some of the unresolved questions identified in this report.

48. *The Working Group is invited to note the contents of the present document.*

[Annex follows]

[27] See Hu and Jefferson (2009) and Li (2012).

REFERENCES

Arundel, A. and P. Patel. (2003). “Strategic patenting.” Background report for the Trend Chart Policy Benchmarking Workshop "New Trends in IPR Policy".

Bansal, I.S., D. Sahu, G. Bakshi, S. Singh. (2009). “Evergreening – A Controversial Issue in Pharma Milieu.” *Journal of Intellectual Property Rights*, 14, 299-306.

Blind, K., J. Edler, R. Frietsch, and U. Schmoch. (2006). ”Motives to Patent: Empirical Evidence from Germany.” *Research Policy*, 35(5), 655-672.

Blind, K., K. Cremers and E. Mueller. (2009). “The Influence of Strategic Patenting on Companies’ Patent Portfolios.” *Research Policy*, 38(2), 428-436.

Chalmers, R. (2007). “Evergreen or Deciduous? Australian Trends in Relation to the ‘Evergreening’ of Patents,” *Melbourne University Law Review*, 30(1), 29-61.

Cockburn, I. M. and M.J. MacGarvie. (2009). “Patents, Thickets and the Financing of Early-Stage Firms: Evidence from the Software Industry.” *Journal of Economics and Management Strategy*, 18(3), 729-773.

Cohen, W. M., R.R. Nelson., and J.P. Walsh. (2000). “Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not).” *National Bureau of Economic Research Working Paper*, No. 7552.

Dwivedi, G., S. Hallihosur and L. Rangan. (2010). “Evergreening: a Deceptive Device in Patent Rights.” *Technology in Society*, 32(4), 324-330.

Eisenberg, R. S. (1996). “Intellectual Property Issues in Genomics.” *Trends in Biotechnology*, 14(8), 302-307.

European Commission (EC). (2009). “Pharmaceutical Sector Inquiry – Final Report.” Directorate General for Competition.

Graham, S. and T. Sichelman. (2008). “Why Do Start-ups Patent?” *Berkeley Technology Law Journal*, 23(1), 1071-1090.

Hall, B.H. (2005). "Exploring the Patent Explosion." *The Journal of Technology Transfer*, 30(2), 35-48.

Hall, B.H. (2009). “The Use and Value of IP Rights.” Paper presented at the UK IP Ministerial Forum on the Economic Value of Intellectual Property.

Hall, B. H. and R.H. Ziedonis. (2001). “The Patent Paradox Revisited: An Empirical Study of Patenting in the U.S. Semiconductor Industry, 1979-1995.” *The RAND Journal of Economics*, 32(1), 101-128.

Hamdan-Livramento, I.M. (2009). ¨How Compliant are Developing Countries with Their TRIPS Obligations?¨ CEMI Working Paper 2009-001, (École Polytechnique Fédérale de Lausanne).

Harhoff, D., B.H. Hall, G. von Graevenitz, K. Hoisl, and S. Wagner. (2007). ”The Strategic Use of Patents and its Implications for Enterprise and Competition Policies.” Report commissioned by European Commission.

Harhoff, D. (2009). “The Role of Patents and Licenses in Securing External Finance for Innovation.” *European Investment Bank Papers*, 14(2), 74-96.

Heller, M. and R. Eisenberg. (1998). “Can Patents Deter Innovation? The Anticommons in Biomedical Research.” *Science*, 280, 698-701.

Hemphill, S.C. and B.N. Sampat. (2012). “Evergreening, Patent Challenges, and Effective Market Life in Pharmaceuticals.” *Journal of Health Economics*, 31, 327-339.

Hu, A.G. and G.H. Jefferson. (2009). A Great Wall of Patents: What is Behind China’s Recent Patent Explosion.¨ *Journal of Development Economics*, 90, 57-68.

Jaffe, A. B. and J. Lerner. (2004). Innovation and Its Discontents: How Our Broken Patent System is Endangering Innovation and Progress, and What To Do About It. (Princeton: Princeton University Press).

Jung, T. and J. Walsh. (2010). “What Drives Strategic Patenting?: Evidence from the Georgia Tech Inventor Survey.” Mimeo.

Kotabe, M. (1992). “A Comparative Study of U.S. and Japanese Patent Systems.” *Journal of International Business Studies*, 23(1), 147-168.

Lee, K. and Y.-K. Kim. (2010). “IPR and Technoolgical Catch-up in Korea.” In H. Odagiri, A. Goto, A. Sunami and R. R. Nelson (Eds.), Intellectual Property Rights, Development, and Catch Up: An International Comparative Study. (Oxford: Oxford University Press).

Li, X. (2012). ¨Behind the Recent Surge of Chinese Patenting: An Institutional View.¨ *Research Policy*, 41, 236-249.

London Economics. (2010). “Patent Backlogs and Mutual Recognition: An Economic Study.” London Economics for the UK Intellectual Property Office.

Mass, W. (1989). “Mechanical and Organizational Innovation: The Drapers and the Automatic Loom.” *Business History Review*, 63, 876-929.

Murray, F. and S. Stern. (2006). “When Ideas are not Free: The Impact of Patents on Scientific Research.” *Innovation Policy and the Economy*, 7, 33-69.

Nagaoka, S. and J. Walsh. (2008). “The Objectives, the Process and the Performance of R&D Projects in the US and Japan: Major Findings on from the RIETI-Georgia Tech Inventor Survey.” Mimeo.

Noel, M. and M. Schankerman. (2006). “Strategic Patenting and Software Innovation.” *Centre for Economic Performance Discussion Paper*, 740. (London: London School of Economics and Political Science).

Shapiro, C. (2001). “Navigating the Patent Thicket: Cross Licenses, Patent Pools, and Standard Setting.” *Innovation Policy and the Economy*, 1, 119-150.

Sichelman, T. and S. Graham. (2010). ”Patenting by Entrepreneurs: An Empirical Study.” *Michigan Telecommunications and Technology Law Review*, 17, 111-180.

Thomas, J.R. (2009). “Patent ‘Evergreening’: Issues in Innovation and Competition.” (Congressional Research Service).

WIPO. (2011). “World Intellectual Property Report 2011: The Changing Face of Innovation.” (Geneva, WIPO).

[End of Annex and of document]