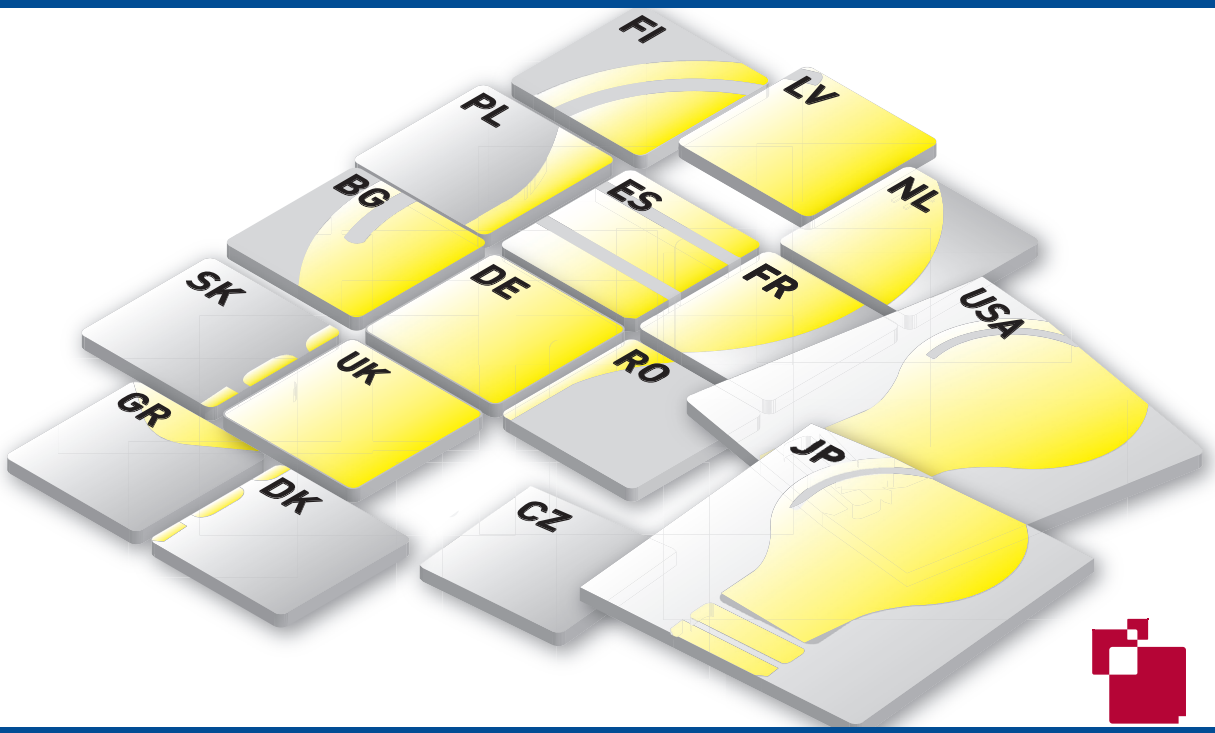
Lost property:
The European patent system and why it doesn't work

BY BRUNO VAN POTTELSBERGHE



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Contents

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His research interests focus on science and technology policies, patent policies, regulation and innovation. His recent book, jointly authored with Dominique Guellec and published by Oxford University Press is entitled: 'The Economics of the European Patent System'. Bruno van Pottelsberghe was Chief Economist at the European Patent Office from November 2005 to the end of 2007 and is Advisor to the Rector of the ULB for technology transfer issues.

See: http://www.ulb.ac.be/cours/solvay/vanpottelsberghe/

Foreword

'Freely have I received,' Martin Luther claimed in the sixteenth century, 'freely I have given, and I want nothing in return'. Those days are long gone and in the present-day knowledge economy the intellectual property regime plays a similar role as that of the land property regime in Luther's time. Millennia of conflict over that land property regime, the associated rents, and the role it plays in determining the fate of countries have told us how important it is to have a regime in place that gets the incentives right. The same applies to the intellectual property regime, only on a larger scale: its features and quality are essential determinants of the pace of innovation and the distribution of its benefits both within and across countries.

It is of therefore hardly surprising that patents have in recent years been the subject of fierce controversy. From the Trade-related Intellectual Property Rights (TRIPs) of the Uruguay round to the patentability of living organisms and of software (not to mention the exchange of music and movies via the Internet) numerous disputes have drawn attention to the delicate trade-offs involved in the public granting of property rights over discoveries or inventions. But most of these debates have focused on the trees and missed the wood. There has been much less discussion about the overall performance of the patent regime, the consistency of rules across countries and global governance questions concerning international cooperation among patent offices, though these are of major importance for competitiveness and growth.

These matters are the focus of Bruno van Pottelsberghe's analysis. He first addresses a specific European issue, and brings bad news: in spite of the supposed ending of the linguistic dispute that for decades prevented its rationalisation, the European patent system is still far from satisfactory. Forget the fact that only 15 of the 35 members of the European Patent Convention have signed the London Agreement on translation requirements. Even in these countries, patents are still at least three times more expensive than in the US or Japan. Fragmentation across European countries, and the ultimate power of countries over patent validity decisions, furthermore results in legal uncertainty and unevenness in the quality of the patents that are enforced.

There is room for discussion on the scope, the breadth and the duration of patents. But a costly and fragmented system that grants national property rights of dubious quality and uncertain solidity is an unwarranted tax on innovation that is detrimental to both entrepreneurs and consumers. Van Pottelsberghe makes a number of simple proposals to improve upon the current situation in Europe, such as the Community patent, a centralised litigation system, reforms in the governance of the European Patent Office and an SME status. These should be at the top of the list for policymakers looking for ways to spur an innovation-based recovery and encourage research in Europe.

Van Pottelsberghe's second topic is what he calls global patent warming and what could equally be called inflation. Here again, issues are first order and numbers speak volumes: in the US, Europe and Japan combined, about one million patents are filed each year. There is overwhelming evidence that this ballooning of patenting activity does not reflect an increase in innovation activity but rather a deterioration in the quality of patents that results from strategic use of patenting, especially in the US. The consequences are considerable delays and an inevitable deterioration of the quality of the examination process. Here again, this is strongly detrimental to innovation and to consumers.

Bruno van Pottelsberghe is doubtful that proposals under consideration (essentially a sort of mutual recognition, trials of which have started) are adequate responses to the problem. Rather, he favours an ambitious Global Patent Standard that would address the quality problems rather than merely sharing costs among patent offices.

Here again the agenda for policymakers is straightforward. They cannot afford to let deliberate mass spamming make an essential tenet of the global intellectual property regime collapse. Action is required – and to outline a streamlined, more quality-oriented international system would after all be a good way to signal the intention to lay the foundations of post-crisis growth.

Jean Pisani-Ferry, Director, Bruegel
Brussels, June 2009

Executive summary

The European patent system faces two broad challenges: a European one and a global one.

Within Europe the key challenge is fragmentation of the patent system, where national patent offices and jurisdictions have the ultimate power to grant or invalidate patents, leading to different results across countries and frequently to the opposite result to that arrived at by the centralised procedure performed by the EPO (European Patent Office).

The consequences of this fragmentation are numerous:

- Prohibitive cost (mainly due to translation costs and national renewal fees);
- High uncertainty, (due to multiple litigation costs and differing legal systems);
- A quality drop (due to shortcuts to grant via parallel national applications).

In other words, the European patent system and the work of the EPO are currently being undermined by the high degree of patent fragmentation in Europe.

The *global challenge* is related to the explosion in patent applications worldwide, which is causing backlogs at patent offices. While patent applications have been growing in number fast at most patent offices, the backlog issue is first and foremost an American problem – the US has a much greater backlog than Europe. The major consequences of these backlogs are more uncertainty on the market due to several hundred thousand patents pending for lengthy periods and a drop in quality, in both patent applications and in patents granted.

We submit that the ultimate cause of the explosion in the number of patents is related to the design of patent systems by policymakers. In the US, a relatively low-quality examination process is evidenced by:

- A very high patent grant rate;

- High turnover of employees (due in part to inadequate incentives);
- Lack of transparency and the lack of an opposition process for third parties;
- A very heavy workload per examiner.

These organisational problems, coupled with relatively low fees and few restrictions on patentable subject matter, have led to a high and ever-growing propensity to patent which does not correlate with any indicator of economic performance.

Major patent offices in the world have recently started negotiating, or have entered into, work-sharing agreements and/or mutual recognition arrangements, given that a proportion of patents are filed simultaneously at several patent offices. The solution put forward by the US and Japan (they were the first to enter into such bilateral agreements) in order to speed up examination and reduce backlogs takes the form of so-called patent prosecution highways (PPHs): if a search or examination report has been carried out by office A, office B must use it and deal with the patent using an accelerated procedure. But it follows from our analysis that PPHs might harm the patent system, because a 'speed' condition is attached to treatment of a foreign report, whereas no 'common' patent quality conditions have been agreed upon by the main patent offices.

Recommendations are advanced to solve the European internal fragmentation challenge and the global backlog challenge. The package of suggested measures to combat fragmentation include:

- Creating the Community patent and centralised European litigation system;
- A sound fee policy;
- The creation of an SME status;
- Improved EPO governance .

Regarding global cooperation, we argue that convergence in global patent standards must occur before mutual recognition arrangements are put in place. Convergence should occur in the three key dimensions of a patent system:

- Access to information;
- Structural changes in the process;
- The human factor (total resources for examiners).

1. Introduction

Why are patents important?

A patent is a legal title granting its holder the right to prevent third parties from commercially exploiting an invention without prior authorisation. In other words, a patent is a government-sanctioned monopoly. It is normally valid for a maximum period of 20 years from the date of application. Patent applications must generally satisfy two key, cumulative grant conditions: novelty relative to state of the art; and *inventive step*, or non-obviousness to a person normally skilled in the art. In Europe, more than 60 percent of patent applications filed with the European Patent Organisation (EPO) are granted, of which it is generally estimated that between two and ten percent are commercially successful.

The public policy rationale for patents is that they help to stimulate innovation, contribute to a broad dissemination of knowledge and hence promote sustainable growth. True, patents involve protecting monopolies, which competition authorities keep a keen eye on for abuse of dominant position, but without them imitators could immediately deprive the inventor of the benefits of his invention and private innovation would thus be discouraged. Governments in effect take the calculated risk that, on balance, the 'carrot' of patent protection will produce a net economic gain for their economies. Clearly, the bigger the jurisdiction a given patent is granted for, the greater the potential gain for both the patent holder and for society.

What are the trade-offs in designing a patent system?

There are a number of general trade-offs in designing any patent system. An important one concerns the length of patent protection. The longer the period during which an invention is protected, the greater the spur to innovation. However, lengthy patent protection also limits the spread of new and useful products or processes, and makes them more expensive. It is clear therefore that the public policy aim of stimulating innovation must be weighed against the deadweight loss caused by lack of competition. When inventions have an important role for public policy, such as vaccines for

public health, governments may choose to limit the length of protection and make the patented drug more affordable.

For business, the key features of any patent system are legal certainty and reasonable cost. Ideally, a company – especially a cash-strapped SME – would always be able to apply for a 'one-stop-shop' patent for any given jurisdiction where protection is sought: national, European, global. With the exception of purely national patents with no protection beyond the immediate border, there is no one-stop-shop at present. Conversely, the greater the cost of acquiring a patent – especially where the bill is bloated by duplicate administrative fees and translation charges which add no value to the patent – the less attractive the system becomes, especially for SMEs.

For governments, the public policy imperatives of a patent regime should be attainable in a way which provides proper incentives for business to innovate – but this is not always the case. Indeed, this matter can be a politically fraught one where, for example, national patent offices stand to lose revenue to a patent office with supranational reach, or where governments are unwilling or unable to devote adequate resources to processing patent applications.

Patent fragmentation

In enforcement terms, there is no such thing as a global, a European or a Community patent. The World Intellectual Property Organization (WIPO) oversees a Patent Cooperation Treaty (PCT), first concluded in 1970, under which companies may file a single international application for protection in virtually every jurisdiction in the world. An international search is carried out, after which a report and an opinion on patentability are issued. But thereafter the company must still apply separately and individually to each jurisdiction where patent protection is required. True, the international search and opinion might reduce the search-related workload of national patent offices subsequently examining the application, but there is no one-stop-shop and no global patent.

Unlike the WIPO system, the European Patent Office does grant a European patent, or more accurately a 'pre-patent'. The EPO was set up under the 1978 European Patent Convention (EPC), which now counts 35 member countries (and includes the EU27). However, a European patent granted by the EPO only provides protection once converted into a national patent in one or more of the EPC signatory countries. There is no European 'one-stop-shop', and for the EU27 with its single market there is no single Community patent ultimately actionable in the European Court of Justice.

The number, geographical origin, and chosen patenting route of filings that occurred in 2007 in five major patent offices are presented in Table 1. The largest patent offices in terms of the number of patent applications filed are the USPTO and the JPO (Japan), followed by China (SIPO), South Korea (KIPO) and the EPO. The EPO figure is relatively small because it is essentially composed of second filings of 'priority' (initial) filings at the national patent offices of the individual European countries, whereas all other patent offices also include domestic priority filings.

Table 1: The five busiest patent offices, 2007

Applications (000s)	EPO	JPO	USPTO	SIPO	KIPO
Total patent applications	140.8	396.3	456.2	245.2	172.5
Applications received acting as a PCT international patent receiving office	26.1	26.9	54.6	5.4	7.1
International PCT searches performed	75.4	25.9	30.5		
Origin of total applications					
% US	25%	6%	52%		
% EPC	49%	7%	14%		
% Japan	16%	84%	17%		
% Rest of world	10%	3%	16%		
% Domestic	**49%**	**84%**	**52%**	**58%**	**76%**
% PCT	**55%**	**12%**	**11%**	**23%**	**16%**

Data source: Trilateral statistical report, 2008, and the WIPO 2008 annual report; PCT: Patent Cooperation Treaty; EPC: European Patent Convention; SIPO: Chinese Patent Office; KIPO: South Korean Patent Office.

Since patent law is a branch of the law of property, it is perhaps unsurprising that any national jurisdiction is loath to cede patent powers to supranational courts. But the opportunity cost of such reluctance is considerable. Fragmentation of patent systems means less innovatory activity, especially from young, small, innovative companies , and hence lower economic growth (eg Veugelers, 2009). For Europe in particular, with a single market and supranational market surveillance, fragmentation of patent systems is clearly a major anomaly and inimical to Europe's innovation and growth.

Global patent warming

Patent systems would ideally be legally predictable and affordable for business, especially for SMEs. But a further challenge confronts patent offices: 'global patent

warming'[1]. Coined by an official of the EPO, this term has been used to describe the growing backlog of pending patent applications in all major patent offices. Owing to the increase in the relative importance of intellectual capital in a globalising world, and perhaps also as a result of an increase in 'speculative' or 'tactical' patent applications by businesses under competitive pressure, the total volume of patent applications worldwide has risen steeply in recent years (see Figure 6). However, the resources of patent offices have not kept step with this rise. This patent inflation is particularly noteworthy in the case of the US patent office.

Faced with such backlogs, patent offices have a number of options: carry on as today and watch the backlogs grow; trade search quality for speed in order to reduce the backlog; or offload processing of patent applications to other offices and agree on mutual recognition of search findings. None of these choices are ideal. Offloading patent processing to other patent offices is perhaps the least unattractive. But work-sharing agreements where one of the parties to the agreement has inflationary behaviour, as is the case for the US, necessarily results in the 'export' of inflation to the other parties, especially to Europe.

Looking at the above issues facing patent systems, we have sought to boil them down to two key challenges for Europe:

- Fragmentation: the continued need for multiple patent applications implies additional cost for business (and ultimately for governments), and overlapping jurisdiction between the European and national levels results in legal uncertainty, potentially yet more costs and *de facto* lower quality.
- Global patent warming: Europe has agreed with the US and others to share work on processing patent applications, this arrangement may not be in Europe's interest given the particularly strong US patent inflation.

The two above challenges are linked. As long as the European patent system is fragmented and costly, there is little incentive for companies to switch from applying for patents through the US system to applying through the European system, thereby providing relief for US patent inflation. It is a vicious circle.

We examine both of the above challenges in detail using new and revealing evidence in the upcoming chapters. We start with the issue of European patent fragmentation in chapter 2, then move to global patent warming in chapter 3. We conclude and make concrete policy recommendations in chapter 4.

1. See 'Urgent call to ease patent backlogs', IP Review Online, 16 September 2008.

2. The European patent system: ‘a little local difficulty’

“Member states cannot claim that R&D and innovation are keys for economic growth and at the same time block progress on the patent agenda.”

Ernest-Antoine Sellière, President of Business Europe,
quoted in ‘Intellectual property’, 16 April 2007, Economist Intelligence Unit

Figure 1: A simplified picture of the European patent system

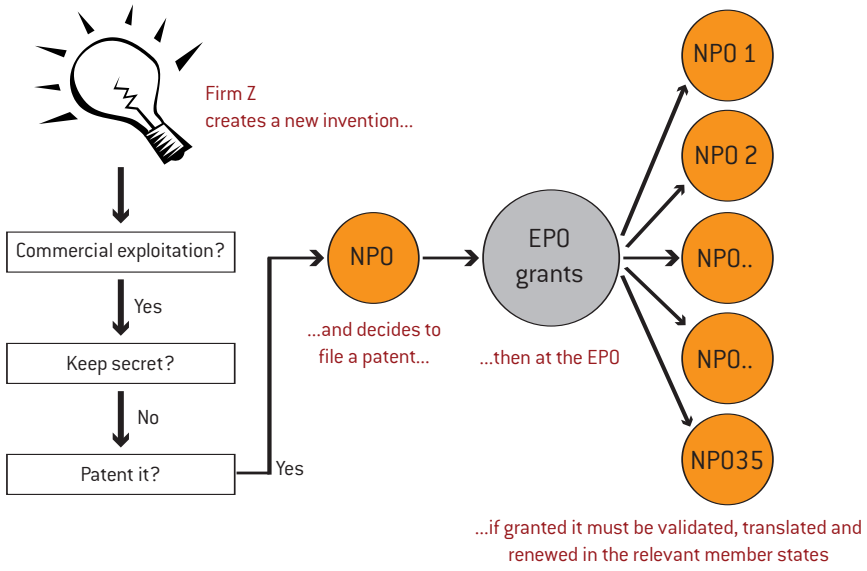


Figure 1 illustrates the fragmentation of the European patent system in a simplified way. Companies wanting to protect their invention in Europe generally start with a priority (initial) filing at their national patent office (NPO, the orange circle). From the

priority date, the applicant has one year to file an application before the EPO (or 32 months if following the PCT 'beyond-Europe extension' route). The EPO then carries out the search (check for novelty) and the substantive examination (check for inventive step) and may grant the patent. If the patent is granted, it can only be enforced in those member states of the EPC where the patent has subsequently been validated and translated, involving additional fees and costs. Each year the owner must pay renewal fees in every country where protection is to be prolonged.

On average, a patent granted by the EPO is validated in 5-6 countries (van Pottelsberghe and van Zeebroeck, 2008). In other words, once granted, a European patent essentially becomes a bundle of national rights. In case of litigation, national jurisdictions have the power to invalidate patent rights, even where the EPO has granted the patent, and to uphold a patent where the EPO has invalidated it.

This is a paradoxical situation: we have EU-wide competition policy but national patent **oversight**. The European Union's competition authority has jurisdiction throughout the European market but the countervailing leverage provided by intellectual property policy is ultimately run at the national level in each EU member state.

An obvious practical drawback of this asymmetry is that illicit parallel trade in patented goods is hard to prevent. It is relatively easy for patent imitators to import goods into the European Union through a country where the patent has not been enforced, and then to distribute them with impunity throughout the EU, including in the countries where the patent is enforced. As a result, companies have to deploy resources to protect themselves against potential patent infringers, a function performed pre-single market partly by border controls. Even if an infringer is identified in one of the national markets of the EU, the patent holder must subsequently rely on the legal system of the state in which the infringement takes place in order to uphold his or her rights.

This fragmentation of the European patent system leads to three 'incongruities' which radically reduce its effectiveness:

1 Prohibitive cost of patenting
2 Legal uncertainty over jurisdiction
3 Inconsistent patent quality

The three key incongruities are analysed in the following subsections.

2.1 Prohibitive cost

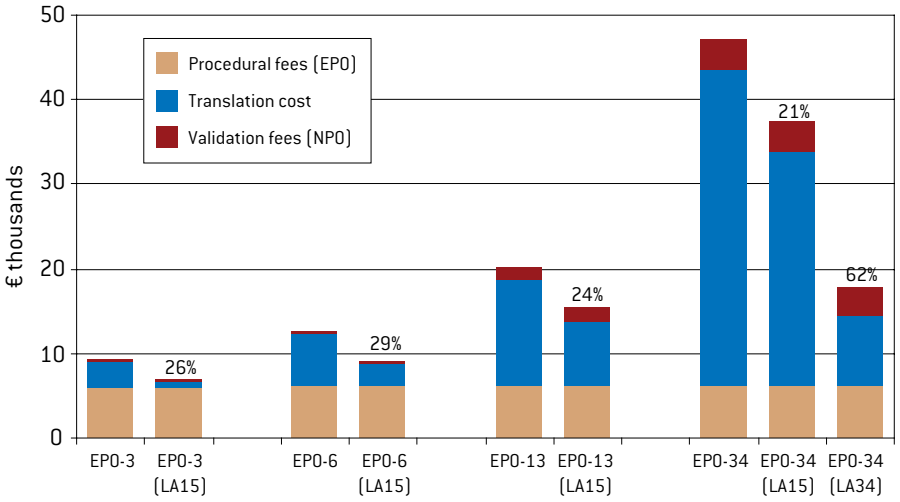
The European patent system is unnecessarily expensive. As mentioned, once granted, the European patent must be validated in each member country of the EPC where protection is required. This step requires the filing of a translated document and the payment of validation fees in each of the relevant EPC countries. Furthermore, annual renewal fees are payable on a country-by-country basis for up to a total of 20 years from the priority date. One recent initiative within the EPC legal framework designed to simplify the procedure and make it less expensive is the so-called London Agreement (LA) on translation requirements. van Pottelsberghe and Mejer (2008) have simulated the consequences that the LA may have on the cost of patenting in Europe (Figure 2).

But the London Agreement has only partially solved the translation problem. The trimmed-down translation requirements only apply in the 15 signatory member states of the LA, not in all the EPC signatories[2]. States which have an official language in common with one of the official languages of the EPO agree to dispense completely with translation. But other states may require a translation of the claims into their own language, and may require the description of the invention to be translated into a language of the EPO. In case of litigation, a full translation of the European patent into the language of the state in which the alleged infringement took place is required. The 20 countries which have not signed the LA may still require translation of the whole patent into their own language(s).

Figure 2, overleaf, summarises the detailed costs of a patent filing at the EPO. The simulation methodology is based on van Pottelsberghe and François (2009). The white area represents the cumulated fees (filing, search and examination fees at the EPO), the shaded area represents the translation costs, and the dark area the validation fees at national patent offices. The LA appears, at first glance, to be a major step forward, bringing cost reductions of 21 percent if all member states are targeted and a reduction of 29 percent if the patent is validated in 'only' six countries. The last column illustrates a 62 percent cost reduction resulting from a purely hypothetical ratification of the LA by all EPC member states, and where all countries are targeted for protection, and can thus be disregarded for practical purposes.

2. As of May 2008 the LA ratification process was initiated in Belgium, it was not yet ratified in early 2009. Since Belgium shares a common language with the EPO its inclusion or not in the simulation would have very little effect on the results. The simulations include Belgium, Denmark, France, Germany, Croatia, Iceland, Latvia, Liechtenstein, Luxembourg, Monaco, The Netherlands, Slovenia, Sweden, Switzerland, and the United Kingdom.

Figure 2: Relative cost savings due to the London Agreement, May 2008



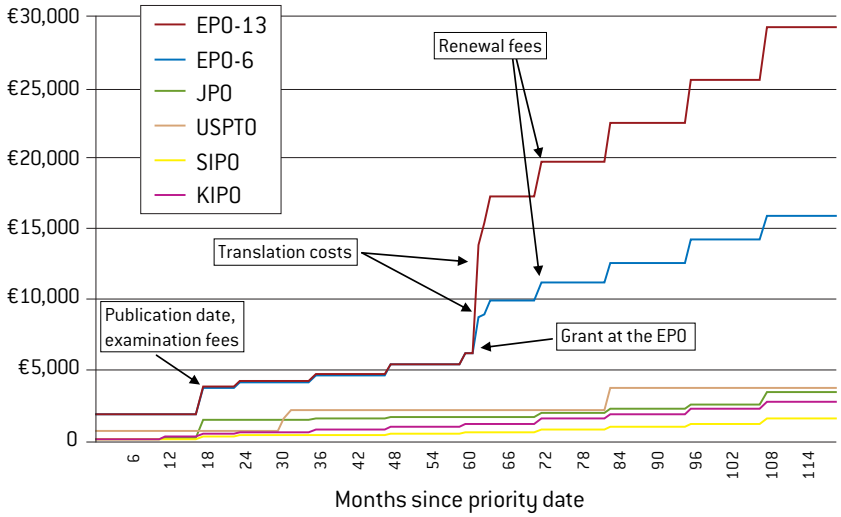
The cost savings are simulated for three configurations: before the LA, after the LA in its current format, with 15 member countries (LA15); and (LA34), the dummy whereby all EPC contracting states have ratified the London Agreement. EP03 means protection in France, Germany and the UK. EP06 (or 13) means protection in the 6 (or 13) most frequently targeted countries. EP0-34 includes all EPC member states as of end 2008.
Source: Adapted from van Pottelsberghe and Mejer (2008)

Bottom line? The London Agreement has reduced costs somewhat, but the cumulated translation costs and renewal fees which occur after the grant of a patent by the EPO are still relatively very high and are clearly still a burden on applicants. This is illustrated in Figure 3, which displays the annual cumulated expenditure associated with a patent granted by the EPO and then protected in six or 13 countries. During the search and examination process at the EPO the cumulated fees increase from about €1800 to €5000 over a period of five to six years. These fees include EPO search fees, EPO examination fees and EPO renewal fees. Once the patent is granted, the applicant must pay translation costs and renewal fees to NPOs in each target country. An additional €5-12,000 (for six or 13 countries targeted for validation, respectively) is payable by the applicant as a result of translations alone.

There is growing evidence that the fee burden in Europe is affecting the behaviour of applicants. Indeed, deliberately delaying the grant date in order to avoid translation costs and renewal fees appears to be common practice among applicants. The EP06 and EP013 curves in Figure 3 go some way to explaining the rationale behind such

delaying tactics. For instance, deliberately filing patents with a very large number of claims and unclear descriptions inevitably leads to multiple contacts between the patent office and the applicant, and hence delays the grant date and the triggering of costs[3].

Figure 3: When do patent costs kick in?



Source: Own calculations, EPO fee structure as of May 2008 and renewal fees at national patent offices. Translation costs, which occur after the grant of the patent, are taken from van Pottelsberghe and Mejer (2008) and take into account the cost reduction brought about by the London Agreement. EP06 stands for validation in 6 EPC countries, EP013 stands for validation in 13 EPC countries. Costs in €1000.

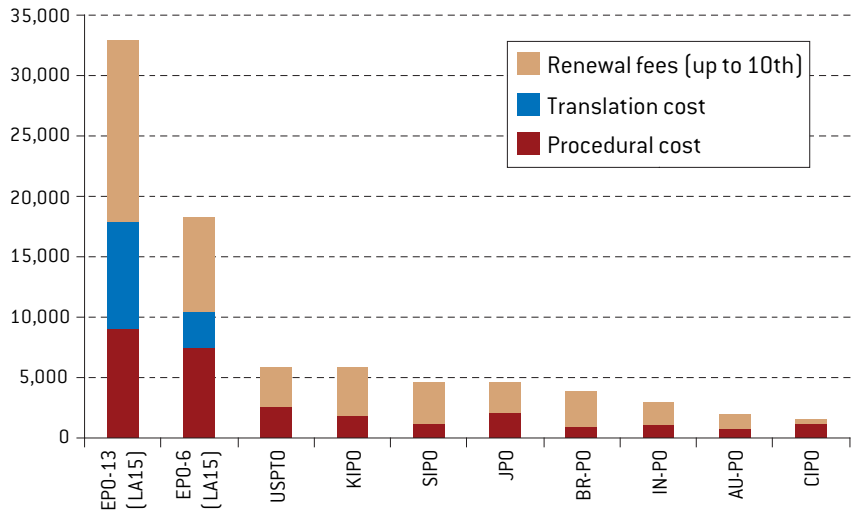
How do Europe's patenting costs compare with those applicable elsewhere in the world? The consequence of European fragmentation is striking: translation costs and national renewal fees make the European system at least four times more expensive than the US, Chinese, Japanese or South Korean systems.

The cumulated costs of the major patent offices in the world are shown in Figure 4. Despite the reduction in translation costs brought about by the London Agreement, a

3. See the typology put forward by Stevnsborg and van Pottelsberghe (2007) for a qualitative description of drafting styles and interaction modes with the EPO which aim at delaying the grant date. For evidence about the impact of the fee structure on the behaviour of applicants, see Archontopoulos *et al*. (2007), de Rassenfosse and van Pottelsberghe (2007, 2008, 2009) and Harhoff *et al*. (2007, 2008). Lazaridis and van Pottelsberghe (2007) illustrate the relationship between the number of claims and the probability of a communication from the examiner to the patent owner, which in turn creates one additional year of delay.

European patent remains much more expensive than anywhere else in the world. The cumulated translation and procedural costs (essentially search and examination fees) total about 17,000 USD PPPs if 13 countries are targeted and 10,000 USD PPPs with six countries. In all other large patent offices the procedural costs are about five times lower, and fluctuate around 2000 USD PPPs (cf. the white areas in Figure 4). If renewal fees for a ten-year protection period are included in the cumulated costs, the cost of a European patent fluctuates between 18,000 and 33,000 USD PPPs, depending on the geographical scope of protection. This is to be compared with about 5,000 USD PPPs or less in the USPTO and in all other patent offices. In other words, ten years' protection in the US or anywhere else in the world costs at least three times less than ten years' protection in the European patent system. As discussed in the subsequent chapters, higher examination fees could be welcome if they correlate with a high quality of the examination process; but this is clearly not the case for translation costs and renewal fees.

Figure 4. International comparison of cumulated patent costs, 2008 (in USD PPPs)



Source: van Pottelsberghe and Mejer (2008), KIPO is the national patent office of South Korea, SIPO for China, JPO for Japan, BR-PO for Brazil, IN-PO for India, AU-PO for Australia, CIPO for Canada.

Let us account for bias in this ranking (van Pottelsberghe and François, 2009). First, patent size (in term of the average number of claims included in a patent) varies substantially across regions. For instance, Japanese patents include far fewer claims per patent (about 9.5) than the average US patent (about 23). The second source of

bias is related to the size of the markets covered by the patent offices. If two countries have similar patenting costs but one has a larger population, the relative cost (per market unit) will logically be lower in this larger country.

The simultaneous correction for the two sources of bias may be performed with the 3C-index (the cost per claim per capita). Despite the savings on translation costs thanks to the LA, the relative cost of a European patent validated in six (thirteen) countries is still at least five (seven) times higher than in the US. Focusing on the largest patent offices in countries with similar levels of economic development (Europe, Japan, South Korea and the US), a demand curve would show high demand for patents in the least expensive patent offices (the USPTO) and lower demand in regions where the relative patenting costs are higher (Europe, South Korea). Recent simulations show that a single EU Community patent (EU27) would reduce patenting costs in Europe by about 60 percent[4]. The fee policy issue will be addressed in subsequent chapters, as it correlates with the quality or rigour of the grant process.

2.2 High legal uncertainty

The very purpose of a patent is to reduce uncertainty by providing monopolistic power to the inventor. This privilege may be challenged at the EPO through a centralised opposition process, or in national courts. But this twin-track challenge leads to a high degree of legal uncertainty. As mentioned, even if the EPO decides to uphold a European patent, opponents of the patent remain free to mount further validity challenges before national courts, which have the power to pass judgment on patent matters within their respective jurisdictions. By the same token, where the EPO refuses a patent application, a national patent office may still grant a similar parallel application for its own territory.

It is relatively affordable to file an opposition before the EPO, as the cost varies between €6000 and €50,000 (including patent attorneys' fees). But it may not be so affordable to conduct litigation in the individual EPO member countries. Table 2 presents the costs of patent litigation in four European jurisdictions and in the US. The starting point for the cost estimates in Table 2 is litigation for an average patent with a relatively small market value (with an amount in dispute of about €1 million). The cost of litigation obviously increases with the amount at stake and with the

4. Danguy and van Pottelsberghe (2009) show that the Community patent would not only drive down relative patenting costs in Europe by 60 percent but would also contribute to increase the renewal fee receipts of national patent offices.

complexity of the case. For example, in Germany the cost of litigation can be as high as €2 million where €10 million are at stake (IP Campenhausen, 2004), whereas in the US litigation costs may attain about €2.5 million if the amount at stake is higher than €16 million (Bessen and Meurer, 2006).

Table 2: Patent litigation costs and occurrence in four EPC Member states and the US (€000)

	Germany	France	The Netherlands	United Kingdom	Cumulative 4EPC	United States
			Litigation cost*			
1st instance	50 to 250	50 to 200	60 to 200	150 to 1,500	310 to 2,150	NA
2nd instance	90 to 190	40 to 150	40 to 150	150 to 1,000	320 to 1,490	NA
Total	140 to 440	90 to 350	100 to 350	300 to 2,500	630 to 3,640	420

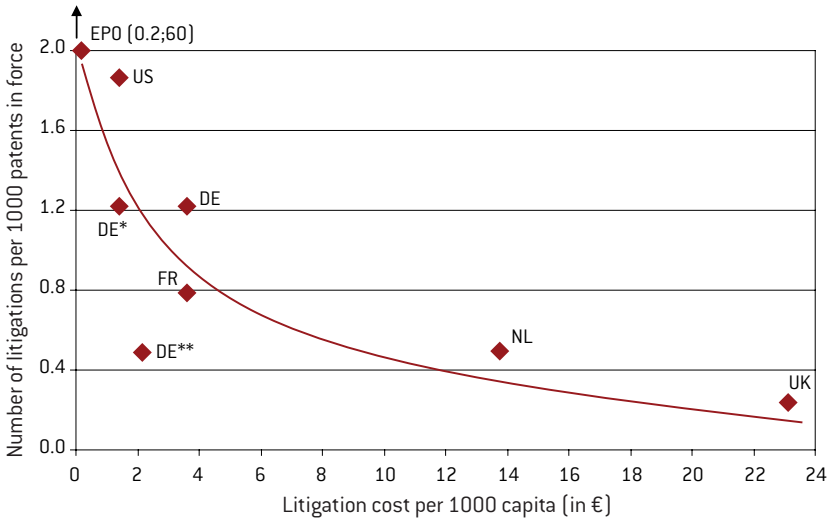
* Estimates apply to a patent with an amount in dispute of about €1 million. For Germany, numbers are given for both validity and infringement cases (separate courts). Cf. Table A.4 in the Appendix of Mejer and van Pottelsberghe (2008). Litigation costs are adapted from EPO Doc. WPL/11/05 Rev. 1, 16 February 2006; AIPLA (2005), and Bessen and Meurer (2006).
Source: Mejer and van Pottelsberghe (2009)

As Table 2 shows, litigation costs vary significantly across jurisdictions. The United Kingdom is by far the most expensive jurisdiction among EPC member countries. Costs in the UK are nearly as high as costs in the other three jurisdictions put together. Litigation costs in France, Germany and the Netherlands are similar. However, in case of multiple parallel litigations across jurisdictions, cumulated costs vary from €310,000 before the four courts of first instance up to €3.6 million when taking account of the cost of appeal at second instance. The cost of multiple litigation is thus prohibitive in Europe, especially for individuals and SMEs, and can be more than twice as high as in the United States. Harhoff (2009) shows that by the year 2013 there might be 200 to 430 cases of multiple litigation in Europe. A single patent court in Europe would produce savings of €148 to €289 million for business.

The US system, covering a market of 300 million inhabitants, has four to six times more patents in force than the largest European economies, which are individually at least three times smaller. The countries with the largest number of patents should logically have a larger amount of litigation. However, the share of litigation in the total number of patents (an indicator of the probability of litigation) varies substantially across countries. Germany is the country with the cheapest and arguably the best-known judicial system for patent-related litigations within Europe. Figure 5 shows the

position of the above five countries (four European and the US) along two dimensions: the average cost of litigation per thousand capita on the horizontal axis and the number of cases of litigation as a share of the total number of patents enforced in the country on the vertical axis. A traditional non-linear demand curve seems to drive the relationship. Among European countries, relatively inexpensive Germany has a great deal of litigation and, at the other, the costly United Kingdom has little litigation.

Figure 5: A litigation demand curve for small market value patents, 2004



Note: For the EPO, instead of the total number of patents in force we take the total number of patents granted in 2004. On average six percent of granted patents are subject to an opposition. European patents are on average validated in 6 countries, therefore population size for the EPO is assumed to be the sum of the population of these countries (about 300 million). In Germany the courts hearing infringement and validity cases are separate. DE* indicates infringement cases in Germany and DE** nullity (validity) cases. The litigation cost is calculated as the average total cost of proceedings at both first and second instance. Source: Mejer and van Pottelsberghe (2009)

In the US, the relatively large market reduces to some extent the prohibitive costs associated with patent litigation, hence the relatively high litigation rate. At the opposite end of the scale is the United Kingdom, with the highest litigation costs per capita and the lowest litigation rate.

It could be argued that while Figure 5 provides a quantitative picture of the litigation costs in different patent systems, it does not provide a comprehensive qualitative picture of how patent systems actually work. Indeed, the quality of the examination

process and other institutional differences are not reflected here at all[5]. However, the fact that the litigation/cost correlation holds good for the four European countries supports somewhat the view that relative litigation costs do influence the propensity to litigate.

But the legal uncertainty produced by the fragmented European patent system is starkest in the 'time paradoxes' involved in the processing and enforcement of patents. Within nine months of a decision by the EPO to grant a patent, third parties may file an opposition to the patent (either for nullity or for amendments) at the EPO. The EPO decision on an opposition case is – logically enough – supposed to apply in all the countries where the patent is enforced. However, at the same time as the challenge at the EPO, the validity of a patent can also be challenged separately under the legal rules of the individual countries in which the patent has been validated. What is more, a national action for nullity may be brought immediately as of the date of validation of the patent by a national patent office, even if an opposition case is still pending at the EPO. By the same token, the patent holder may sue potential infringers in the relevant national court immediately as of the date of validation in that country. Since it takes on average three years for the EPO to decide on an opposition case, a party may be accused of patent infringement and be required to pay damages or even endure permanent injunction at national level even where the patent is subsequently declared invalid by the EPO (cf. the four case studies developed by Mejer and van Pottelsberghe (2009) and briefly summarised in Appendix 5).

The legal reasoning of a national judge faced with this time paradox is instructive. In May 2007, the UK Court of Appeal ruled that damages for patent infringements awarded by a UK court are not required to be paid back even if the patent is subsequently declared invalid by the EPO. In this ruling, Lord Justice Jacob justified his decision by the need for certainty in business:

> *'First and foremost, the defendant has had a full and fair opportunity of attacking the validity of the patent in his own proceedings. Next there is a very strong public interest in the finality of litigation.[...] It is much better that he knows that the first litigation about validity is the time and place for him to get his best case together – that he knows he will have no second chance'.*

5. The five jurisdictions differ not only in terms of proceedings costs but also in terms of institutional design and legal practice, such as procedural law, speed of proceedings, damage assessment or quality of rulings (Mejer and van Pottelsberghe, 2009). For instance, with regard to the quality of proceedings, Germany has the highest number of legally and technically qualified judges, against none in France and the Netherlands.

What motivated Lord Justice Jacob in this case was not the question of which court had jurisdiction, but how best to operate with an imperfect European patent system. Here, the fact that his compromise might produce a manifestly unfair result does not seem to influence his view:

> *'I am not sorry to reach that conclusion, [...] It means that businessmen in this country know that they can use the rather speedy court system here to get a conclusion one way or the other'.[...] If the patent is revoked, the way is cleared; if it is upheld and held infringed then compensation will be payable for past acts. And an injunction will run unless there is a later revocation by the EPO. Subject to that last point, the effect of all this is that one does not have to wait to find out who has won until the slowest horse in the race gets there.'*
>
> 'Patent damages not refunded if EPO cancels patent' (Out-law.com, 2007a)

This stance is not shared by judges in all EPC countries, nor even by all involved in the UK patent system, and certainly not by the UK Trade Marks, Patents and Design Federation:

> *'We are concerned that current management emphasis appears to be more on timely grant than on achieving the high standards of examination of former years.'*
>
> TMPDF (2008, p. 3)

But the point here is not so much that a UK judge has taken a decision that is highly pragmatic but potentially unfair to some parties to a patent dispute. The point is that the European patent system allows and even encourages such legal uncertainty to exist, threatening the credibility of the system, harming business and ultimately detracting from the innovation, knowledge and growth benefits that governments pursue.

2.3 Inconsistent patent quality

The incongruities mentioned in the previous section are the outcome of a dual system in which the EPO grants patents centrally but where national patent offices have the ultimate power to validate, invalidate and assess infringement proceedings relevant to their own jurisdiction. But another source of inconsistency deserves attention: the fact that national patent offices may grant a national patent even if a

patent has not been applied for at the EPO, and indeed even if the same application has been refused by the EPO. Procedurally, it is perfectly permissible to make simultaneous filings at one or several national patent offices and at the EPO. If an EPO patent is granted, the patent owner simply proceeds with validation in the desired member countries. If the EPO application is refused or amended, it is still possible for the unsuccessful EPO applicant to rely on the patent(s) filed through the national route(s).

Interestingly, the aggregate number of patents granted by national patent offices in 2007 (more than 58,000 patents, see Table 3) is not far from the total number of patents granted by the EPO the same year (about 55,000). So, purely national rights are as important as EPO-granted rights. These figures confirm that 30 years after the creation of the EPO, the national route is still important.

Another measure of the importance of the national route may be gained by looking at the share of foreign applications in the total number of patents granted by the national patent offices of EPC member countries, (Table 3). Of the patents granted by national patent offices, 25 percent (or 15,000) were granted to foreign applicants. This share varies substantially but is significant in most countries. In Germany the ratio of foreign applications is 27 percent, and about 20 percent for France and the UK. These figures show that the parallel, non-EPC route is frequently used, especially in the case of large national patent offices. Applicants clearly face no major disadvantage in getting a patent granted in a selection of countries, even if the EPO has not granted it beforehand.

It seems, then, that the granting process orchestrated by the EPO can be 'bypassed' if one or more applications are made directly to national patent offices. This practice may have a number of explanations, some innocent (only interested in one or two markets), some less so (a perception that some national offices are a 'soft touch' for applications compared with the EPO). In any case, it is clear that the existence of twin routes to the grant of a patent in Europe is not of a nature to foster Europe-wide consistency of patent quality. This being the case, any initiative by EPO member countries to agree upon mutual recognition of patent decisions would bear the risk of further inconsistency in patent quality, a race to the bottom, and ultimately 'qualitative fragmentation' of the European patent system.

Table 3: Patents granted by national patent offices, 2007

National patent offices		Total	To foreign applicants	Foreign (%)
Austria	AT	1963	352	18
Bulgaria	BG	259	176	68
Czech Republic	CZ	1203	976	81
Denmark	DK	223	72	32
Finland	FI	921	305	33
France	FR	12116	2362	19
Germany	DE	17739	4762	27
Hungary	HU	637	525	82
Italy	IT	6469	545	8
Netherlands	NL	2319	524	23
Romania	RO	684	200	29
Slovakia	SK	574	485	84
Spain	ES	2667	342	13
Sweden	SE	1287	238	18
Switzerland	CH/LI	737	295	40
Turkey	TR	629	332	53
United Kingdom	GB	5930	1162	20
TOTAL	**EPC**	**58497**	**14666**	**25**

Source: Adapted from EPO, CA/F 5/08 f, P.60.; own calculations.

3. Global patent warming

'[EPO President] Alison Brimelow has warned that national patent offices must avert 'global patent warming' by working closer together to ease backlogs. The European Patent Office (EPO) president was speaking at the 41st World Intellectual Property Congress. [...] The term 'global patent warming' [...] was first coined in July by one of the most senior EPO officials, controller Ciáran McGinley, who wrote that incoming volumes per patent office were increasing as a result of globalisation driven by trade and patent activity. He also pointed out that the general pendency volume was increasing despite what was happening to pendency times in individual patent offices. "Woolly boundaries are widespread," he argued, "not just between granted patents but especially among pending applications."'

'Urgent call to ease patent backlogs' (IP Review Online, 2008)

This quotation describes the current perception of so-called 'global patent warming' – severe processing backlogs – in the world patent system by key policymakers and hints at the solution they envisage: a global patent coordination package. The end of 2008 saw a number of agreements aiming at work-sharing and coordination of approaches to patents. The USPTO had already signed two Patent Prosecution Highways (PPH) agreements with Japan and the UK. In September 2008, the USPTO and the EPO launched their own PPH agreement, whereby each patent office exploits the work previously done by the other office and fast-tracks the patents in question. The one-year trial between the USPTO and the EPO is scheduled to end on 29 September 2009[6]. On 14 November in The Hague, the three offices (EPO, UK, US) agreed to move forward on work-sharing and to support the recently initiated co-operation of the five largest intellectual property offices.

The objective of this chapter is to assess these global work-sharing packages in the light of recent developments in patenting in major patent offices. A key driver of these

6. IP Review Online, 'US Strengthens global patent ties', 3 October 2008.

bilateral agreements is the backlog in processing patent applications. We address the following questions:

- To what extent is 'global patent warming' actually taking place and what are its consequences?
- If 'global patent warming' exists, what has caused it?
- Is a global work-sharing package an appropriate solution, in particular for Europe?

This chapter is structured as follows. The first section presents the broad global trend in the number and size of patent applications. The second section shows the potential consequences of these developments in terms of backlogs at the EPO, the USPTO and JPO. The third section investigates the causes of these backlogs. The fourth section argues that the current work-sharing packages (the PPHs) in reality seem to constitute US 'dumping' of low quality patents.

3.1 The patent bubble

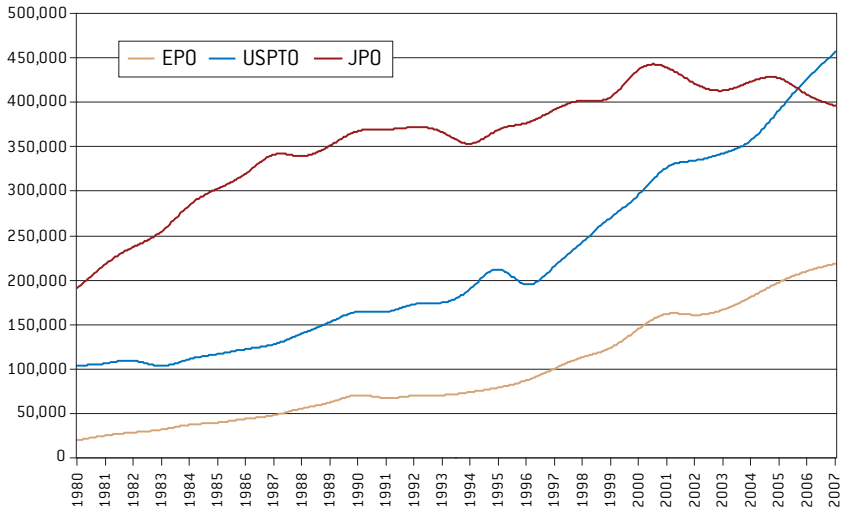
The patent bubble is characterised by a constant increase in the number and size of patent applications. For the EPO, the year 2008 saw a record-breaking number of patent filings, nearly 227,000, an increase of about 60 percent on 2000[7]. Figure 6, overleaf, shows that this is far from being an isolated issue. The USPTO was close to the 460,000 applications threshold in 2007, more than twice the number of patent applications as at the EPO (218,000 in 2007) and increasing fast. Japan seems to be stabilising at around 400,000 applications per year. The 2008 crisis will probably have a similar effect to the 1995 downturn in the US, with a sharp drop in applications, but the previous trend will no doubt return thereafter.

This accelerating trend in the number of patent filings at the EPO is attributable to several factors (cf. Guellec and van Pottelsberghe, 2007):

- The success of the EPC, which has grown from fewer than 10 countries in the late 1970s to 35 countries as of April 2009, representing about 600 million inhabitants;

7. These figures include Euro-Direct applications (direct filings at the EPO) and PCT international filings, which can be considered as options for future applications at the EPO, ie 'PCT Regional Phase'. PCT international applications must, however, be taken into account as they substantially increase the workload of EPO examiners, who must provide a search report (checking for prior art) and a non-binding opinion on the patentability of the application.

Figure 6. Total patent filings at the USPTO, JPO and EPO, 1980-2007 (000s)



Source: EPO, USPTO and JPO.

- Higher levels of research and development, fast-emerging technological fields (eg nanotechnologies, biotechnologies), and fast-growing countries (eg China, with more than 1,000 European applications per year, has become the fifth most active non-European applicant country);
- New types of institutions entering the patent arena, eg universities (from less than 0.5 percent of total applications in the early 1980s, academic patenting now exceeds four percent with about 5,000 applications filed each year at the EPO)[8];
- New innovation management practices developed within the business sector, and new filing strategies adopted by firms.

The above factors are not confined to Europe. The global level of R&D activity has also grown fast, leading to more inventions and hence patent filings. From less than 300 billion (in constant 2000 USD PPPs) in the early 1980s, the annual level of R&D expenditures in the OECD area increased to 700 billion in 2006. If countries such as China, Russia, Israel and Singapore are also accounted for, an additional 120 billion

8. The Bayh-Dole Act of 1980 gave US universities greater incentives to commercialise technology: 'The act allowed universities to patent the results of federally-funded research and license the resulting technology to businesses and other entities' (Joint Economic Committee US Congress, 1999, p.31). European countries and Japan adopted similar legislation during the 1990s. See Sapsalis and van Pottelsberghe (2006), Schmoch (2004) and van Zeebroeck *et al.* (2009) for recent empirical evidence. According to Mowery and Sampat (2004), this trend is also observed for applications filed at the USPTO.

must be added (as compared to 50 billion in 2000)[9].

In addition to this intensification of research activity, there has been a growing propensity worldwide to rely on the patent system. Institutions are not only more likely to seek protection for a given invention, they are also protecting the invention with more than one patent. The patent to researcher ratio in the OECD area has more than tripled at the EPO, from 1.6 in 1980 to 5.1 patents per 100 researchers now. In the US the ratio has not quite doubled but was already much higher than in Europe, witnessing a strong propensity to protect intangible assets in the US. It has jumped from about six patents per 100 researchers to more than 10 over the past three decades[10].

New innovation management practices, leading to more inventions and hence patent applications, can be seen in a new division of labour whereby some firms specialise in research activities and offer their research output to 'producing' firms. According to Kortum and Lerner (1999) the observed jump in patenting in the 1990s reflects an increase in US innovation spurred by changes in the management of research. A more recent trend in innovation management is reflected in the so-called 'open-innovation' process (cf. Chesbrough, 2003) through which firms collaborate on innovative projects with other specialised firms in order to widen the scope of their knowledge base and to speed up their research and market reach. Opening your doors and knowledge base to others generally requires sound protection of your own intangible assets, which partly explains the need to rely more frequently on the patent system[11].

But increasing reliance on specific patenting strategies is the most important factor underlying the increase in the observed propensity to patent. There is evidence that companies have tended to change their management practice from a 'single-patent' approach to a portfolio approach, which may be said to be based more on quantity than quality. This practice may be attributable to tactics, well described in Arora *et al*. (2002), designed to 'reserve' markets for technology. Glazier (2000) lists the following specific corporate objectives[12] which may lie behind a new portfolio approach to patents:

9. Data on R&D expenditure comes from the OECD-MSTI database.
10. Own calculations from patent series statistics and R&D expenditure (OECD, MSTI, 2008).
11. For instance, Peeters and van Pottelsberghe (2006) show that three key dimensions of innovation strategy influence the size of a firm's patent portfolio: the relative importance of basic and applied research in total R&D activities, the product or process orientation of innovation efforts, and the extent to which firms enter into collaborative R&D with other institutions. R&D collaboration is increasing, so there are more patent applications.
12. Cf. Teece (1993), Reitzig (2004b) and Guellec *et al*. (2007) for recent insights on patent strategies.

- To 'freeze' a technology (to prevent access to a particular technology by other actors);
- To guarantee its own freedom to operate and avoid potential litigation (safety net);
- To be perceived as an important innovator on the market (communication strategy);
- To enhance negotiating power for future access to the market and for potential mergers;
- To avoid being 'invented around' (a thicket of patents is filed around a key invention);
- To invent around the patents filed by other companies (to enter a protected area);
- To create a smoke screen (filing many applications in order to 'hide' one important one);
- To generate additional revenues through the monetisation/licensing of patents.

A secondary objective of multiple patenting may consist of flooding patent offices with similar applications in order to maximise the probability of getting 'something' granted[13].

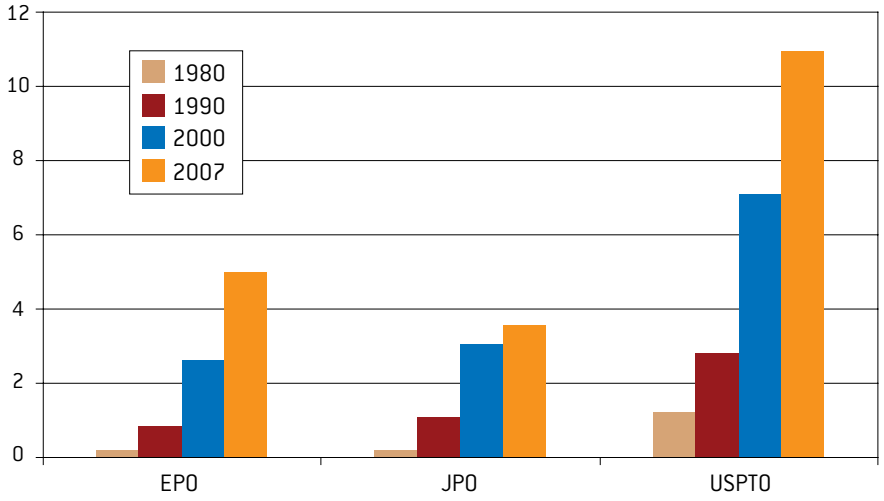
Such patent practices may prove incompatible with the original purpose and functioning of patent systems: to be a mechanism designed to stimulate innovation. They not only generate more patent applications than would normally be the case but they may also deliberately build delays into the treatment of patents through vague drafting and large numbers of pages and claims. Since the early 1980s the average patent application size at the EPO has grown by more than 200 percent, from 10 claims per patent in 1980 to about 22 claims now. The average patent filed at the USPTO contains 24 claims. In the 1980s, patents filed at the JPO had on average only one claim, as against nine nowadays.

The surge in both the number and the size of patent applications has led to a near-exponential evolution in the incoming workload of patent offices, as illustrated in Figure 7. The trend is particularly pronounced in the US. From just over one million

13. The content of the book 'Patent Strategies for Business', written by Glazier (2000), provides an interesting insight into the snowball effect created by some advisors or patent attorneys. The third chapter of this book is called 'Invent around your competitor's patent (and the antidote) and other patent strategies'. The other strategies include 'how to submarine a picket fence', and its 'counter-attack strategy'. In a nutshell, this patent expert puts forward practices or tactics that consist of filing more patents, with additional claims over time (through continuation in parts), and reliance on submarine practices (applications hidden until they are granted). The side effect of these strategies is that patent-based indicators might be misleading, and deserve to be properly taken into account for any type of statistical inference at aggregate level.

claims in 1980, the total number of claims filed annually at the USPTO now far exceeds 10 million, ie nine times more than 25 years ago. Although the total workload at the EPO and JPO is smaller than that of the US Patent Office, the upward trend is actually more pronounced. In the early 1980s the two regions received about 200,000 claims per year. Now Japan receives nearly four million claims and Europe five million claims annually, or respectively 19 and 25 times more than in 1980. Compared to ten years ago, the three offices have seen a doubling of their incoming workload. Had the number of pages been taken into account, an even more pronounced upward trend in workload would have been observed (cf. Archontopoulos *et al*, 2007).

Figure 7. Incoming workload: total number of claims filed, 1980-2007 (millions)



Source: EPO, USPTO and JPO.

3.2 Two worrying consequences

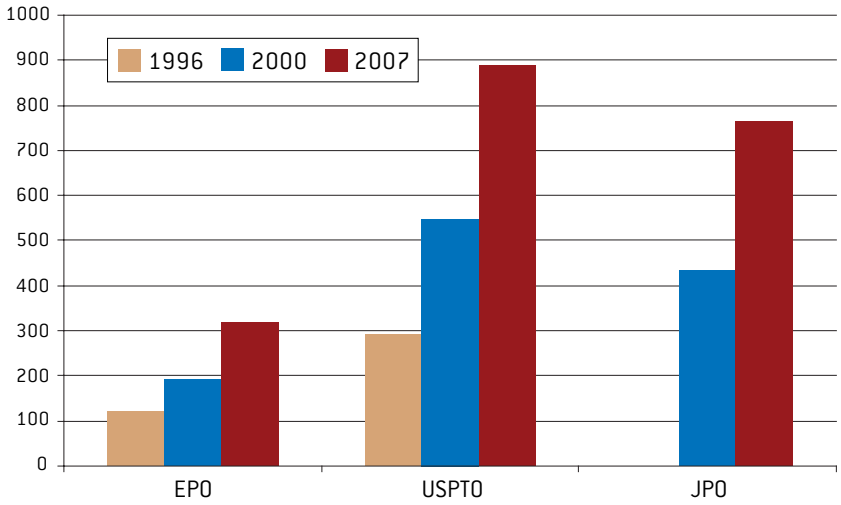
A. Backlogs: alternative ways of looking at them

The explosion in patent filings and the constant increase in their size have led to backlogs: an ever- increasing stock of pending applications. These backlogs are detrimental to the economy because they mean a longer period of economic and legal uncertainty on the market, in other words large numbers of potentially monopolistic rights hanging over the market but unresolved, constituting potential threats to other

businesses. Major patent offices rely on the presence of such backlogs in order to justify current attempts to share best practice and achieve some form of mutual recognition of search and examination reports, probably with the ultimate aim of agreeing mutual recognition of granted patents.

But before entering into work-sharing agreements with the US and others, should Europe not first pause and examine to what extent backlogs have reached unmanageable levels, especially in some patent offices? As this is at least in part a matter of judgement for individual countries, the question is difficult to address, and only broad comparisons between countries can be performed. Figure 8 shows the trend in *pending applications* in Europe, Japan, and the US. It clearly appears that Europe has the smallest backlog, with about 320,000 applications pending in 2007. This may be compared with 888,000 pending applications in the US, and more than 760,000 in Japan. In other words, Europe, though by far the largest economic area, faces a backlog that is much smaller, about 35 percent that of the US. The number of pending applications in the European system in 2007 is actually similar to the number of pending applications at the USPTO as far back as 1996.

Figure 8. Patent applications under examination, 1996-2007 (000s)

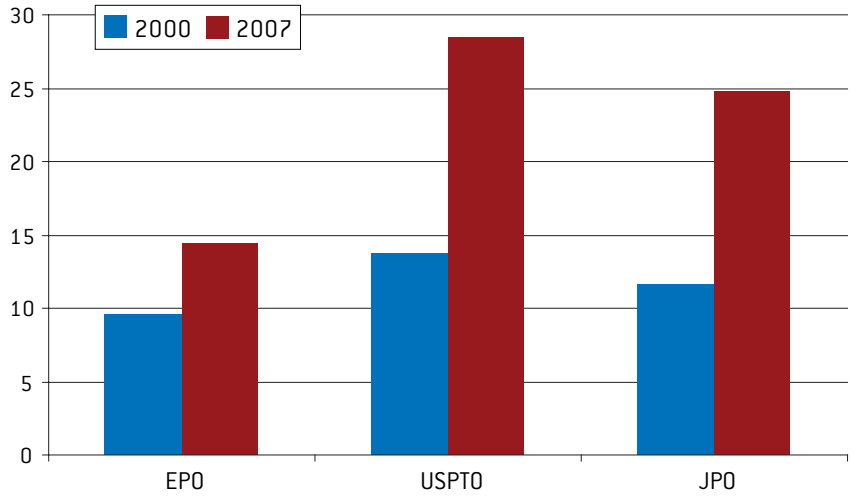


Source: Trilateral Statistical Report (2006).

The backlog of pending claims in the US is also three times larger than in Europe, which confirms that the backlog issue is primarily a US phenomenon. True, a *per*

capita approach would put the US and Japan on a similar level (5 to 6 claims per 100 head of population). But the backlog of pending claims in the US and Japan would still be five to six times higher than in Europe.

Figure 9. Total prosecuting time, 2000 and 2007 (millions of months)



Source: Own calculation from data provided in the Trilateral Statistical Report (2008). The figures correspond to the number of patents under examination multiplied by the average pendency of examination (not search).

However, measuring and comparing backlogs by simply looking at the number of pending patents or claims provides a biased picture if the duration of examination varies across countries, which is the case. According to the Trilateral Statistical Report, the average pendency of patent examination in 2000 was 50 months at the EPO, nearly twice as long as average pendency at the JPO and the USPTO at 27 and 25 months, respectively. The EPO managed to reduce pendency to 45 months by 2007, whereas it increased in Japan and the US to 32 months. The improvement in pendency at the EPO is probably the consequence of managerial changes (more examiners and/or improved monitoring), whereas in the US and Japan the longer delays probably reflect very high (absolute or relative) backlogs exacerbated by a steep annual increase in the number of applications.

Figure 9 shows the total number of months (in millions) needed to process the backlogs of 2000 and 2007 in the three offices. This 'duration-and-quantity' approach shows that in 2000 the three offices were in a similar situation, fluctuating between

10 million months (Europe) and 14 million months (US). Looking at 2007, this indicator suggests that the US is in the most difficult situation, with more than 28 million months of backlog[14] against 25 million months in Japan and 'only' about 14 million months in Europe.

In a nutshell, comparing backlogs across regions is far from being straightforward, However, a few conclusions are robust to the counting methodology. First, the backlog issue as it stands at present is essentially an American and a Japanese issue. The backlog might become an issue for the EPO, but it is currently definitely less dramatic than in the case of the USPTO and the JPO.

B. A fall in the quality of patent applications?

A worrying aspect of this surge in the number and size of incoming applications is that it is definitely associated with a significant drop in the quality (or value) of applications. The erosion of the average quality of patent applications may be observed in the changes in a number of patent value indicators. Figure 10 portrays a negative correlation between the increased propensity to rely on the patent system in Europe and a corresponding fall in patent value indicators.

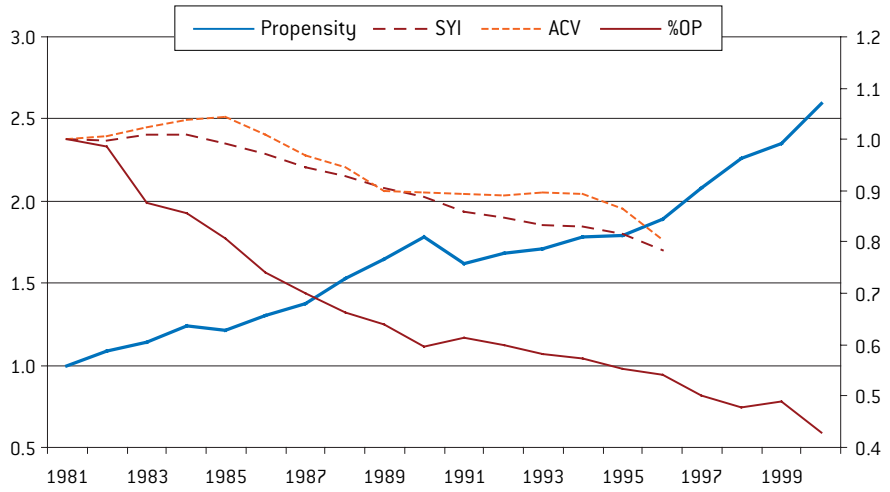
A first indicator (%OP) measures the rate of opposition to patents granted by the EPO. Oppositions are frequently taken as a proxy for the potential market value associated with a patent[15]. Indeed, an opposition would be filed by a firm only if a significant (actual or expected) market value is attached to the patented invention, otherwise there would be no need to incur the expense of opposition. The rate of opposition has constantly fallen over time, suggesting that the average patent is less worthy of opposition – and thus of lower value - now than in the past (a number of individual patents will of course still have a high market value).

A second indicator, the scope-year index developed by van Pottelsberghe and van Zeebroeck (2008), brings together a score representing the average duration and average geographical scope of patent protection within the European patent system. The principle of the indicator is that the longer a patent is enforced and the larger the

14. The sharp increase in Japan is also due to a change in the patent law, which has decreased the time to request an examination (from the application date) from seven years to three years. This has led to a higher share of examination requests.
15. Cf. Harhoff *et al.* (2003), Sherry and Teece (2004), Reitzig (2004a), Sapsalis et al. (2006), Sapsalis and van Pottelsberghe (2007) and van Zeebroeck (2008) for empirical evidence on various patent value indicators and surveys of the literature.

geographical scope of protection, the higher the potential value of the patent. The scope-year index has fallen constantly since the mid-1980s, suggesting that the average value of patents has been decreasing. A similar conclusion may be drawn from the average composite value indicator (ACV) in Figure 10), which includes information on forward patent citations, renewals, geographical scope and oppositions.

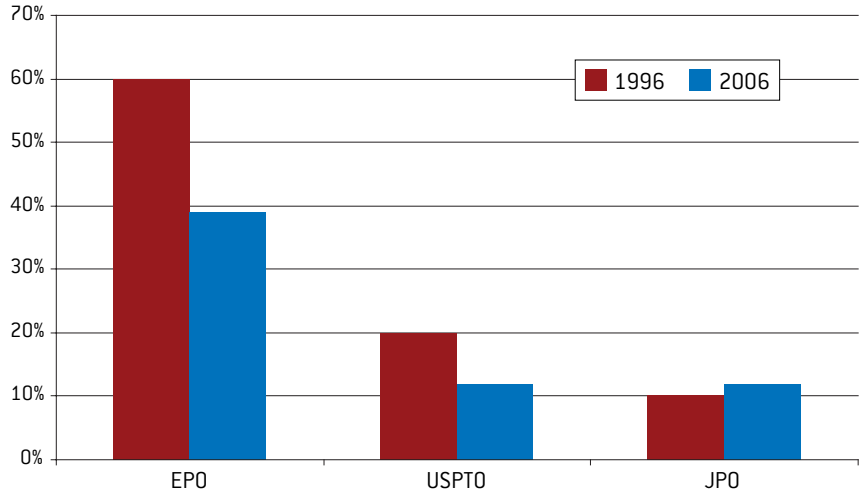
Figure 10. Patent propensity at the EPO vs value indicators, 1982-2000*



* 'Patent propensity' is the total number of patents filed at the EPO (Euro-Direct+ PCT-international) divided by OECD GERD (gross expenditures on business R&D). SYI is the scope-year index put forward by van Pottelsberghe and van Zeebroeck (2008), which summarises the average geographical scope of protection and the length of the enforcement period. ACV is the average composite value index put forward by van Zeebroeck (2007b), and %OP is the trend in the rate of opposition to EPO-granted patents. Source: Own calculations from EPO and OECD databases, and referred authors.

Combining the evidence provided by these three indicators allows us to conclude that the average quality of the patents filed at the EPO has dropped over time, as the propensity to file patent applications has steadily increased. Since the EPO receives much fewer applications than the USPTO or the JPO (cf. Figure 6), it seems fair to assume that a similar trend towards lower patent quality and value also applies in the US and Japan. As far as the USPTO is concerned, the very high but still-growing propensity to file patent applications probably implies an even more pronounced drop in average patent value. This supposition is well documented by Jaffe and Lerner (2004) and Bessen and Meurer (2008) using a large number of examples and case studies.

Figure 11: Share of triadic patents in total applications at patent offices, 1996-2006



Source: Own calculations from OECD MSTI database on triadic patent filings and patent office data on total applications. Applications at the EPO include PCT-Regional applications. Triadic applications in 1996: 37,944; in 2000: 45,917 and in 2006: 51,500 (extrapolated from 2005 data).

But there is more evidence of a bigger drop in patent quality in the US and Japan than in Europe. The share of triadic patents in the total number of patent applications, presented in Figure 11, provides internationally comparable information on the average value of patent applications. Triadic patents are applications that are filed simultaneously at the USPTO, EPO and JPO. This is often taken as a value indicator because applicants must bear the translation and prosecuting costs on three different continents, which are much higher than the costs associated with a domestic or regional application. It clearly appears that the average value of EPO applications is much higher (three to four times) than the applications filed at USPTO or JPO. Whereas nearly 40 percent of EPO applications were simultaneously filed in the US and Japan in 2006, only 12 percent of the applications filed at the JPO and USPTO were simultaneously filed in the other two offices.

Backlogs and falling quality of patent applications raise important issues. If the trend towards the filing of low-quality applications were to continue, this would incur needless consumption of resources: examiners would increasingly be spending time justifying refusal of 'obvious' inventions. This situation would certainly not serve the purpose of patent systems: to stimulate innovation through the provision of temporary monopolistic rights. Identifying the root causes of this patent inflation might

throw up solutions for the patent backlog and quality issues. Again, the evidence suggests that many of the factors driving a reduction of patent quality apply in particular to the US patent system.

3.3 Are policymakers to blame?

The main argument developed here is that policymakers (politicians, patent offices, judges) have contrived to design patent systems in such a way that their current plight became inevitable. Four dimensions of policymaking have indubitably played a role in this respect: deciding what is patentable subject matter, allowing flexibility on prior art (novelty), examination fee levels and the rigour of the examination process (inventive step).

A. Patentable subject matter

Policies regarding patentable subject matter partly explain the difference in the number of patent applications between countries. In the US, the very few restrictions on patentable subject matter logically lead to more applications. This is striking for software, business methods, mathematical formulae, scientific discoveries or gene-related patents, amongst many other technological or scientific domains with lax patentability restrictions. For software and business methods, for example, it is much more difficult to identify the prior art properly, because of a lack of codification of previous 'inventions', or because of inventions hidden by source code. Europe is much more restrictive and forbids the patentability of such subject matter. However, while the regulation of subject matter may explain differences in the level of patenting, it accounts for little of the sharply rising patent propensity (more patents per researcher filed over time).

B. Flexibility on identification of prior art

A patent is granted if it satisfies the novelty condition (with respect to the prior art) and the inventive step (or non-obviousness) requirement. If the content of the submitted application has been published prior to the filing of the patent, the 'novelty' condition is not met and the patent should not be granted. This is theoretically straightforward and is normally applied quite stringently. According to the UK Trade Marks, Patents and Design Federation (TMPDF), a timely and high-quality search is central to the quality of the EPO examination capability:

> *'A high quality search underpins everything, for without it, the rest of the examination process can be a waste of time. Moreover, reliably good early searches can lead applicants to abandon applications that would otherwise clog the system.'*
>
> TMPDF (2008, p. 2)

Five elements of the US patenting process soften the novelty condition and hence lead to higher patent propensity: the lack of a search report, the grace period, divisional applications, the lack of a pre-grant opposition process and allowing for hidden applications. None of these peculiarities, which are described in Appendix 2, prevail in Europe, except for divisional applications.

C. Fee policies

Lax fee policies seem to have contributed to the trend towards a higher propensity to file patents. Although still rarely considered as effective policy leverage, patent fees do matter. Recent quantitative evidence confirms that applicants' behaviour is influenced by the fee structure of patent offices[16]. In Japan entry fees (ie filing and search fees) have always been very low, virtually zero (cf. de Rassenfosse and van Pottelsberghe, 2008b). In the US they have fluctuated between 500 and 700 USD PPPs, whereas Europe is slightly more expensive. For all the fees up to the grant of a patent (filing, search and examination), Japan and the US have cumulated fees of about 2000 USD PPPs, whereas cumulated fees in Europe are about 5000 USD PPPs. This downward trend in entry and cumulated fees up to the grant has probably encouraged the increase in patent filings at the EPO. The relatively very low fees in Japan and the US partly explain the large number of patent filings observed in these two countries.

16. Several observers frequently argue that fees should not play an important role because they constitute only a fraction of total patenting costs (which include services provided by attorneys, drafting support, search for prior art). These costs are difficult to approximate (van Pottelsberghe and Mejer, 2008) and are indeed substantial. However, for large firms with an IP department these costs could be considered as fixed costs, whereas filing fees and renewal fees are by definition variable costs. Quantitative techniques must therefore be used to assess whether fees influence applicants' behaviour: see de Rassenfosse and van Pottelsberghe (2007, 2008a) for evidence about the influence of national filing fees on the number of priority applications; Harhoff *et al*. (2007, 2009) for the influence of validation fees, renewal fees and translation costs on the chosen geographical scope for protection; Archontopoulos *et al*. (2007) for the impact of claim-based fees. De Rassenfosse and van Pottelsberghe (2008b) perform the first evaluation of fee elasticity with time series. All these studies confirm that fees do affect the behaviour of applicants, with a price elasticity of demand for patents fluctuating around -0.4: an increase of 10 percent in fees would lead to a drop in demand for patents of about four percent.

D. The rigour of the examination process

> *'...The 'problem' is that patents being issued today do not generate the confidence and respect in the public that, as a matter of public policy, one would expect. The bad press and attacks on patents in general have eroded confidence in all patents. An inventor who obtains a patent cannot enjoy as much of the benefits of the patent as public policy would dictate. The 'solution', which is almost universally touted, is to improve patent quality. Patents should be issued for inventions which are new, useful, and fully disclosed. Inventions that do not meet all three requirements should not be issued.'*
>
> Blog written by Russ Krajec, US registered patent attorney[17]

Grant rates for patents – the ratio of applications to granted patents – might shed light on the rigour of patent examination and thus also on patent quality. However, while such an analysis can be performed with a degree of caution for Europe, international comparisons are much more complex. This is attributable to the fact that 'real' grant rates are difficult to compute (due to the use of so-called divisional applications or continuation in parts and to the possibility of filing numerous similar applications). Alternative indicators must therefore be computed to assess patent offices' rigour[18]. Several alternative indicators of rigour in patent offices' work are presented in Table 4. These indicators include differences in relative workload per examiner, pendency of examination, and corrected grant rates. The first three columns report the number of examiners, the number of incoming applications and the number of patents granted. In 2007 the USPTO is by far the largest patent office in terms of the number of examiners (5,376).

The fourth and fifth columns of Table 4 show the ratio of incoming applications per examiner. The IN/EX column represent the total number of patents filed per examiner and the INC/EX column represents the total number of claims filed per examiner. An examiner at the USPTO received on average 85 incoming applications in 2007, whereas at the EPO the workload per examiner was less than half of this (36). If the number of claims filed per examiner is considered (column INC/EX), the average USPTO examiner must tackle about four times more claims than his EPO counterpart. At the EPO (the USPTO) about 538 (2036) claims were filed per examiner in 2007.

17. Blog 'Everything under the sun made by man', contribution entitled 'McCain vs Obama on IP Issues: There is No Contest' posted on Thursday, 28 August 2008. Russ Krajec is a registered patent attorney, engineer and inventor with over 20 US patents. http://www.krajec.com/index.php?/weblog/index/.
18. See van Pottelsberghe and François (2009) for an early analysis of the rigour of patent offices based on these indicators.

The trend in the workload of examiners over a 10-year period is depicted in Figure 12. From 2000 to 2004 each USPTO (JPO) examiner had to process an annual workflow of more than 2500 (1500) claims. This is five (three) times more than the average workload of a European examiner. Since 2004 some convergence has been visible. The USPTO recruited nearly 2,000 new examiners between 2002 and 2007. That the backlog has continued to rise is probably due to the time required to train new examiners. However, regardless of the trend, US workload per examiner remains four times higher than in Europe.

Table 4: Rigour in patent production process, 2007

	Examiners (EX)	Application (IN)	Grant (OUT)	IN † /EX	INC †*** /EX	OUT /EX	Pendency in months	Grant rate**
USPTO	5376	456154	157283	85	2036	29	32	87-97%
JPO *	1468	396291	164954	208	1255	112	(36)+32.4	0.64
EPO (PCT-R)	3689	140763	54699	36	538	15	(18)+45.3	0.67
KIPO	660	172469	123705	261	NA	187	15	NA
SIPO	2672	245161	67948	92	NA	25	26	NA
IN-PO	133	28940	8000	218	NA	60	NA	NA

Data source: Adapted from referenced papers and from the data provided in the Trilateral Statistical Report, 2007, and the WIPO annual report of 2008. The number of applications at the EPO includes PCT-Regional filings (EPO-R). KIPO: South Korea, SIPO: China, IN-PO: India.

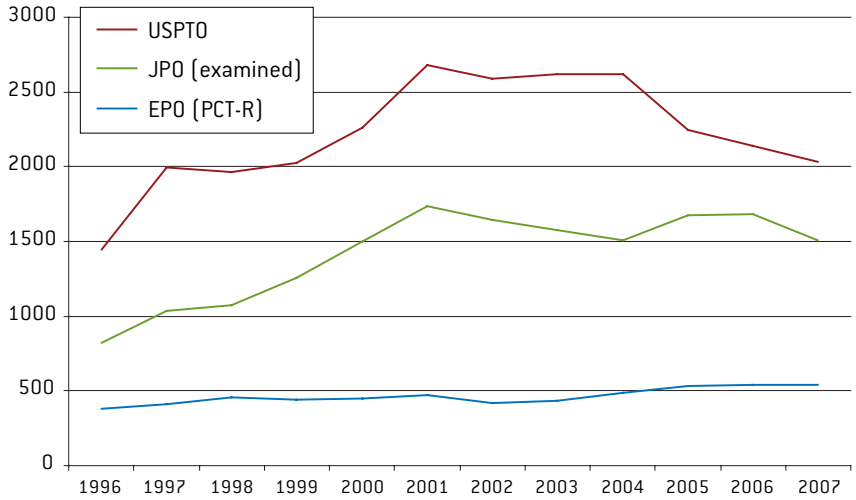
* In Japan the search process is outsourced to an external organisation composed of about 1,300 persons (retired examiners, freelances), which results in a biasing of 'per-examiner' comparisons which include Japan.

** Quillen and Webster (2001) and Quillen *et al*. (2002) put forward corrected grant rates for the period 1995 to 1999 for the EPO and the JPO, and for the period 1993 to 1998 for the USPTO. The authors show that the USPTO grant rate (allowances divided by total disposals, ie the sum of allowances and abandonments), corrected for continuous applications, ranges from 87-97 percent, depending on the extent to which prosecution of abandoned applications was continued in re-filed applications.

† The share of patent applications for which a request for examination is filed is 100 percent at the USPTO (where an application is automatically examined); 94 percent at the EPO and 67 percent at the JPO. The share is smaller in Japan because the applicants can wait up to three years before requesting an examination.

*** INC stands for the total number of claims included in patent applications, which are computed from the average number of claims per patent filed: 24 at the USPTO, 23 for PCT international applications filed at the EPO, 15 for patent applications at the EPO including transferred PCT (or PCT regional); and 9 at the JPO. The data is not available for other patent offices.

Figure 12: Trend in the annual number of claims under examination per examiner, 1996-2006 (000s).



Source: Own computation from USPTO, EPO, JPO information on patent filings and average number of claims; and from the Trilateral Statistical Report. For both Japan and the EPO we take into account only the patents that are actually subject to an examination request (a proportion of total applications).

The column OUT/EX in Table 4 shows that the actual amount of work performed per examiner is also twice as high in the US as in Europe. The European examiner grants on average 15 patents per year, against 29 in the US, 25 in China and more in Japan and the rest of Asia. These figures suggest that both the incoming workload of examiners and their actual output are two to four times higher at the USPTO and Asian patent offices than at the EPO. One explanation for this overwhelming difference might be attributable to the average time spent by examiners on each patent, which may in turn correlate with higher patent quality in Europe.

The EPO has the longest average pendency rate (63 months, or five years, made up of 18 months for the search report and 45 months for the substantive examination) compared to the JPO (32 months of examination, but a much longer period to decide whether the patent should be examined or not) and the USPTO (32 months, all inclusive!). It is worth noting that the examination pendency has actually fallen to 45 months at the EPO over the past eight years (it was 50 months in 2000), whereas it has increased at the USPTO and the JPO over the same period (it was 25 and 27 months, respectively, for the year 2000). These divergent developments confirm once again that the backlog is more a US or Japanese issue than a European one; this

suggests that quality may be higher in Europe as a result.

A slower process might mean that examiners spend more time on each patent application. Assuming similar analytical skills, it can logically be inferred that EPO examiners' decisions are based on more detailed knowledge of the prior art and a more in-depth analysis of the patented invention. This, in turn, would lead to a higher quality patent (ie higher rates of withdrawal or refusal)[19]. The fact that it lasts longer in Europe indubitably correlates with a higher degree of rigour and thus patent quality. Table 5 summarises the empirical evidence on patent quality.

Table 5: On the design of patent systems

	USA	Japan	Europe
Structural factors			
Many patentable subject matters	+++	+	+
High flexibility w.r.t. prior art	+++	++	+
Hidden applications allowed	+++	+	+
Low fees	+++	+++	+
Opposition process	no	yes	yes
Human factors and rigour			
Workload per examiner	+++	++	+
Short Pendency (fast)	+++	+	+
High turnover, low experience	+++	+(+)	+
High corrected grant rate	+++	+	+
Impact on applicants' behaviour			
Higher propensity to patent	+++	++	+
Strategic filing, larger patents	+++	++	++
Impact on patent systems			
Backlog and delays	+++	++	+
Drop in quality/value	+++	++	+
Patents enforced in 2007 (millions)*	1.8	1.2	0.5
Claims enforced in 2007 (millions)**	36.2	6	7.5

* WIPO statistical series, 2008; for Europe the figure on patents enforced applies to Germany. ** For the average number of claims per patent in force we follow a conservative working hypothesis of 20 claims per patent for the US, 15 for Europe and five for Japan.

19. Lazaridis and van Pottelsberghe (2007) show that nearly half of the withdrawals could be considered as being caused by the work of EPO examiners, because they occur just after a communication from the examiner. This figure suggests greater rigour in the examination process than would be reflected by the simple refusal rate (a bit more than five percent).

BOX. 1: EXAMINERS' INCENTIVES AND EXPERIENCE

An additional indicator of higher quality in the European patent system is related to the turnover of the examiner workforce, and hence its average experience. Annual turnover of the USPTO workforce was about 33 percent in the early 2000s: about one employee out of three would leave the office each year, or each examiner would spend on average three years at the USPTO before joining the business sector (generally recruited by firms relying on the patent system). The incentive to leave the office is probably related to employment conditions. USPTO examiners are civil servants and not highly paid[20]. This situation is to be compared with the EPO, with a very low annual turnover in the workforce (less than five percent) and high wages, as the examiner is required to demonstrate a high level of education, speak several languages and has the status of an international civil servant.

Would these remuneration and turnover differences correlate with the quality of the examination process? The answer is yes, definitely. An examiner at the EPO is recognised as fully operational after five years of training and experience, whereas at the USPTO examiners until recently left after 3-4 years. Since the examination process is complex, technical and legally binding, examiners with longer experience obviously deliver a higher-quality service on average, even if it is on account of the high remuneration that examiners choose to remain working for lengthy periods at the EPO[21].

It seems that the USPTO is gradually changing its employment conditions, providing substantial seniority-based premiums, and in 2008 achieved a significant fall in the turnover of examiners. History will tell us whether this reduction in turnover resulted more from the premiums or from the current financial crisis and economic slowdown. At any rate, the USPTO's corrected grant rate of 87-97 percent makes the USPTO a more 'applicant-friendly' patent office than the EPO and JPO, which have grant rates of 67 percent and 64 percent respectively.

20. Regarding the USPTO, Lemley reports that *'There are strong structural and psychological pressures on examiners to issue patents rather than rejecting applications, no matter how weak the alleged invention seems.'* Marc Lemley (2001, footnote 5).
21. This positive correlation between an examiner's experience and the quality of her work is further documented by the British Trade Mark, Patents & Design Federation: *'A number of our members have experienced poor quality search and examination, which some attribute to the work of new recruits who have had less training and supervision than used to be provided,'* TMPDF (2008, p.3).

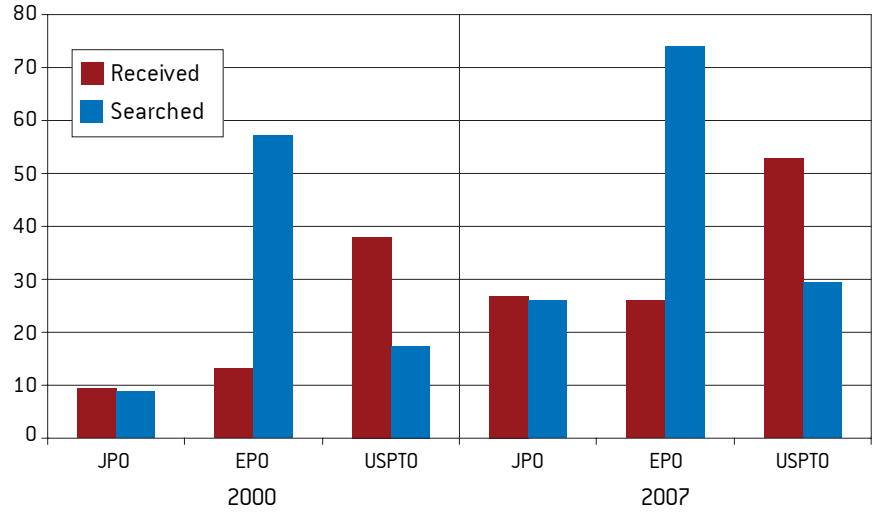
3.4 US patent dumping?

The Patent Cooperation Treaty (PCT) – the international patent regime under WIPO – actually supplies more convincing evidence about the attractiveness of the EPO, and its perception as a provider of high-quality search reports (cf. Appendix 1). A patent applicant wanting international protection can select the search authority among the patent offices that are recognised as International Search Authorities by the applicant's own patent office. Two indicators may therefore help to gauge the perceived quality of a patent office: the extent to which it is recognised as a search authority by other patent offices, and the extent to which it is actually selected by foreign applicants to perform an international search report and draw up an opinion on patentability.

Of all the patent offices, the EPO is most frequently designated as search authority to perform searches for other countries' PCT filings (see Appendix 6). Figure 13, on the next page, displays the number of PCT applications received by the JPO, USPTO and EPO and the number of search reports performed by the same offices. Whereas the EPO received a little over 26,000 PCT applications in 2007, primarily from European applicants, it searched nearly 74,000 PCT applications. The USPTO clearly produces far fewer search reports (less than 30,000) than it receives (53,000). In other words, the EPO does much more for the rest of the world than the reverse. Since PCT filing fees do not compensate for the actual cost of performing a reliable search report, one may conclude that the EPO to some extent subsidises innovation in the rest of the world.

The US, arguably the country with the most dramatic patent backlog in the world, has moved to tackle the backlog in two different ways. The first one is to recognise foreign patent offices with different organisational designs and fee structures as International Search Authorities for US PCT applications (KIPO and the Australian patent office provide PCT search services for relatively low fees).

Figure 13: Europe to the rescue of global backlogs? Received and searched PCT applications, 2000 and 2007 (thousands)



Source: Own computations from data provided in the Trilateral Statistical Report, 2007.

The second one is to conclude agreements for the creation of so-called Patent Prosecution Highways (PPHs): one with Japan and one with the UK (and these two offices have also signed a bilateral agreement with each other). These PPHs involve sharing and recognising each other's patent examination reports. The offices hope that the PPHs save significant application time for patent holders. An applicant who has had an examination report produced by one office benefits from accelerated treatment from the other office. These agreements are warmly welcomed by policymakers:

> *'The Patent Prosecution Highway agreement between the UK-IPO and the USPTO will enhance the operational efficiency of both agencies and improve patent quality,' said Lord Triesman, parliamentary undersecretary of state for intellectual property and quality. 'The agreement will help to efficiently and effectively safeguard inventors' intellectual property and help to stimulate innovation on a national and international scale [...].*
>
> *[...] the aim of the patent offices is to create a wide-ranging network of such agreements [...]*
>
> *[...] The PPH helps both offices in their goal of stimulating and rewarding invention and innovation and is a further step towards a global patent*

prosecution highway network.'

'Our collective goal is to reduce duplication of work, speed up processing, and improve quality,' said Jon Dudas, director of the USPTO. 'This pilot project with the UK builds on work with the Japanese Patent Office, and contributes to a more rational international patent system.'

'UK and US team-tag to speed patent prosecution process'
(Out-law.com, 2007b)

The EPO and the USPTO have now signed a similar agreement, described in Appendix 3. The use of other offices' work is already common practice, and has not required a special agreement or partnership. What the PPH agreements add is *accelerated treatment* if the patent has already been examined abroad. Whether such accelerated treatment will lead to a *'more rational international patent system that speeds up processing and improves quality'* is far from assured, especially if it is acknowledged that fees and quality vary substantially across countries, and that they both matter.

Companies may choose to file several applications in the cheapest office with the lowest quality examination services, and then extend these applications (based on a single, relatively low-quality report) to the other two offices under the accelerated treatment facility. But this practice may drive low-quality processing of backlogs, as speed is not synonymous with quality.

To sum up: as long as the quality of the examination process is not harmonised, it can fairly be argued that the recent moves towards global work-sharing and mutual recognition agreements might actually drive global patent quality down towards the lowest level available. And specifically for Europe, the current and understandable attempt of the USPTO to outsource evaluation of its own applications through the designation of low-cost PCT search offices and through bilateral agreements with Japan, the UK and the EPO, may actually drive down patent quality in Europe.

It is also striking to see certain national patent offices in Europe adopting national positions which seem to be at odds with the interests of the EPO. There are two clear examples of this. First, the Austrian patent office offers the cheapest (with South Korea) PCT search and preliminary examination reports in the world, each costing €200, against €1,700 at the EPO. Second, the UK-IPO has signed two Patent Prosecution Highways with the US and Japan, apparently independently of the EPO. These two autonomous and internationally visible positions bear witness to the lack of a centralised and strong European approach to the global patent backlog issue, and

implicitly undermine the negotiating power of the EPO.

The global patent warming problem is a major challenge for Europe, coming on top of Europe's own internal, home-made problem: its fragmented patent system.

4. Conclusions and policy recommendations

> *'Patents should draw a line between the things which are worth to the public the embarrassment of an exclusive patent, and those which are not. Patents are, after all, government-enforced monopolies and so there should be some 'embarrassment' (and hesitation) in granting them.'*
>
> Thomas Jefferson (1794)

Chapter 2 illustrated the economic incongruities created by a fragmented patent system: the lack of an integrated system in Europe, or the 40 year-long attempt to establish a Community patent, generating prohibitive costs, a high level of uncertainty, and a low-quality grant system owing to parallel national routes and the ultimate power of national jurisdictions over patent enforcement issues. These incongruities actually cancel out the high-quality examination services provided by the EPO. Chapter 3 shows that the relatively high rigour of the EPO examination process can be considered to be, jointly with the level of examination fees and other components of the design of its system, a key element which has led to smaller demand for patents in Europe than in the US or Japan, and hence a relatively small and much less worrying backlog. However, the EPO has entered into mutual recognition processes (through PPHs) that might actually harm the quality of its own examination services.

Two types of policy recommendation can therefore be formulated, first with respect to what could be done in Europe to create and effectively leverage a European patent system (section 4.1). The second set of recommendations concern the role of Europe (and of the EPO) in the global arena, especially in the context of current attempts to share work and exploit economies of scale (section 4.2). Here, a global patent standard (GPS) charter – minimum international patent quality benchmarks – would be an essential preliminary step which would subsequently open the door to effective recognition of the work performed by examiners across the world.

4.1 Build Europe

Europe's patent system has at its centre the EPO (European Patent Office), which grants patents on behalf of the 35 member countries of the EPC (European Patent Convention. Most applications at the EPO are second filings of first ('priority') filings at national patent offices. Once granted by the EPO, the European patent must be validated and enforced in each member country, with nationally applicable validation fees, translation requirements and renewal fees. The Community patent project, which has been on the negotiating table since 1962, seeks to provide a 'one-stop-shop' for obtaining patent protection in the EU: once granted the Community patent would be enforced automatically in the EU, with a single renewal fee schedule covering all countries. Any cross-border litigation could then be dealt with through a centralised European litigation system, and ultimately in the European Court of Justice. The Community patent would be an additional, parallel, patent protection route in Europe, alongside the European patent. Companies would be free to choose between the European patent and the Community patent at the time of the EPO's grant decision.

The Community patent and a centralised litigation system

The Community patent and a unified and integrated European patent litigation system are key ingredients for ensuring that the EU single market works properly. The failure to implement them means missed opportunities. It is paradoxical to have a patent office – the EPO – that covers the largest market in the world, and which ensures high-quality examination services, but has not contributed to the development of the largest market for technology due to prohibitive cumulated enforcement costs and a high level of legal uncertainty. If European governments wish to foster innovation and create a suitable environment for fast-growing technology-based firms, the Community patent project should become a prime objective. A centralised patent litigation system would reduce the prohibitive costs caused by parallel litigation and ease the uncertainty generated by differing litigation outcomes[22].

22. Local chambers for infringement and counterfeiting issues should be created, which would then lead to a central chamber for patent validity issues (and then back to the local chamber for infringement and counterfeiting) that could be used by third countries as well. The system should ensure that at least one member of the local chamber would be part of the centralised process, in order to keep a degree of coherence in the assessment. This is required because during the invalidity proceedings patent holders try to reduce the interpretation of the claims (ie limit the breadth of protection associated with the patent), whereas during infringement proceedings patent holders logically try to broaden the interpretation of the claims.

BOX 2: TURNING THE CRISIS INTO AN OPPORTUNITY? LEARNING FROM HISTORY

It is tempting to draw a parallel between the current attempts to create a centralised patent system in Europe and similar attempts by the German Empire several years after its creation in 1871. Each of the German states had its own patent system, or else no specific protection for inventions at all (eg Hamburg and Bremen). According to Seckelmann (2001) the differing economic legislation within Germany inhibited the development of an internal market between the member states of the German Custom Union (Zollverein). The states were rather in favour of mutual recognition of their patent regulations. Interestingly Prussia, the largest state, actually followed a policy that consisted in banning patent legislation. After years of public debate, the first significant economic crisis of the Empire in 1873, and thanks to the prominent role of Werner Siemens, the German Patent Act was enacted by the Parliament in July 1877, with a centralised Imperial Patent Office being the only authority to grant patents.

The German Patent Act was not only a quantum leap towards centralisation and rationalisation, but it also provided unique incentives to German industry to perform costly development, and hence became a cornerstone of Germany's national innovation system (Otto, 1993). Seckelmann (2001) reports that in 1900 the German dyestuff industry held 90 percent of the world market, an achievement that would not have been possible without the legal stability provided by the patent act of 1877[23].

The current economic crisis offers two unexpected opportunities. For global patent systems in general, the crisis will lead to a significant drop in patent applications, hence contributing to a reduction of backlogs, assuming patent offices do not reduce existing resources. For the European patent system, creating the Community patent would not only strengthen the effectiveness of the patent system but also send a powerful symbol that Europe has the political will to create a single market for new technologies.

23. This idea was already coined by Weber (1924), who suggested that international trade could expand as a result of international legal stability. Capitalism requires a highly predictable legal system, as illustrated by the impact of the first national patent law, the statute of monopolies of 1623 in England, which played a major role during the first industrial revolution. North (1981) imputes the economic success of the western world to the legal framework that secured returns on investment, including the patent laws that protected emerging industries.

An additional source of complexity is attributable to the co-existence of parallel routes to patent protection in Europe. National patent offices (NPOs) could contribute to limiting the abusive behaviour sometimes adopted by applicants, in particular the practice of filing simultaneously at the EPO and at several NPOs so as to maximise the probability of getting something granted. It is proposed that NPOs should stop granting patents altogether and instead strengthen their services to domestic innovators, including training, search and coaching services to young innovative companies. They could also be information providers to local business on counterfeiting issues. Their search capability could be used mainly to provide search reports (including for PCT applications) and – at most – non-binding opinions on patentability. Their funding would be ensured by the renewal fee receipts generated by the new Community patent[24].

Reform of EPO governance as a catalyst for change

A patent policy is more effective when it is coordinated with other policies that affect innovation. The objective of a patent system is to stimulate innovation, which is also, directly or indirectly, the objective of competition, industrial, and science and technology policies. These regulatory or R&D-funding policies interact with the patent system and hence need a minimum level of coordination.

So far there is no patent-related coordination between policies that affect innovation performance. The administrative council of the EPO is essentially composed of the representatives of national patent offices. The 35 member countries frequently have divergent – and sometimes conflicting – interests to those of the EPO. But it is these same members that elect the president of the EPO and the five vice-presidents.

In order to ensure smooth decision-making and proper representation, the EPO administrative council should include representatives of major stakeholders of the patent system and a reduced number of NPO members acting as representatives of all NPOs. This arrangement would not preclude holding an annual EPO general assembly which all NPOs could attend. This new EPO governance structure is described in Box 3.

The new administrative council would include representatives of the business sector (large and small firms), representatives of consumer associations and

24. Danguy and van Pottelsberghe (2009) perform simulations that suggest that most national patent offices would earn more money from renewal fees with the Community patent than without it.

representatives from the academic sector (academic networks and technology transfer office associations). In addition, four members of the European Commission should have a seat: the commissioners in charge of research, competition, enterprise and the internal market.

The fee policy

The fee policy must get the incentives right. Excessively high fees make the patent system prohibitive, whereas fees pitched too low make it too easy to file inventions of dubious merit. It is important to distinguish between examination fees and after-grant fees and costs. The USPTO has very low fees both before and after the grant. The EPO has higher fees for the examination process (including filing, search and examination), and prohibitive fees and costs after the grant as a result of translation requirements and cumulative renewal fees that must be paid each year in each country where protection is required.

BOX 3: TIME FOR NEW GOVERNANCE AT THE EPO?

Current EPO administrative council	Future EPO administrative council
35 NPOs	10 member country representatives (NPOs)
Observers: European Commission BusinessEurope Patent attorneys	Representatives of: Consumer associations Business associations Academia Technology transfer offices Patent attorneys Centralised patent litigation institution
	1 independent member European Commissioners for research, internal market, enterprise and competition Observer from the European Parliament

The level of examination fees should be set so as to compensate for the cost of performing a high-quality search and examination. In this respect, Europe, with a market of 500 million inhabitants (EU alone), can have cumulated up-to-grant fees that are higher in absolute terms than in the US, while keeping relative costs (cost per capita, or per market unit) competitive. Sufficiently high absolute fees are needed to justify a minimum degree of quality in the examination process and to ensure a certain self-selection of applications. Low fees result in more applications and do not generate enough resources to ensure a high-quality examination process. The system should avoid a sudden increase in fees or costs just after the grant of the patent by the EPO, because it stimulates firms to adopt filing strategies aiming at delaying the grant date. The Community patent could obviously provide a response to this issue. The fee structure of the Community patent should be set at a level that corresponds to the cumulated renewal fees that are currently paid by patent owners, which is equivalent to renewal fees in about four countries over the life-span of a patent[25].

Create an SME status

Young innovative companies and SMEs lack resources and managerial time to tackle patent enforcement issues properly. In addition, though governments purport to favour SMEs with a potentially global reach (through exports and foreign direct investment), the current system actually constitutes a barrier to internationalisation. While with a Community patent these firms would benefit from EU-wide protection, entry costs could still be prohibitive.

It is therefore urgent to create a long-awaited SME patent status at EU level, as the USPTO and the JPO have had for many years. This would imply setting reduced SME fees at the EPO at, for instance, about half the fee level applicable to other companies.

4.2 A Global Patent Standard

Out of the millions of patents filed at the main patent offices each year, a significant share, at least 10 percent, are so-called triadic patents filed simultaneously in Japan, the US and Europe. The share of bilateral applications to the USPTO and the EPO is much higher: 14 percent of USPTO filings come from Europe and 25 percent of EPO filings come from the US. Needless to say, major cost and time savings could

25. Danguy and van Pottelsberghe (2009) show that with a renewal fee structure equivalent to about four countries, the Community patent would generate higher renewal fee receipts than the current European patent does in all national patent offices combined. The data presented in van Pottelsberghe and van Zeebroeck (2008) confirms that the patents that have been enforced for 15 years are generally valid in about four countries.

potentially be achieved in a collaborative framework, and the willingness to evolve towards work sharing and/or mutual recognition at the global level is certainly to be welcomed. There is clear political will to reach global economies of scale whereby a patent granted, say, in the US would also be considered to be granted in Europe. The G20 has put forward the idea of a global litigation court that would be hosted by WIPO in Geneva. The Patent Prosecution Highways (PPHs) also evidence a strong will for mutual recognition of search and examination reports.

We have argued that PPH agreements as presently conceived are not a panacea because they may reduce global patent quality further through their 'fast-track' component – a clear route towards a race to the bottom. We propose that examiners should be free to use the work performed by others without any requirement to deal with such patents by an accelerated procedure.

In general, convergence projects that focus on the output of patent systems instead of input – the absolute quality of the examination process - should be avoided. Be it the PPHs launched in 2008 or the World Intellectual Property Court envisioned by the G20 in April 2009, no convergence project can afford to skirt the difficult issue of creating a global patent standard (GPS).

Global convergence should evidently first tackle the key patentability conditions (novelty, inventive step, applicability) and secure the main pay-back for society at large (dissemination of information about an invention so others can build on it or focus on something else). Three broad dimensions should therefore be addressed: access to information, structural factors influencing the search and examination process, and the human factor (see Box 4 for a detailed list of convergence issues).

GPS: Free access to key information

Free access to patent information – a key part of the patent bargain – is a myth today. Many players (especially SMEs, universities, independent inventors) do not have ready access to information about granted or pending patents. Improved transparency, which would re-install confidence in the system, could be achieved if the following key information sources were freely and readily available to all online: search tools and databases needed to investigate prior art; all patent applications within 18 months after their first filing; requests for use of any accelerated procedure; all patents currently in force in a given country. In a similar vein, full and free sharing of search and examination reports by examiners would contribute to reducing pendency and hence backlogs.

GPS: Structural convergence

Structural convergence between systems is a logical preliminary and necessary condition for embarking on any form of effective mutual recognition of the work performed by third offices. This is required because structural processes (patent grant criteria and rules) influence the speed and outcome of examinations. Global convergence should tackle the following dimensions: the identification of ownership of the invention (first-to-file versus first-to-invent); the methodology used to assess the inventive step; the time allowed to reply to a communication by the examiner (ie to reply to a question to elicit further information); the selection of patentable subject matter; the possibility to split a patent; the grace period (ie leeway for scientists/researchers to file); the level of fees; and the possibility for third parties to file an opposition before the patent office (before/instead of having to attempt the more costly litigation route).

GPS: Examiners' skills and incentives

Although rarely acknowledged, the key factor in patent systems resides in the examination work performed by individual examiners. The quality of their work depends on their workload, their experience as an examiner, their education and training in their technological area, the speed at which they have to process an application, and their incentives. A convergence of patent systems would therefore logically require convergence of human resource practices, including incentives to keep experienced examiners, training schemes to stay up to date with technological progress, recruitment policies based on relevant skills, and individual performance indicators.

By way of epilogue: unfortunately only a few of these convergence themes (free and ready access to information, structural issues, and human resource policy at patent offices) are part of the coordination package signed by the five major global patent offices on 14 November, 2008 (see Appendix 4).

The US has recently taken steps designed to improve patent quality. First, informal contacts confirm policy moves in the form of seniority-based wage premia for US patent examiners. Second, on October 30 2008, the US Court of Appeals for the Federal Circuit (CAFC) ruled that many existing business-method patents are invalid or substantially limited in scope. This decision will most probably restrict the patentability of software and business methods in the US[26]. Third, the first-to-file

26. In its 30 October 2008 decision (Ex Parte Bilski) the CAFC subscribed to the 'machine-or-transformation test,'

system, applicable in Europe, might also be adopted in the US. Taken together, these are encouraging signs, but constitute only small steps along the way towards what could be deemed a true global patent standard. The OECD and WIPO might well be appropriate places to foster further discussion on global patent standards.

BOX 4: A GLOBAL PATENT STANDARD – THREE KEY AREAS OF CONVERGENCE

DOMAINS OF QUALITY IMPROVEMENT

Access to information

- Open access to patent offices' search tools and databases
- Publication of all patent applications after 18 months
- Publication of requests for accelerated search/examination
- Publication and ready access to patents in force
- Publication of patents available for licencing

Structural factors

- First to invent (F2I) vs first to file (F2F) for ownership
- Requirements for novelty and inventive step
- Patentable subject matter (business methods, software, discoveries, formulae)
- Forbid several generations of 'divisionals' and/or 'continuation in parts'
- Deadline (three months) for replying to a communication by examiner
- Fees (filing, search, examination) should be cost covering
- Pre-grant opposition process
- Grace period for scientists and researchers

The examiner

- Education level
- Training schemes
- Average experience at patent office
- Turnover of employees
- Incentive mechanism
- Performance measurement decoupled from grant decisions

which is what the standard used to be in the 1970s. To be valid, the inventor must show that his business method is either 'tied to a particular machine or apparatus,' or 'transform[s] a particular article into a different state or thing.' The CAFC ruled that if neither of these tests is met, then the business method is not patentable.

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Appendix 1.
The patent jargon: key terms and basic process

This section provides basic definitions of specialised terms used in this book.

Intellectual property rights

Patent: a legal title protecting commercial ideas or inventions whereby the owner can prevent others from making or selling the idea/invention.
Trademark: a legal title protecting names, words, symbols or devices.
Copyright: a legal title protecting the expression of ideas (creative work, authorship) in the form of software, text, characters and songs.

Patent institutions

EPC: European Patent Convention, signed in 1978, included 35 member states in May 2009
EPO: European Patent Organisation, created in 1978, grants patents on behalf of EPC member states
JPO: Japanese Patent Office
KIPO: South Korean Patent Office
NPOs: National patent offices of the EPC member states
PCT: Patent Cooperation Treaty
SIPO: Chinese Patent Office
USPTO: US Patent and Trademark Office
WIPO: World Intellectual Property Organization

Basic patenting process[27]

According to Articles 52 and 53 of the European Patent Convention (EPC), an invention must satisfy three main conditions for a patent to be granted: i) be new; ii) involve an inventive step (be non-obvious); and iii) be capable of commercial application. In addition the invention must be a *patentable subject matter*, for which there is a more stringent test in Europe and Japan than in the US[28].

Novelty is a condition requiring good knowledge of the published state of the art at the date of first filing of the patent. The applicant cites the prior art that is related to the invention, which is generally published in patent databases and technical or scientific journals. In Europe and Japan, a 'search report' is published 18 months after the date of first filing, along with the filed document. The search report lists all published material related to the invention and checks whether the invention is novel with respect to this state of the art. The search report may also include citations identified by the patent examiner that were not quoted in the filed document. If the search report confirms the novelty of the invention, the applicant may request a *substantive examination* of the application. This examination aims at assessing whether the invention involves an *inventive step* for a person normally skilled in the art.

In return for the protection provided by the patent, the invention must be disclosed in detail, so that everyone can benefit from it. This disclosure in exchange for patent protection is also known as the 'patent bargain'. Patents provide dynamic efficiency that compensates for their static inefficiency. The latter comes from the monopolistic prices that can be set, and hence a lower level of consumption than in a more competitive environment. On the other hand patents provide dynamic efficiency that consists in the creation of knowledge and innovation which, while commercially protected, is available to others and potentially benefits the economy as a whole.

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27. A more detailed explanation of patenting procedures is presented in Guellec and Van Pottelsberghe (2007), chapters 1 and 6.
28. For instance, several fields, including discoveries, scientific theories and mathematical methods, aesthetic creations, schemes, rules and methods for performing mental acts, playing games or doing business, programs for computers and presentations of information are not considered to be inventions if the European patent application only relates to such subject-matter or activities as such. In addition to this, inventions falling into any of the following categories are excluded from patentability: i) inventions whose commercial exploitation would be contrary to the public interest or would be immoral; ii) plants and animal varieties or essentially biological processes for producing plants or animals (microbiological processes and products thereof are not excluded); iii) methods for treatment of the human or animal body by surgery or therapy and diagnostic methods practised on the human or animal body (products, substances and compositions for use in such methods, eg medicines or surgical instruments are not excluded).

The global patent system is quite complex, as various routes can be followed to gain protection in a given geographical environment. Figure 14 shows a simplified process. Once an invention is generated, the applicant may choose between three options: keep it secret, publish it, or file a patent to try to exclude others from using it.

Assuming that the inventor wishes to protect the invention on his domestic market, the first stage consists of a 'priority filing' at a national patent office. The date of receipt of the application is called the 'priority date', for which all previously published material (patents, scientific articles) will constitute the 'prior art'. Since the international Paris Convention of 1883, an applicant has one year to extend an application abroad without risking loss of the patent on the grounds of lack of novelty. The international extension consisting of filing a foreign application within one year of the priority date is depicted as route 1 in Figure 14.

However, one year is often considered too short for the evaluation of an invention's economic potential. Thus the Patent Cooperation Treaty (PCT), ratified in 1970, introduced the possibility of delaying further the extension of the application abroad while still fulfilling the novelty criterion. The PCT route, or route 2 in Figure 14, allows inventors to wait for up to 32 months before deciding to file an application abroad.

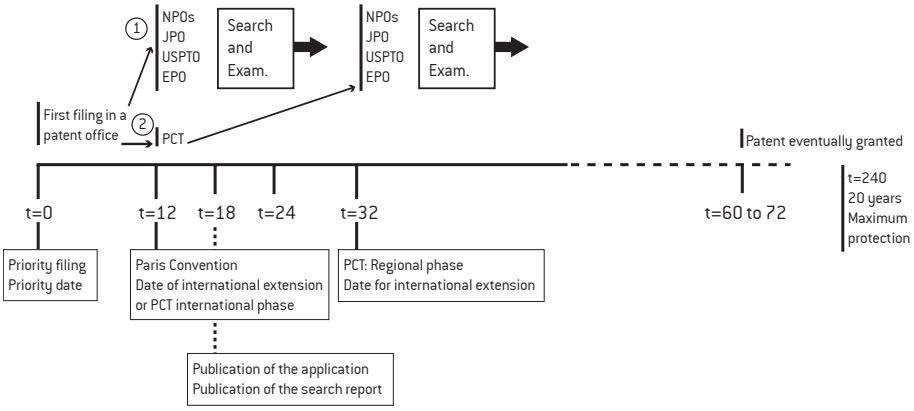
It is important to keep in mind that a PCT application as such is not an application for the grant of a patent, and the application is not converted into a patent unless and until the application is lodged with the national patent office of the foreign country or countries concerned. It should be added that the 32-month period allows inventors to delay incurring the fees and translation costs which become payable once the application is submitted to national patent offices abroad.

The first step of the international application procedure is filing with a suitable patent office, called a Receiving Office (RO). A search is then carried out by an authorised International Search Authority (ISA) to find the most relevant prior art documents regarding the claimed subject matter. This procedure results in an International Search Report (ISR), together with a written opinion regarding patentability[29].

29. International Search Authorities (ISA) and International Preliminary Examining Authorities (IPEA) include: 1. Austrian Patent Office; 2. Australian Patent Office; 3. Canadian Intellectual Property Office); 4. State Intellectual Property Office of the People's Republic of China; 5. European Patent Office; 6. Spanish Patent and Trademark Office; 7. National Board of Patents and Registration of Finland; 8. Japan Patent Office; 9. Korean Intellectual Property Office; 10. Federal Service for Intellectual Property, Patents and Trademarks (Russian Federation); 11. Swedish Patent and Registration Office; 12. United States Patent and Trademark Office; 13. Nordic Patent Institute. All International Search Authorities are also International Preliminary Examining Authorities.

Be it under the Paris Convention route or the PCT route, a search report is published together with the international application no later than 18 months after the filing date. The international search report of the PCT route helps the applicant to decide whether it would be worth seeking protection abroad and in how many countries.

Figure 14: Patent processes and patenting routes



Appendix 2. ‘Soft’ identification of prior art in the US

The lack of search report: the novelty standard prohibits the grant of a patent if a description of the invention has been previously published. According to Barton (2000), however, prior publications in the US system would not bar issuance unless all features of the invention have been disclosed in a single prior publication. The fact that no search report is publicly available (for any domestic application) is evidence of a lack of transparency on the part of the USPTO with respect to the rest of the world. A filing at the USPTO automatically leads to a search and examination, whereas at the EPO and most other patent offices in the world a search is first performed and then a search report published together with the filed document within 18 months of the date of application. A substantive examination is performed only at the request of the applicant (otherwise the patent falls into the public domain). As search reports provide an early indication of patentability, the USPTO would improve its own backlog by performing (and publishing) a search report.

A grace period allows researchers to publish a scientific article but to submit a patent application on the same content up to one year after the publication date (or the release of the working paper, or the dissemination of conference proceedings). Japan has adopted similar legislation but with a shorter grace period. This flexibility is particularly welcomed by academic researchers, because the patenting process does not obstruct or delay their publication output. The grace period is particularly relevant to the *first-to-invent* rule that applies in the US. In nearly all other countries a *first-to-file* rule has long been applicable in order to stimulate researchers to file patents as soon as practicable, and to avoid the often difficult process of identifying the ‘first’ inventor in case of litigation.

Continuation in parts (CIPs) means subsequent applications based on a priority

(first) filing, which share the same 'priority date' (date of first filing). CIPs may add, change, or withdraw claims in the original application. It is a facility frequently used by applicants in order to maintain important claims under examination and to enlarge the scope of protection. The possibility to add claims in subsequent CIPs provides an incentive to file further applications. The European counterpart to continuation in parts is a **divisional application**, or the splitting of the original patent application into two or more subsequent applications. It generally occurs with large applications involving numerous claims and which contain more than one invention. The scope for abuse of these facilities, especially CIP, is clear.

The pre-grant opposition process allows third parties to challenge the validity of a patent before the EPO up to nine months after the decision to grant. This process improves the actual and perceived quality of the European patent system. It is much less expensive than patent litigation in court (see Chapter 2) and allows third parties to produce new prior art or useful information against the validity of a patent. About five percent of granted patents are currently opposed. The US system does not have such a system, which means that challengers bear the burden of very high litigation costs (see Hall *et al.* (2003), Graham and Harhoff (2006) and Maskus (2006) for qualitative and quantitative arguments in favour of the instalment of a reasonably priced post-grant opposition process at the USPTO).

Hidden applications introduce further unwelcome uncertainty into the system. In most countries except the US, patent applications are kept secret (unpublished) for only 18 months from the priority filing. The patent application is then published. In the US only patent applications for international markets (under the PCT) are published. Domestic applications targeting the US market alone are kept secret during the whole examination process and are only published once granted. This specificity undermines the US patent system, as it encourages 'submarine' strategies, which consist in keeping a patent pending (and hence unpublished) until its grant, and then immediately enforcing it.

In Europe (nearly) all applications are published 18 months after their priority date. It is possible to hide an application only if it is refused by an examiner (or withdrawn by the applicant) before the official publication date.

Appendix 3.
The Patent Prosecution Highway pilot programme between the USPTO and the EPO

I. Background

The European Patent Office (EPO) and the United States Patent and Trademark Office (USPTO) announced on 28 April 2008 that they intended to launch a new trial co-operation initiative called the Patent Prosecution Highway (PPH) in September 2008. The PPH is designed to leverage fast-track patent examination procedures already available at both offices and thus to allow applicants to obtain patents more quickly and efficiently. It also permits each office to exploit the work previously done by the other office and thus reduce duplication. In turn the initiative will reduce the examination workload and improve patent quality.

II. Patent Prosecution Highway pilot programme

The PPH was established to enable an applicant whose claims are determined to be patentable/allowable in the office of first filing (OFF) to have the corresponding application filed in the office of second filing (OSF) for accelerated examination while at the same time allowing the OSF to exploit the work results of the OFF.

Where the EPO is the OFF and the EPO application contains claims that are determined to be patentable/allowable, the applicant may request accelerated examination at the USPTO for the corresponding application filed with the USPTO as the OSF. The procedures and requirements for filing a request with the USPTO for participation in the PPH pilot programme are available from the USPTO website at: www.uspto.gov. Where the USPTO is the OSF, the applicant must provide the USPTO with the necessary documents for requesting participation in the PPH pilot programme. It is envisaged to

allow applicants to request the EPO to obtain the necessary documents electronically via Document Access System (DAS).

Where the EPO is the OSF and the corresponding application filed with the USPTO as the OFF contains claims that are determined to be patentable/allowable, the applicant may request participation in the PPH pilot programme at the EPO.

The PPH pilot programme started on 29 September 2008, for a period of one year. The trial period may be extended for one more year if necessary to assess the PPH programme's feasibility. The EPO and the USPTO will evaluate the results of the pilot programme to determine if and how the programme should be fully implemented after the trial period. The offices may also terminate the PPH pilot programme early if the volume of participation exceeds a manageable level, or for any other reason.

Appendix 4.
Foundation Projects for a work sharing infrastructure

To secure the necessary infrastructure, the five patent offices will each lead two of a total of ten Foundation Projects over the coming years. The projects aim to harmonize the global environment for patent searches and examination and to enable work-sharing among the five offices.

The designated offices and their projects are as follows:

European Patent Office (EPO): Common Documentation Database with resource material for patent examination and Common Approach for a Hybrid Classification of patents across offices.

Korean Intellectual Property Office (KIPO): Common Training Policy for patent examiners and Mutual Machine Translation to overcome language barriers.

Japan Patent Office (JPO): Common Access to Search and Examination Results across offices and Common Application Format to ensure that patents are digitally filed in XML-format.

State Intellectual Property Office of the People's Republic of China (SIPO): Common Rules for Examination Practice and Quality Control to harmonise patent quality standards and Common Statistical Parameter System for Examination for accurate international patent statistics.

United States Patent and Trademark Office (USPTO): Common Approach to Sharing and Documenting Search Strategies and Common Search and Examination Support Tools in a shared system.

The project's progress will be closely monitored and discussed at follow-up meetings throughout the next year.

Source: EPO (2008) 'Five IP Offices announce shared vision on cooperative framework', http://www.epo.org/topics/news/2008/20081031.html, 31 October, accessed 4 June 2009

Appendix 5.
Four case studies on economic incongruities created by the European patent system

Four case studies illustrate the economic incongruities created by the currently fragmented European patent system and the managerial complexity this implies for firms. These case studies are reported with more details in Mejer and van Pottelsberghe (2009).

Epilady v. Remington: In 1988, Remington entered the European market with *Smooth and Silky*, a ladies' shaver that performed exactly the same function as the patented *Epilady* products but with a slightly different mechanism. Within the same year it had filed an opposition at the EPO questioning the validity of Epilady's patent. The Epilady patent was eventually upheld by the EPO in 1991. Meanwhile, Epilady brought a patent infringement action against Remington in Austria, Belgium, Germany, France, Italy, the Netherlands and the United Kingdom. The subsequent rulings of the national courts differed across jurisdictions. Courts in Austria, France and the United Kingdom judged that there was no infringement of the Epilady patent, whereas courts in Belgium, Germany, Italy and the Netherlands ruled that an infringement had taken place.

The Epilady case illustrates the 'non-European' dimension of the European patent system: national courts do their own thing.

Coffee wars: The Dutch-American company Sara Lee/DE and Philips Electronics developed the *Senseo* coffee machine, for which a patent was granted by the EPO. The coffee machine proved to be a great success and competitors started entering

the market for coffee pads, delivering copy-cat products in shops. At the end of 2001 Sara Lee initiated a number of infringement proceedings against several competitors in Belgium and in the Netherlands. It argued that as the pads constituted an essential part of the innovation, producing and selling them constituted an indirect infringement of the patent. Shortly after the grant, in September 2001, the firm Albert Heijn B.V filed an opposition before the EPO. In mid 2002 the Court of Appeal in The Hague held in its preliminary proceedings that there was no indirect infringement. Therefore, the Dutch competitors were allowed to continue selling their copy-cat products. In 2004 the Antwerp Court of Appeal, without waiting for the outcome of the opposition proceedings at EPO, held that the competitors had infringed the patent. Sara Lee won in Belgium and kept its monopolistic situation until August 2006, when the EPO actually revoked the patent in full for lack of an inventive step.

The Senseo case shows that the current system not only produces discrepancies in interpreting the claims and evaluating infringements but also generates time paradoxes or inconsistencies, especially when the EPO and national courts decide in parallel on the validity of a patent.

The Euro: Document Security System Inc. (DSS) is a US firm which holds a European patent for 'non-replicable document and method of making same'. In August 2005 DSS filed a patent infringement suit before the European Union's Court of First Instance (CFI) against the European Central Bank (ECB) claiming that it was infringing on their technology (ECJ case T-295/05). The ECB then filed claims to invalidate the DSS Patent in eight countries. The United Kingdom and French Patent Court invalidated the DSS patent, but the German and Dutch Patent Courts upheld it. The CFI of the European Union refused jurisdiction in the DDS patent infringement suit, paving the way for country-by-country infringement litigation related to the 'single' currency.

The Euro case illustrates the discrepancies in assessing the validity of a patent and the difficulty to identify a proper 'central' authority for infringement.

Angiotech v. Conor: Angiotech, is a Vancouver-based pharmaceutical company which patented an innovative stent coated with paclitaxel-containing polymer that prevents restenosis, a typical problem following angioplasty. In 1997 the EPO granted the Angiotech patent. Conor Medsystems conducted a similar research project and patented a stent that also contained paclitaxel. Angiotech's patent was opposed at the EPO by five different companies, including Conor. In February 2005, Angiotech initiated patent infringement action in the Netherlands against Conor. Shortly after, a

claim was filed by Conor in the United Kingdom alleging that Angiotech's stent patent was invalid. In February 2006, the court of first instance in the UK held the Angiotech patent to be invalid due to the lack of inventive step. The District Court in The Hague held the opposite, validating Angiotech's patent. Eventually, after nine years of opposition proceedings, the EPO decided in March 2007 to uphold Angiotech's patent, however making very extensive amendments to the claims.

The Angiotech vs. Conor case shows that the definition of 'inventive step' is far from being obvious and varies across member states, which can lead to different outcomes for a given product.

Cases of antagonism between EU competition jurisdiction and national jurisdictions and cases of applicants taking the easier intra-EU parallel trade are nearly as frequent as the number of patents in force in Europe. They affect the managerial complexity and litigation costs 'only' when infringement occurs. 'Time paradox' is a less frequent event because it takes place only when a centralised process (ie an opposition at the EPO) occurs simultaneously with one or several national cases of litigation. This type of incongruity is, however, more frequent than it appears at first sight, and the heterogeneous decisions of national courts exacerbate this effect.

Appendix 6.
The PCT route: description and stylised facts

Table 6 (overleaf) presents the number of time International Search Authorities (ISA) and International Preliminary Examination Authorities (IPEA) are designated by patent offices around the world to perform the searches and preliminary examinations of PCT filings. It appears that the EPO is designated as ISA and IPEA by four other offices. It is the most frequently listed one, followed by the Australian and the Austrian Patent Offices (designated as an ISA by three other countries).

The bottom rows of Table 6 show the PCT fees charged for the search report and for the preliminary examination, which vary substantially across countries. The cheapest fees are charged by Austria, South Korea and China. Price competition seems to be taking place here, at least between a few offices. For instance, the cheapest office, in South Korea, was 'officially' selected by Microsoft corporation to proceed its 500+ annual PCT applications (according to Asialaw IP Review, January 2007, p. 19). For the search report, the EPO, the Swedish patent office and the USPTO are by far the most expensive offices, especially when compared to the Chinese or South Korean patent offices. For the preliminary examination, the EPO appears as an outlier, with a fee that is at least three times higher than in other patent offices. Such a high level of heterogeneity in PCT fee schedules again raises the quality issue: do these fee variations reflect variations in the quality of the search and examination services? If so, this would again militate against any attempt to move towards mutual recognition practices.

Table 6: ISA and IPEA designated by selected patent offices for their PCT applications

Receiving office	Selected authorities that can act as ISA or IPEA under PCT, as of November 2008									
	AT-PO	AU-PO	CIPO	SIPO	EPO	JPO	KIPO	SE-PO	USPTO	Total:
AU (1)		X					X			2
BR	X				X			X	X	4
CA (2)			X							1
CN				X						1
EU (3)					X					1
IN	X	X		X	X			X	X	6
JP					X	X				2
KR (4)	X	X				X	X			4
US (3)		X			X		X		X	4
Total:	3	4	1	2	5	2	3	2	3	
Search fees	200	827	1023	231	1700	726	128	1607	1351	
Examin. fees	200	284* 403**	511	165	1675	270	128	508	450* 563**	
Total fees	400	1101	1534	396	3375	996	256	2115	1801	

International Search Authorities (ISA) and International Preliminary Examination Authorities (IPEA) are chosen by each PCT member state. Fees are expressed in euro, * are the fees charged if the search report was performed by the same office, and ** if the search report was performed by another office. The fees charged by Spain and Finland are very similar to the fees requested by Sweden (SE). The ISA/IPEA offices that are not listed in the table are the Spanish Patent and Trade Mark Office; the National Board of Patents and Registration of Finland; the Federal Service for Intellectual Property, Patents and Trademarks (Russian Federation) and the Nordic Patent Institute. http://www.wipo.int/pct/en/access/isa_ipea_agreements.html

(1) The Agreement that allows Australian applicants to choose KIPO as ISA or IPEA was concluded in September 2008. It is anticipated that this agreement will come into force in early 2009. http://www.ipaustralia.gov.au/resources/news_new.shtml#44

(2) EPO acted as ISA and IPEA for Canada until 2004 when the Canada itself obtained ISA/IPEA status www.cipo.ic.gc.ca/epic/site/cipointernet-internetopic.nsf/en/wr00733e.html

(3) EPO will only act as IPEA where the international search report was issued by the EPO or was done in one of the following EPC offices: Austria, Finland, Spain, Sweden. Similarly the USPTO declared that it is competent as IPEA only if the international search report has been prepared by that office.

(4) Korea designated AU-PO only as ISA, not as an IPEA.

Source: adapted from country-specific information provided in the PCT Guide, World Intellectual Property Organization www.wipo.int/pct/guide/en/index.html

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The European patent system and why it doesn't work

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