Study for the EPO on the Economic Dimensions of the Fee Structure in the European Patent System

Final Report

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EXECUTIVE SUMMARY

Background

1 EPO and national patent fee policies are not co-ordinated across Europe. However, there is a shared preference in Europe for a 'traditional patent fee policy' that is characterised by low procedural fees, designed to make the system widely accessible and to promote innovation, and progressively increasing renewal fees to induce patent holders to give up their patent rights and to subsidise examination costs incurred for unsuccessful applications.

2 In a time of increasing patent applications, many of which will never be granted, and of increasing backlogs at patent offices, the traditional patent fee policy looks questionable. It is questionable, too, whether low entrance fees to the patent system are an appropriate way to foster innovation.

3 Economic theory supports the concept of a socially optimal patent fee structure (composed of both procedural and renewal fees) that would encourage a socially desirable amount of patent applications. An optimal fee structure should encourage patent applications of high innovative value and discourage patent applications that are of less value to the economy, and especially those that have negative effects on the patent system itself. At the same time, an optimal fee structure should limit patent pending periods and reduce the lifetime of granted patents to a socially desirable level.

4 The general objective of this study is to provide an economic analysis of the current fee structure of the European patent system and to analyse feasible alternatives. More specifically, it aims:

(a) to conduct a critical assessment of the existing economic literature in order to assess whether the traditional intended role of fees is challenged by recent developments. This task is carried out in Section 1 of the report.

(b) to describe fee policies of a number of national patent offices (NPOs), and their rationales, in order to identify similarities and differences, and to compare the theoretical framework described in Section 1 with these realities. This task is carried out in Section 2 of the report.

(c) to analyse the relationship between the EPO's procedural fees and European applications, in order to assess how applicants' decisions, at each stage of the procedure, have responded to changes in procedural fee levels. This task is carried out in Section 3 of the report.

(d) to analyse the effect that national renewal fees have on patent life in different EPC countries, in order to determine whether more progressive renewal fee schedules and higher renewal fee levels shorten patent life. This task is carried out in Section 4 of the report.

(e) to provide general welfare conclusions based on the lessons learned from the previous tasks. These are set out in Section 5 of the report.

Previous studies on patent fees

5 The 'traditional patent fee policy' of most patent offices is characterised by low procedural fees to make the system widely accessible and progressively increasing renewal fees to induce patent holders to give up monopoly rights while subsidising examination activities on unsuccessful applications. The rationale for this policy is derived from a well-established literature which is based on the following assumptions:

- Demand for patents should be encouraged (because of a simplistic understanding that more patents are better for the economy).
- Patents should be properly designed (i.e. through the right mix of breadth/length). The exclusive rights they confer increase transparency and certainty in markets (due to the publication and dissemination of technical information from patents).
- Patentees file applications with the genuine intent of obtaining protection for their inventions.
- Patent offices have unlimited resources, are able to make correct and instantaneous grant decisions, and are concerned about social welfare.
- There is a single patent authority and a single representative market where patent protection can be sought.

6 However, there is abundant evidence — brought to light by more recent studies — suggesting that the assumptions of the 'traditional fee policy' are challenged by today's reality. More specifically:

- The scarce resource is no longer patenting activity alone but also patent offices' capacity to process applications.
- There is growing evidence that applicants obtain economic benefits not only from the exclusive rights conferred by granted patents, but also from the patent pending status. As a consequence, patent applications may be filed not only with the originally intended purpose of obtaining formal protection, but also with a view to taking strategic advantage of the system.
- Patent backlogs and the increasing importance attached to strategic use of patent rights help to create uncertainty and make patent rights less predictable.
- Patenting authorities are far from perfect: they have limited processing resources, and they make grant decisions after relatively long periods which can be further prolonged by applicants' filing strategies. Moreover, the self-funding status of

offices may imply that welfare considerations are not taken into account when fee policies are set.

- The reality of the European patent system is extremely complex because of the multitude of institutional players involved, and the possibility of misalignment of incentives associated with it. Therefore, even if national fees are set at socially optimal levels, there is no guarantee (and in fact it seems very unlikely) that these would be optimal for the European area as a whole.

7 Overall, the evidence from the existing literature on patent fees suggests that the 'traditional fee policy' is challenged by the current reality. This literature suggests that a re-evaluation of the role of patent fees for policy purposes and as a sorting device is highly desirable from a welfare perspective.

Patent fee policies in Europe

8 The report analyses the fee policies that have been pursued over the last ten years by six European NPOs, namely:

- the Swiss Federal Institute of Intellectual Property
- the Norwegian Industrial Property Office
- the Netherlands Patent Office
- the Hungarian Patent Office
- the UK Intellectual Property Office
- the Italian Patent and Trademark Office.

9 The information on NPO fee policy was gathered though a survey, followed by telephone interviews of approximately one hour. More specifically, data on procedural and renewal fees charged in the last ten years was gathered, and NPOs were questioned about the rationale behind individual changes in fees in the past. They were also questioned about the general objectives of their national fee policies, and about the main motivations for setting procedural and renewal fees.

10 The majority of NPOs considered adopt, to varying degrees, the 'traditional fee policy' approach: (1) procedural fees generate less income than renewal fees, and (2) renewal fees are progressive (except at the Swiss Federal Institute of Intellectual Property).

11 It seems highly unlikely (if not impossible) that the six NPOs will move away from this traditional fee policy in the near future. All of them indicated that charging high procedural fees would be politically unacceptable. Such a policy would also be constrained by the financial agreement that exists between NPOs and the EPO. NPO revenues are largely driven by renewal fees on patents that have been granted by the EPO; thus there is no

direct link between the NPOs' fee income and their patent processing work. Consequently the pressure associated with increasing backlogs and strategic use of the patent application system is experienced first by the EPO before it passes on to NPOs.

12 Although the same general fee philosophy is shared among all six NPOs, a series of features that are distinctive to each NPO were identified, concerning:

- intended goals of procedural and renewal fees
- relative and absolute levels of procedural and renewal fees.

13 Moreover, these distinctive features appear to be correlated with the financing status of the offices.

14 With regard to the offices' motives when setting renewal and procedural fees (cf. Table 2.18), almost all of the six NPOs recognise the cost recovery role of renewal fees. Interestingly, two of them (those self-financed) indicate that social welfare considerations are not taken into account when setting renewal fees.

15 The NPOs' differences as to the main motivations for setting procedural fees are summarised in Table 2.19. For all NPOs considered, an important motivation for setting procedural fees is the recovery (at least partial) of the processing costs for applications. Some NPOs recognise the potential screening role that procedural fees play in either influencing the number of patent filings or ensuring a minimum quality level for applications. Finally, several offices charge fees, such as excess claims/pages fees, fees for amendments or fees for requesting extensions to time limits, which have the potential of steering applicants' behaviour.

16 The Hungarian Patent Office, in particular, has a sophisticated tariff system, the most interesting feature of which is the progressive structures of the fees for amendments and for requesting extensions to time limits. Fee amounts are lower for the first amendment/request, but progressively increase up to the third amendment/request. The rationale for having progressively increasing fees for amendments and extension requests could be very similar to that for having progressive renewal fees, i.e. the so called 'revelation principle'. With each additional request for extension, applicants reveal that they benefit from prolonging the procedural phase, and consequently they are charged more for doing so. Further investigation is required.

17 Finally, NPOs differ in respect of both the progressiveness of renewal fees and the proportion of income that is generated by procedural fees. Moreover, such differences appear to be driven by the financing status of the offices. First, offices that are self-financed have a 'flatter' renewal fee schedule than those that are fully (or partly) financed by the state (see Section 2 of the report). Second, self-funding patent offices tend to have a larger procedural-to-renewal fees ratio than fully (or partly) funded offices (see Section 2 of the report).

18 The overall conclusions from this review can be summarised in the following two points:

(a) Even if all NPOs adopt a traditional fee policy based on low procedural fees, the relatively sophisticated procedural fees set by some offices indicate that they recognise the important role that procedural fees can play in shaping applicants' behaviour.

(b) The NPOs' financing status influences fee policy. In the given sample of NPOs, renewal fees are more progressive over the years of patent lifetime with state-financed NPOs than with self-funded NPOs.

Empirical evidence on procedural fees

19 Based on a sample of EP applications filed in the 1998-2008 period, an econometric analysis was carried out on the impact of the EPO's procedural fees on applicants' decisions to proceed to the next phase of the application process. More specifically, the analysis considered the impact of filing and search fees, examination fees, fees for grant and printing and fees for further processing. Special attention was given to French applicants, who have a choice of filing directly with the EPO or filing with the French national patent office (INPI) and, in both cases, receiving a search report drawn up by the EPO.

20 All fees examined have a statistically significant and negative impact on applicants' decisions to proceed to the next stage. However, the magnitude of their impact varies greatly, which implies that not all fees would be equally effective if used as a sorting device. In particular:

(a) The impact of search and filing fees is negligible (see Section 3), which suggests that the overwhelming majority of applicants who file with the EPO do so having already anticipated the payment of these fees.

The relatively limited role that filing and search fees could play as a sorting device is also confirmed by the analysis conducted on French patent applications (see Section 3). This analysis indicates that the main rationale for filing a first application directly with the EPO (and incurring a higher search fee than would have been payable if the application had been sent to INPI) is to file in the English language and consequently simplify communications with non-French inventors.

(b) Examination fees, in contrast, have a substantially larger impact on applicants' propensity to proceed to the next stage (see Section 3) and could therefore potentially be a strong sorting device.

(c) Among the other fees considered, fees for further processing have the largest impact on applicants' behaviour. More specifically, they discourage applicants from requesting further processing once. This effect diminishes with each further request. This result provides a rationale for the progressive structure of the fees charged by

the Hungarian Patent Office for requesting extensions to time limits, and suggests that such fees could be considered a 'success story'.

(d) Finally, there are factors other than fees that influence applicants' decisions. In particular, the findings show that the search outcome is a good indicator of the resources that an application is likely to absorb during the examination phase: i.e. applications with more 'X' and 'Y' documents – which are negative signals of application quality – are more likely to require further processing within the examination phase.

21 Furthermore, an analysis of patent renewal fees considered the extent to which higher and progressive renewal fees have an impact on patent life. The findings confirm that renewal fees fulfil their traditional sorting role: both an increase in the absolute level of renewal fees and a more progressive renewal fee structure have a negative impact on patent lifetime.

Conclusions and recommendations

22 The report's findings point to the following welfare conclusions and practical recommendations.

23 National renewal fees seem to fulfil their traditional welfare-enhancing role. The only concern is that renewal fee structures may not be sufficiently progressive in some EPC contracting states.

24 As to procedural fees, there is growing economic evidence that the patent pending period — which was originally intended to provide applicants with temporary protection while they improved their applications — is often strategically exploited by applicants. One consequence is increasing pressure on the resources of major patent offices (including the EPO); another consequence is increasing patent backlogs and market uncertainty.

25 Such evidence points towards the need for a 'new fee policy' in which procedural fees play a much more prominent role by steering and shaping applicants' behaviour. There are several economic rationales that call for welfare-enhancing use of procedural fees.

(a) *Paying for externalities*. — With strategic patent applications, applicants impose negative externalities on society, e.g.:

- they increase patent offices' overloads by absorbing resources that could be used to process applications from inventors who apply with the genuine purpose of obtaining a grant;

- they contribute to patent backlogs, thus creating uncertainty as to whether and when certain IP rights would be granted;

- they fuel and sustain a cycle of contrary incentives; the fact that some firms file patent applications strategically induces other companies to follow their example out of competitive necessity.

(b) *Paying for private benefits.* — Procedural fees could be considered a 'tax' on the negative externalities imposed on society. Just as patent holders pay renewal fees in exchange for the financial benefits they enjoy from IP rights, applicants should be charged for the economic benefits they derive from the patent pending status.

26 These two rationales are based purely on economic welfare considerations. A third rationale (which can be justified on budgetary grounds) is that applicants should pay for the service they receive. Moreover, since costs associated with the delivery of a service (e.g. examination) may vary across applicants, the pricing should also reflect differences in the resources absorbed. If applicants that use the system strategically require more of the EPO's time and resources, they should pay accordingly.

27 Among all European patenting authorities, the EPO is the institutional player for which the welfare effect of a reform of procedural fee policy would be most tangible. First, NPOs' reluctance to move away from the traditional system and the need for co-ordination imply that the transition towards new policies would be long and difficult. Second, and more importantly, the majority of applicants seeking patent protection in Europe follow the centralised EPO grant procedure. Therefore a reform of the EPO's procedural fees would have an impact on the largest group of applicants.

28 The empirical findings suggest that, among all the procedural fees considered, the most promising candidates for reform are the fees for further processing, followed by examination fees. In contrast, the potential role of filing and search fees as a sorting device, and as a means of managing the flow of applications, appears to be limited. The reasons behind these conclusions are explained in the following:

Filing fees

29 Applicants' sensitivity to filing and search fees is very limited. The overwhelming majority of applicants who file with the EPO are willing to pay a relatively high price for a service which is not perceived to be closely substitutable by the national grant procedures.

30 Therefore, in order for these fees to have a tangible sorting effect, they would have to be substantially increased. However, such a change is not recommended because it would impose an entry cost which would be prohibitively high for some applicants, while the benefits are likely to be uncertain. There is no guarantee that the reduction in the number of filings that would result from higher filing and search fees would translate into a significant reduction in patent backlogs. The evidence suggests that backlogs are to a large extent caused by applicants' strategic filing behaviour within the examination phase. An increase in the entry cost would not address this issue.

31 Moreover, several economists argue that the recent surge in patent filings is largely attributable to new players entering the patent systems (emerging economies,

universities, SMEs, etc.) and to the emergence of new technologies. Therefore fee changes aiming primarily at reducing the number of filings would be questionable from an economic welfare perspective.

Examination fees

32 Examination fees, in contrast, have a substantially larger impact on applicants' propensity to proceed to the examination stage and would therefore be a much more effective method of managing the EPO's workload.

33 Moreover, the findings show that search outcomes provide an indication of the resources that an application is likely to absorb during the examination phase (i.e. applications with more 'X' and 'Y' documents are more likely to require further processing within the examination phase). This argues in favour of introducing a two-tier examination fee structure, whereby applications with more than a certain amount of 'X' and 'Y' documents are charged a higher fee.

34 Even if such a proposal is conceptually sound and backed up by empirical evidence, it is not without risks. Such a fee schedule would be an example of a fee payment that depends on the Office's outcome, rather than on the applicant's decision (such as excess claims fees). Consequently there would be a risk that applicants would perceive such a fee as non-transparent: examiners might have an incentive to increase the number of 'X' and 'Y' documents in order to extract higher payments.

35 Therefore an increase in the general examination fee may be the most appropriate solution.

Fees for further processing

36 Overall, the analysis indicates that fees for further processing are most in need of reform, for two reasons. First, the evidence suggests that applicants are highly responsive to this type of fee. Second, the examination phase is particularly expensive in terms of the Office's resources. Shortening the examination phase is clearly justifiable from an economic welfare perspective. In particular:

- If the request for further processing is a genuine request, i.e. not driven by the wish to delay the examination process, the fee payments can be justified on the ground that such requests contribute to backlogs, and thus impose an externality on the system as a whole.

- If the request is made with the intention of delaying the examination process, the fee would act as a means of discouraging such strategic behaviour.

37 Finally, with regard to the redesign of fees for further processing, the recommendations are as follows:

(a) *Higher fee level*: Charging a higher fee level for the *first* request for further processing is the most effective sorting solution: applicants are more responsive to these fees if they have not yet made the first request for further processing.

(b) *Progressive structure*: The EPO might wish to consider whether a progressive further-processing fee structure would be desirable, given that applicants' sensitivity to these fees decreases with the number of further-processing requests already made. In other words, with each additional request for extension, applicants reveal that they benefit from prolonging the procedural phase, and consequently they should be charged more for doing so. An example of a progressive structure of this kind is the fee charged by the Hungarian Patent Office for requesting extensions to time limits.

Further research

38 Some recent academic papers have addressed the impact of aggregate procedural fees (from filing to grant) on patent filings. However, there is apparently no study which adopts a step-by-step analysis of the effect of individual procedural fees on applicants' decisions to proceed within the application process. Therefore one of the main merits of the current report is the novelty of the research question that it has addressed.

39 Nevertheless, the insights that the report is able to provide into economic aspects of fee policy in the European patent system are, of course, incomplete. More specifically, the following areas appear to be potentially relevant and in need of further research.

(a) *The impact of other procedural fees.* — There are other procedural fees that might be investigated. For instance, internal renewal fees may have an impact on applicants' propensity to stay within the application process for a prolonged period.

(b) *The linkages between procedural and renewal fees.* — Clearly there is a dynamic relationship between procedural fees and renewal fees, and a better understanding of this linkage would provide additional insights into the economic dimension of patent fee policies. In the context of this study, it would have been useful to investigate the relationship between EPO-internal renewal fees and national renewal fees. What is the conjoint impact of these fees on patent life (if the birth of a patent is defined as the moment of filling)?

(c) *The multi-jurisdiction nature of the European patent system.* — The development of a theoretical framework that investigates the functioning of this type of system should be a key priority on the agenda of patent economists. The establishment of a framework in which for example it is assumed for simplicity that national fees are set by a centralised 'benevolent dictator' seems to be the prerequisite for obtaining a more comprehensive view of what the optimal European fee policy should look like.

(d) *The limitations of fee policies.* — The current report is concerned mainly with patent fee policy. Consequently it investigates how welfare could be enhanced through the setting of appropriate fees, while assuming that the legal and institutional frameworks are external givens. The focus on fees is justifiable on the ground that fee policies

have the advantage of being immediately effective and relatively easy to implement. However, policy-makers have at their disposal a variety of tools, of which patent fees are only one example. It should therefore be acknowledged that some of the welfare concerns discussed in this report could also be addressed through changes in the legal and/or institutional framework. To this end, impact assessment studies that highlight the costs and benefits of alternative policy interventions might also be desirable.

1 LITERATURE REVIEW

Introduction

Objectives

1.1 This Section provides a comprehensive and critical review of the economic literature on patent fees with an emphasis on social welfare. The principle aim of this review is to identify the extent to which this literature is relevant to the EPO's fee policy.

1.2 An optimal fee policy requires an understanding of what constitutes an optimal patent system. It is therefore necessary to consider other strands of the literature that — even though they do not deal with fee policies directly — provide insights into the functioning of the patent system as a whole. Consequently, besides the literature on patent fees, we have reviewed also the theoretical issues and the empirical findings that relate to the following topics: the determinants of patent demand; patenting behaviour; and socially optimum patent lives and breadth.

1.3 The findings of this literature review will also feed into the work conducted in Sections 2, 3, 4, and 5.

Structure of the Literature Review

1.4 Section 2 is organised in four sub-sections:

(a) *Patent demand* deals with :

- Number of patent filings; and
- Voluminosity of patent applications (i.e. number of pages and/or claims).
- Summary and conclusions

(b) *Patenting behaviour* deals with studies that analyse the main typologies, motives, and determinants of *:*

- Strategic use of granted patents; and
- Strategic use of the patent applications.
- Summary and conclusions

(c) *Socially optimal patents considers* :

- Socially optimal patent lives; and
- Socially optimal patent breath.

- Summary and conclusions

(d) *The role of fees in the patent system considers*:

- Optimal renewal fees; and
- Optimal procedural fees.
- Summary and conclusions

(e) Section 3 presents our conclusions on how and in what ways these findings relate to the EPO.

(f) Section 4 provides the bibliography.

Patent demand

1.5 Patents are only one of several possible ways by which inventors can appropriate the benefits of their inventions. Alternative methods of appropriation include for example, trade secrecy, first mover advantage, product distribution techniques, complementary assets, prizes and contracts (see e.g. Gallini and Scotchmer (2001)). Even though we acknowledge that, by looking and analysing these options, a better understanding of patent demand and applicants' behaviour can be made, we believe that this goes beyond the scope of this study.[1]

1.6 We therefore analyse patent demand 'in isolation', i.e., with the two following pre-assumptions:

(a) An applicant's decision to file a patent application is rational, i.e., it results from the correct calculation of the trade-off between the prospect of patent protection and all other alternative forms of appropriation available at the moment of filing.

(b) Patent protection represents the socially optimal form of research incentive for the specific subject matter for which patent protection is sought.

[1] In fact, doing so would require drawing from the vast literature that analysis the effectiveness of different forms of research incentives with the consequential risk of loosing our focus which is primarily on patent fee policy. Nevertheless, we refer the interested reader to: Wright (1983), for a comparison between patents, prizes, and public contract procurements; Shavell and Ypersele (2001), for a comparison between IPRs and direct reward systems; Arundell (2001), for a comparison between patents and trade secrets; Teece (1986), for a discussion of the importance of having manufacturing assets next to innovative activity; and Grandstrand (2003) for a general discussion on the challenges that the transition from the old to the new economy imposes on the IP system.

1.7 With this understanding, patent demand has two different dimensions:

(a) The *number* of patent filings.

(b) The *voluminosity* of patent applications.

Number of patent filings

1.8 The number of patent filings at the EPO has doubled over the last 10 years. This trend has been attributed to a combination of factors: the low level of fees, globalisation/ transfer of technologies, new generic technologies, the emergence of dynamic countries such as China, and the arrival of new actors such as Universities and small firms (Van Zeerbroeck et al. (2007a); and Van Zeerbroeck et al. (2007b)).

1.9 With regards to the EPO, Van Zeerbroeck et al. (2007a) attempted to account for differences in the rate at which applicants transfer their applications from their national patent office to the EPO directly, or via the PCT route. They found that GDP per capita and the length of membership in the EPC positively affects the transfer rate of domestic filings to the EPO. Their analysis did not however, assess the role of fees set by the EPO.

Patent voluminosity

1.10 In addition to the significant growth in patent filings experienced by many patent offices, there has also has been a surge in the voluminosity of patent applications i.e. the number of claims and/or the number of pages in each filing Van Zeebroeck et al. (2007b)); De Rassenfosse and Van Pottelsberghe (2008); Archontopoulos et al. (2007). Based on two million EPO applications, Archontopoulos et al. (2007) found that the average size of patent applications (based on the number of claims and the pages) has doubled over the last two decades.

1.11 Van Zeebroeck and Van Pottesberghe (2008) found that the following four factors have played some role in explaining the voluminosity of patent applications:

(a) *Differences in national drafting practices* – countries with Common law tended to induce larger applications than those with a Civil Law system.

(b) *The complexity of research activities* – the complexity of an application and the research leading to it, was also found to induce larger documents. For example, inventions led by large teams which heavily rely on state of the art research appear to require more description and claims to be disclosed and protected.

(c) *The emergence of new sectors* – emerging sectors (e.g. biotech, computer science etc.) with less established vocabulary and practices lead to larger patent applications than more traditional areas (e.g. industrial chemicals, civil engineering etc.).

(d) *Patenting strategies* – the rising trend in patent applications that are subsequently split into several divisional filings.

1.12 In addition to the above, Archontopoulos et al. (2007) also found evidence that increases in claim-based fees may have had a negative effect on the number of claims in a given application (the role of fees will be discussed further in depth in paragraphs 1.83-1.100).

1.13 The most prevalent interpretation of the growing number of claims is that it reflects a broader scope of patent protection (although there is no definitive interpretation of the relationship between the number of claims and the breadth of protection). If true, this may be negative for social welfare. Archontopoulos et al. (2007), for example, suggest that broader protection, as reflected by more claims per application, reduces social welfare because it limits the number of substitutes in the market.[2] It may also increase the level of uncertainty for competitors during the examination period and beyond. These conclusions are however speculative and, in fact, the empirical evidence seems to suggest the opposite. In general, the empirical literature concerning the effects of excessive claims has attempted to establish a link between the following variables:

(a) *Number of claims and patent value* — how is the number of claims correlated with the commercial value of granted patents?

(b) *Number of claims and application quality* — how is the number of claims correlated with the quality of a patent application, i.e. the application's inventiveness and its consequent likelihood of resulting in a grant?

1.14 Concerning the first question, Van Zeebroeck and Van Pottesberghe (2008) found that the number of claims is strongly related to patent value. Patents with excessive claims tend to be associated with more citations, tend to be validated in more jurisdictions within and beyond the EPC, and tend to live longer (which implies longer payments of renewal fees). This result was obtained by testing the impact of claims on five different indicators of patent value including;

(a) the number of forward citations received within five years of the publication date;

(b) the number of EPC contracting states in which the patent is validated after being granted by the EPO;

(c) whether the patent was still in force in France, Germany and the UK ten years after filing;

(d) whether the patent is a member of the triadic family; and

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[2] For further argumentation concerning the wlefare impcat of patent breath we refer to a later section.

(e) Whether the grant has been opposed at the EPO.

1.15 With regards to the second question, Schneider (2007) found the link between claims and applications' quality to be non-significant. The author presents two models where the quality of a patent application is measured, respectively, by grant/refusal and pursue/withdraw decisions. Schneider (2007) decomposed claims into two groups, one which included up to ten claims and the other of claims above ten (as it is assumed that applicants are sensitive to the fact that a fee is charged for claims above ten). The author conclude that claims have no significant impact on the granting rate or the applicants' decision to withdraw an application.

1.16 Calderini and Scellato (2004) attempt to establish a link between patent specific characteristics, such as the number of claims or the number of patent families, and the probability of opposition. They conclude that these patent characteristics are not significant in explaining the opposition of newly granted patents. Care should be taken however, when interpreting this result in terms linkages between claims and application quality. On the one hand, opposition can result from poor (and wrongly granted) applications that lack novelty. On the other hand (as the authors also note) opposition is more likely to emerge to patents of high perceived commercial value and might therefore be completely unrelated to the intrinsic quality of the application.

Summary and conclusion

1.17 A high patent demand is traditionally associated with positive welfare consequences. Since patent filings reflect innovative activity, a large demand for patents has been traditionally welcomed by economists and policymakers. They note, for example, that the recent surge in patent filings is largely attributable to new players entering the patent systems (emerging economies, universities, SMEs, etc.) or to the emergence of new technologies. Empirical evidence also suggests that larger patent applications are not necessarily something to worry about; on the contrary, they are likely to reflect the higher complexity of inventions and tend to be associated with patents of higher commercial value.

1.18 The paradigm 'the more applications the better' is the main rationale behind the traditional fee structure adopted by patent offices around the world: procedural fees are set very low in order to make the system widely accessible, and unsuccessful applications are subsidised by the renewal fees on successful applications. The validity of such a system relies upon the implicit assumption that patent offices have endless resources. However, the surge in patent filings experienced in the last decades suggests that the scarce resource is no longer patenting activity, but patent offices' capacity to process patent applications. As in any overloaded system (e.g. transport, communications), this gives rise to congestion costs. Each additional application delays all the other applications in the system. Delays reduce the expected net present value of the incomes that will eventually flow from the patents that are granted and also create uncertainly.

1.19 To the best of our knowledge, there is no published study which quantifies the social costs of excessive workload experienced by patent offices.[3] However, evidence that some offices operate under extremely stressful conditions, and the potentially detrimental consequences associated with it, are well documented. For instance, King (2003) shows that, while the quality of patent examination at the USPTO has not declined over the past two decades (e.g. because the examiners appear to devote the same amount of time per application), the patent pendency period has become longer. This result is consistent with the significant increase in backlogs observed in other patent offices, and suggests that the recent rise in patent filings gives rise to an awkward trade-off within the patent system. If it is not acceptable to lower standards of examination then examinations will take longer. This must have adverse welfare consequences because backlogs increase uncertainty.

1.20 Another aspect of the current patent system which poses a challenge to the traditional appetite for patent demand is represented by the presence of second filings. First, if used as proxy for innovation, the aggregate number of patent filings overestimates the innovative activity because it does not take into account the possibility of few inventors applying in several jurisdictions. Moreover, second patent fillings impose an externality on the patent system as they imply a duplication of effort across patent offices. These externalities are typically ignored by the literature.

1.21

1.22 Recent studies suggest that fees might be a useful instrument in alleviating patent offices' workload. Some studies show the existence of a negative elasticity of patent demand. This means that, in principle, patent filings could be reduced by an appropriate increase in procedural fees[4]. Similarly, fees that depend on the number of claims/pages might be introduced (and in fact are already used in some patent offices) in order to steer applicants' drafting style (see e.g. Archontopoulos et al (2006)). There seems, therefore, to be a justifiable rationale in for using procedural fees as means of dealing with an excessive workload. However, it is important to stress that a policy which is based solely on raising procedural fees has a number of limitations.

1.23 First, patent offices do not typically charge a unique procedural fee, but a set of fees (e.g. filing fee, search fee, examination fee, etc.), each one applying to a specific stage of the application process. Therefore, when designing a procedural fee policy, the effect of changes in the fee structure (i.e. non-uniform changes in the fees that apply at different stages of the application process) should also be considered. To the best of our

[3] We are aware of one such study that is in progress and are in touch with the authors.
[4] This strand of the literature is discussed in detailed later on.

knowledge there are no studies that analyse to what extent stage-specific fees influence applicants' decisions to proceed further in the application process (this would be our task in WP3).

1.24 Second, a fee policy which aims at increasing the cost of accessing the patent system, if successful, would reduce the number and size of patent applications but not necessarily the behaviour of those applicants who have entered the application process. This is potentially problematic because a significant share of patent offices' workload is associated with activities carried out during the patent examination process (e.g. communications with applicants, processing of divisional filings, etc.) and that are to a large extent driven by applicants' behaviour. A fuller discussion of applicant behaviour is provided in the next section.

Patenting behaviour

1.25 The underlying principle underlying modern patent systems is to provide patent holders a time-limited exclusive right over an invention in order to encourage innovative activities (see Arrow (1962)). More specifically, the monopoly right conferred to patent holders offers them the opportunity to earn greater profits than they would be able to earn if imitation were permitted, thus providing incentives to undertake research and development. This temporary monopoly right does however result in social costs that arise from the lower output and the higher prices as compared with those sustainable in competitive market (although it is not clear how valid this comparison is, since in the absence of patents, fewer innovative products and processes would be developed in this "competitive market"). As stated in the pioneering work of Nordhaus (1967; 1969), patent systems attempt to ensure that the social benefits generated by the induced incentive to innovate (dynamic efficiency) outweigh the social costs of associated with a monopolistic market (static inefficiency).

1.26 An alternative argument for patents is that they represent a contract between society and the inventor by which the inventor discloses his invention in exchange of an exclusive right of exploiting commercially. Some authors (see e.g. Guellec and Van Pottelsberghe 2007)) argue that, even if this interpretation of patent rights is widely accepted from a legal viewpoint, it is somehow deficient from an economic standpoint. In particular, by emphasising the role that patents play in incentivising the disclosure of knowledge, no attention is paid to the reasons why inventions are made in the first place. We would therefore like to stress that the traditional and primary economic rationale for patent remains that of providing firms with incentive to undertake R&D activities.

1.27 It has become well documented in the literature that the role of patents underwent a fundamental change during the mid-1990s and that this change has been largely attributed to the growing incidence of 'strategic patenting' practices. These can be broadly divided into two categories:

(a) Practices that reflect a strategic use of the IP rights conferred by granted patents.

(b) Practices that make a strategically rational use of the patent application system (which we refer to as 'gaming the system').

Alternative use of patent rights

1.28 Several authors (e.g. Blind et al. (2009); Choen et al. (2000); Thumm, (2004)) argue that the secondary use of patents as a strategic tool has increased in importance over the last decade. In some industries this secondary use of patents as a rationale to seeking patents has become more important than the original role of patents in appropriating direct returns from R&D investments. Thumm (2004) for example, identifies four key strategic patenting strategies based on the empirical findings of a survey of the Swiss biotechnology industry carried out in 2003:

(a) *Protection from competition* – this strategy is in line with the traditional rationale for patents, i.e. to prohibit others from commercialising the patented technology.

(b) *Complementary protection* – refers to patenting around the core technology that in itself has no direct commercial purpose. This phenomenon is also known as "patent thickets" (e.g. Shapiro (2001)) and refers to the practice of obtaining several patents with very similar scope. This practice is particularly common in the biotechnology sector and there is a belief that it is carried out with the primary goal of increasing rivals' costs by limiting the entrants' ability to acquire industry know-how.

(c) *Safeguarding future technologies* – this refers to the practice of protecting associated areas of the technology as means of protecting future technologies; and

(d) *Basis for alliances* – patents may also be used as way of improving the negotiating position against competitors, for example in cross-licensing cooperation (which is also referred to as the 'exchange motive'). In fact, Noel and Schankerman (2006) found that a large patent portfolio tends to enhance the bargaining power of a company.

Further, cross-licensing agreements may used to monitor cartels. For instance, infringements involving a cartel member cross-licensing to an external firm would be easily spotted by other cartel members, enhancing the deterrence effect of retaliations (see e.g. Shapiro (2001)).

Other forms of commercial alliances involving patents include the so called 'patent pools', i.e. "… a single entity that licenses … the patents of two or more companies to third parties as a package", (Shapiro (2001)). Patent pools represent an effective way to commercialise products whose technology is necessarily based on multiple as opposed on a single patent.

(e) *Deliberate willingness to be infringed* – there is growing evidence that some firms ambush R&D-intensive manufacturers in patent infringement traps. These firms, referred to as patent 'trolls' or patent 'sharks' and are defined as "[…] *individuals or firms that seek to generate profits mainly or exclusively from licensing or selling their (often simplistic) patented technology to a manufacturing firm that, at the point in time*

when fees are claimed, already infringes on the shark's patent and is therefore under particular pressure to reach an agreement with the shark", (Reitzig et al. (2006)). Reitzig at al. (2006) developed a game–theoretic model where being infringed (i.e. being a 'shark') emerges as being the optimal strategy given the legal rules governing damage award calculations. The message of the author's paper is that the legal framework may play key role in allowing patent sharks to operate profitably.

1.29 Additional strategic motives cited in the literature include using patents as performance indicators for R&D departments and employees (Blind et al. (2009)), using patents to assist in the acquisition of venture capital (Thumm, (2004))[5], and using patents to operate or avoid potential litigation (Guellec and van Pottelsberghe (2007)). Further, in certain industries, patents might be sought because they enhance the market value of a firm. Noel and Schankerman (2006) for example, found that for firms in the computer software industry, there is a large 'patent premium' in stock market returns that accounts for approximately 20 per cent of the private returns of R&D.

1.30 Concerning the relative importance of the strategic motives described above, in a survey of R&D laboratories in the US manufacturing sector in 1994, Choen et al. (2000) found that in addition to the traditional reasons, the most prominent motives for patenting included the prevention of rivals from patenting a related invention (i.e. the offensive blocking motive), the use of patents in negotiations and the prevention of suits. He also found that in 'complex' product industries (e.g. telecommunications equipment, semiconductors etc.), firms are more likely to seek patents as a blocking device whereas firms in 'discrete' product industries (e.g. chemicals) are more likely to use patents to force rivals into negotiations.

1.31 Blind et al. (2009) present evidence, based on survey data from 400 German companies combined with patent information from the EPO, that the patenting strategies of firms can to some extent account for the characteristics of patent portfolios (i.e. the number of citations and the number of patents that receive an opposition). They also found evidence that strategic motives (such as blocking competitors and using patents for negotiations with other firms) tend to result in patents of lower value (measured in terms of the number of citations received), compared with patents that are sought for their traditional function of protecting innovation from imitation (i.e. appropriating direct returns from R&D). Further, having differentiated between defensive and offensive blocking strategies, they argue that defensive blocking strategies are likely to lead to lower value patents than those patents that result from offensive blocking strategies. The literature suggests that strategic

[5] For a counterargument see Jell at al. (2009), where it is shown that higher level of innovativeness are not necessarily associated withy a higher probability of acquiring venture capital.

patenting may distort the nature of R&D incentives, may lead to socially wasteful outcomes, or may block market entry (e.g. Blind et al. (2009) and Thumm (2004)). However, empirical studies on the magnitude of these affects appear to be scant at best.

'Gaming' of the patent application system

1.32 Attention has also been devoted recently to the use of the patent application system itself (i.e. the use of the patent applications rather than granted patents). In particular, there appears to be a growing body of literature, spurred on in the context of growing grant delays and patent backlogs that attempts to explain the determinants of and rationale for extending the patent pending period.

1.33 For the U.S. patent system, the determinants of the overall length of patent pendency have been analysed in Popp et al. (2004). The authors found that, while many inventor-specific characterises (such as the nature of the applicant — e.g. university versus, companies, individual inventors etc.— , the geographical origin, the drafting style — e.g. number of claims and citations —) are statistically significant in determining patent pending periods, differences across technological sectors are by far the most important determinants. In particular, drugs and biotechnology patents are those with the longest patent pending periods.

1.34 Another strand of the literature, which focuses largely on the European Patent System, can be ideally categorised into two groups according to whether the focus is on examination delays or on patent withdrawals.

Examination delays

1.35 The pendency period of an application - the total period of uncertainty with regards to the status of an application - can be decomposed into two components: the lag between the filing date and the day in which the examination procedure officially starts (the literature refers to this as 'request lag' or 'examination lag'); and the time window between the start of the examination and the final grant/refusal decision ('examination duration' or 'grant/refusal lag').

1.36 The "request" lag is a function of applicant specific variables. A number of authors that have carried out studies on pendency periods have suggested that given the opportunity, a large proportion of applicants will delay the request for examination for the longest period possible, subject to the regulated maxima (e.g. Jensen et al. (2008a; 2008b); Van Zeebroeck (2009); Yamauchi and Nagaoka (2009); and Henkel and Jell (2009)).

1.37 The literature also suggests that the examination process itself is influenced by the way in which applicants interact with the patent office and manage their patent filings. The key findings in this area are summarised as follows:

(a) *amended applications* – i.e. applicants re-file amended applications in response to initial rejections of various claims (Popp et al. (2004);

(b) *increasing the breadth of the patent* – i.e. including a large number of claims in the application (Van Zeebroeck (2008)). Van Zeebroeck (2009) found that on average, the largest filings submitted to the EPO (i.e. those with over 30 claims) take approximately two additional years to process. Further, Lazaridis and Van Pottelsberghe (2007) found that on average, two additional claims lead to an additional communication between the examiner and the applicant, and that one additional communication induced one year of delay in the application outcome;

(c) *divisional filings* – Van Zeebroeck (2008) found that these are most closely associated with the longest patent length. He also notes that while not all divisional filings are aimed at delaying the decision of a given patent, this would be the most efficient way of delaying a decision should an applicant wish to; and

(d) *PCT filings* – these allow applicants a longer period to delay decisions about the number of designated countries (i.e. for up to 30 months after the date of the priority filing) – and thus provide a greater option value – than if they applied via the EPO for a non-PCT filing.

1.38 The literature also highlights a number of reasons, the majority of which are strategic, that may motivate applicants to delay their pendency period. The major rationales for extending the pendency periods identified by the literature can be grouped in the following categories:

(a) *Financial motive*. The costs incurred during the granting process are likely to be small when compared with the fees a patent holder would be expected to pay post-grant in the form or renewal fees. An extension of the pendency period postpones of the larger component of the financial costs associated with a keeping a patent alive (e.g. Jensen et al. (2008b)).

(b) *Information gains motive*. Delaying examination may provide the applicants with additional time to improve, amend, and estimate the quality of their applications, while still enjoying the protection rights associated with pendency periods. For instance, Yamauchi and Nakoagra (2009) suggest that the merit for firms in delaying a request for examination is that they can acquire additional information reduces any uncertainty they face. This theory is supported by the empirical findings documented by Jensen et al. (2008a) who found evidence that granted applications in the EPO and JPO tend to have shorter request times compared with those that are not granted. They argue that this suggests that those applicants who are more uncertain over the probability of success of their application are those that will tend to make full use of pendency period (see also Henkel and Jell (2009)). This idea is consistent with the finding of Van Zeebroeck (2009), i.e., longer pendency periods are typically associated with lower grant rates.

(c) *Purely strategic motives*. Additionally, patent pendency may also be used to extract rents via licensing agreements arranged before the outcome of the examination process (Henkel and Jell, (2009)). According to Van Zeebroeck (2008) patent

pendency provides the potential for firms to "enjoy an abusively large scope of protection for the longest possible time", and the threat of enforcement that the patent pending theoretically poses may be sufficiently credible that it confers the applicant a significant degree of bargaining power. Moreover, patent pendency periods may be used as market signals to distort the investment decision of competitors (see e.g. Jensen et al. (2008b)).

(d) *Freedom to operate.* Henke and Jell, (2009; 2008) argue that firms may file an application without the intention of obtaining a grant, but with the sole purpose of having the application published in order to create prior art. This practice is referred to as *defensive publishing*: it allows firms to secure the freedom to operate as the establishment of prior art precludes, at least in principle, subsequent patent grants with the same subject matter.

1.39 While the literature cites many private benefits that may be conferred to applicants by virtue of the patent pendency period, the social costs of patent pendency have also been well documented. From a welfare perspective, since business uncertainty (in this case, regarding the scope of intellectual property rights) tends to lead to reductions in social welfare, Jensen et al. (2008b) argue that there is nothing to be gained by permitting a pendency period that is longer than necessary. The literature does not however, provide much guidance over what can be regarded as a 'necessary' pendency period (which would arguably be more relevant for the request lag component of the patent pendency period).

1.40 Further, to the extent that the pending applications are enforceable on the market, Zeebroeck (2008) notes that they are able to preclude competition in the market and therefore represent a cost to consumers in advance of any definite granting decision.

1.41 Finally, Guellec and Van Pottelsberghe (2007) argue that, in its most extreme form, the strategic use of the patent applications can result in an explicit abuse of the system. The authors have also suggested a series of filing practices and behaviours that are likely to be common in applications that abuse of the EPO patent application procedure[6]. Examples of these include the following:

(a) deliberately deficient styles of drafting;

(b) unclear and long descriptions;

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[6] These practices refer specifically to patenting routes in which the US is the priority state followed by PCT.

(c) many independent and long claims; and

(d) successive divisionals, each with slow prosecution.

Patent withdrawals

1.42 In some cases the social costs due to patent pendency are less pronounced because a number of applicants can be expected to withdraw their applications before a grant decision has been made. For example, Lazaridis and Van Pottelsberghe (2007) studied data on EPO applications between 1985 and 1994 and found that approximately 30-35 per cent of applications made to the EPO are withdrawn. The factors cited in the literature as the determinants for application withdrawals include the following:

(a) the characteristics of the applicant – e.g. its organisational resources and competences (e.g. see paragraph (e)) ;

(b) the features of the application itself – e.g. the number of claims and the number of forward and backward citations (e.g. see paragraph (e));

(c) filing strategies – e.g. the filing route (either direct or via the PTC route), and divisional filings (e.g. see paragraph 1.46); and

(d) the stringency of patent examiners – i.e. via the search reports produced and/or the communications that take place during the examination period (e.g. see paragraph 1.46).

(e) defensive publishing – Henke and Jell, (2008;2009) argue that firms may file a patent without the intention of obtaining a grant, but with the sole purpose of having the application published in order to create prior art. In this way, the authors argue, firms can secure the freedom to operate as the establishment of prior art precludes, at least in principle, subsequent patent grants.

1.43 Sterlacchini and Schettino (2008), analysed the propensity to withdraw patent applications made to the EPO based on a on a regional sample of 341 Italian applicants between 1991 and 2001. They distinguish between early withdrawals (i.e. before request for examination – within 2 years of filing) and late withdrawals (i.e. during the examination period – within 5 years of filing), and found that applicants with a low levels of organisational resources and competences are more likely to withdraw their application earlier and that the chance of a withdrawal increase the greater the number of backward citations added by the examiner to the original application.

1.44 In contrast, they found that the probability of late withdrawals decreases with the size of the patent family. The latter is assumed to be a proxy for the sunk costs borne by the applicants in extending the geographical coverage of their intellectual property rights and thus they interpret their finding as suggesting that the more unrecoverable resources applicants spend on increasing the extent of their protection, the less likely they are to

make a late withdrawal. They authors recognise however that EPO examiners may play an important role in determining late withdrawals.

1.45 In fact, Lazaridis and Van Pottelsberghe (2007) and Schneider (2007) found that EPO examiners play an important role in inducing patent withdrawals. Lazaridis and Van Pottelsberghe (2007), provide quantitative evidence which suggests that up to 54 per cent of all withdrawals could be considered as 'induced withdrawals' – which are due to the work of the EPO examiners (i.e. those withdrawn just after the search report, or after the communications that occur during the examination process).

1.46 More specifically, they found that 'search-induced withdrawals' and 'communications-induced withdrawals' accounted for 20 and 30 per cent of all withdrawals respectively. They did find however, that this share tends to differ according to: the filing route; the technology area; and the country of residence of the applicant. EPO first filings for example, were found to account for approximately 35 per cent of total induced withdrawals, while EPO second filings were found to account for 20 per cent of total induced withdrawals. With respect to the technological class, they found significant differences between the dropout rates for different sets of joint cluster technologies (JC), with some JC accounting for 25 per cent of induced withdrawals after the search, and other JC accounting for up to 40 per cent of induced withdrawals after the first and the second examination communication.

1.47 As to the applicants' country of residence, Switzerland, Belgium, and Italy were found to have a high rate of induced withdrawals (i.e. about 40 per cent) after the search report. Japan, the Netherlands, the USA and the Nordic countries on the other hand, were found to have a relatively high rate of induced withdrawals (again, about 40 per cent) after either the first of the second communication during the examination process. Further, the authors argue (in the same way as does Schneider (2007)) that 'induced withdrawals' can be viewed as a proxy for expected refusals and therefore reflects, to some extent, the 'toughness' of the patent examiners.

1.48 Harhoff and Wagner (2006), on the other hand, focused on the features of the application and found that the extent of forward citations (which a number of studies have found to be positively correlated with the monetary value of a patent) is positively associated with late withdrawals and that backwards citations by EPO examiners (which is taken as an indicator that the invention does not meet the necessary novelty requirements) are positively related to early withdrawals.

Summary and conclusion

1.49 A striking conclusion of this review is that the roles of both patent rights and the patent system itself have become more complex.

1.50 On the one hand, patent rights were traditionally designed to confer to inventors the exclusive right of commercial exploitation of their inventions. However, evidence shows that patents do not always lead to the commercialisation of new products, but are often sought with the mere purpose of influencing competitors' behaviour (e.g. blocking patents)

and increasing the IP holder's bargaining power (e.g. in litigations and dispute resolutions).

1.51 On the other hand, the patent pending period — which was originally intended to provide applicants with temporary protection while they improved their applications — is often used in a way that allows firms to extract significant financial benefits.

1.52 There are two questions that we would attempt to address here:

(a) To what extent are these alternative uses a concern from a welfare perspective?

(b) What role could fee policies play?

1.53 With respect to the strategic use of patent rights, we believe that, even if welfare concerns are material, the potential role of fee policies is more limited than one might at first be inclined to think. The fact that a patent is not 'materialised' into a commercialised product does not imply that the patent is of any lesser value. The fact that IP rights are extensively used in licensing agreements, forming basis for alliances, dispute resolutions, and other key business decisions, arises from the complexity of today's markets. Therefore, the fact that patents are used as intangible exchange goods in the 'market of IP rights' is not a problem per se. Welfare concerns arise only if there exist structural market inefficiencies that lead to patents being used to limit innovation instead of fostering it. Examples are firms' use of blocking patents to enjoy abusive dominant positions, or badly designed legal frameworks which allow patent sharks to operate profitably. These issues can be addressed by the correct balance between IP policies, competition policies and legal frameworks (a discussion of these issues would be too broad and beyond the scope of this study).[7] If these market inefficiencies are addressed by designing appropriate legal and regulatory frameworks, then a use of patent rights different from the traditional one should not pose any further challenge to the economic dimension of fee policies. For instance, economists argue that an optimal renewal fee scheme acts as a sorting device where only those patent holders with the most valuable patents have the incentive to extend the life of their patent[8]. This would be true whether a firm's assessment of the value of a patent is based on the estimated revenues from selling an innovative product, or from the comparative advantage the patent might give in a litigation process. Moreover, if, indeed, such market inefficiencies do exist, it could be argued that it would be more appropriate to address them via competition policy or changes in legal frameworks than by changes in the fee structure.

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[7] Both IP policy and competition policy share the same ultimate goal (i.e. enhancing social welfare), but there is clear tension between the two. While the former is concerned with the provision of monopoly rights, the latter attempts to limit market power.

[8] Renewal fees are discussed in details in later on.

1.54 The conclusions we draw are however drastically different once we turn to the consequence of practices aimed at 'gaming' the patent application system.

1.55 A patent office is an examination authority whose purpose is to screen 'good' inventions (i.e. those that display novelty and inventiveness) from 'bad' inventions. In a perfect world, no granted patents should be later found invalid in a court of law, and grant decisions should be made in a reasonably short time. This implies that, ideally, a perfect patent application system provides applicants with *no economic benefit other than certainty*, i.e. it should provide highly predictable property rights in the shortest possible time. However, nowadays patent application systems seem to be failing in exactly these two aspects. First, evidence shows that, in fact, applicants enjoy significant financial benefits simply by remaining in the system. Second, this strategically rational use of the system undermines the certainty principle of the system as whole.

1.56 Therefore, there are several economic rationales that call for the use of procedural fees to alleviate these inefficiencies. In particular, these include:

(a) *Paying for the service / cost recovery* — Applicants should be paying for the service they receive. Moreover, since costs associated with the delivery of a given service (e.g. examination) may vary across applicants, the pricing should also reflect differences in the resources absorbed. If applicants that 'game' the system utilise more time/resources, then they should pay more.

(b) *Private benefits.* — Just as patent holders pay renewal fees in exchange for the financial benefits they enjoy from IP rights, applicants should be charged in exchange for the economic befits they derive from the patent pendency status.

(c) *Externalities*: — By 'gaming' the application system, applicants impose various negative externalities to society, e.g.:

- they increase the patent offices overload by effectively absorbing resources that could be used to process 'good willing applications' (from inventors who apply with the genuine purpose of obtaining a grant);
- they contribute to patent backlogs, thus creating uncertainty on whether and when certain IP rights would be granted;
- they fuel and sustain a cycle of perverse incentives because the fact that some firms 'game' the system makes it optimal for other firms to do the same.

Consequently procedural fees could be increased to include a 'tax' on the externality imposed to society.

1.57 Even if the three rationales listed above were accepted as conceptually sound from an economic viewpoint, they would pose a number of practical problems. First, there is little guidance in the literature about the level at which procedural fees should be set (e.g. how should private benefits be calculated? How should the costs of uncertainty be

estimated?), and on who should bear these additional costs (e.g. how could 'gaming applicants' be distinguished from 'genuine applicants'?).

1.58 Second, and more importantly, although higher procedural fees could be defended on the ground that they compensate society for the undesirable consequences of 'gaming' behaviours, they may do little to prevent applicants from continuing to 'game' the system. A more radical — and in our view appropriate — fee policy should be designed with the primary goal to create an incentive scheme that discourages applicants from 'gaming' the system in the first place.

1.59 Standard economics of incentives suggests a 'guillotine' system, where procedural fees are set sufficiently high and financial rewards (e.g. a significant reimbursement of procedural fees) are offered to applications that result in a grant. Alternatively, the 'guillotine' could be made even sharper by providing reimbursements only for those applications that resulted in valuable patents (i.e. patents that are renewed for at least a minimum number of years and/or in at least a number of markets). This could discourage applicants from 'staying within the system', and realign their behaviour with the original purpose for which the system was designed. Obviously, by linking procedural fee payments to outcomes that are realised after the application procedure (e.g. renewal decisions), this fee policy requires first a general economic understanding of the role of patent life. This is discussed in details in the next section.

Socially optimal patent life and breadth

1.60 This section surveys the literature on the following;

(a) The definition of socially optimum patent lives and scope; and

(b) The interactions and trade-off between patent life and breadth.

1.61 According to economic theory, the optimal life of a patent is such that the marginal social benefit (MSB) of a patent is equal to its marginal social cost (MSC). The marginal social benefit refers to the incremental benefit resulting from the additional incentive to innovate that is generated by the granting of that patent in a given year. Further, it is assumed that the curve is downward sloping, thus reflecting the idea that the incentive to innovate diminishes over the life of a patent. The social costs arising from the patent occur in the form of the monopolistic behaviour of the patent holder (e.g. in terms of monopolistic pricing and muted incentives to improve the patented product). The marginal social cost therefore, represents the incremental social costs of the patent in a given year. In contrast

to the MSB curve, the MSC curve is assumed to slope upwards, reflecting the idea that the marginal social costs of the patent increases over its life.

1.62 In general, the literature refers to the work of Nordhaus (1967; 1969) as the conceptual foundation for study in this area.[9] His work emphasised the trade-off that arises under patent systems between dynamic efficiency and static welfare losses (i.e. as discussed above) and that the optimal patent life is that which maximises the consumer and producer surplus. He concluded that the optimal patent term should be a finite term. Further, he noted that in general, the optimal patent length is longer the more inelastic is the demand curve for the invention protected by the patent right.

1.63 Without disputing the optimality of a finite patent term, Cornelli and Schankerman (1999) argued that uniform patent lives may not be optimal where there is ex-post heterogeneity in the value of inventions which is not observable by the governments. In this situation the length of patent protection should reflect differences in firms' specific productivity levels. This is based on the assumption that applying a uniform statutory life to all patents provides too large an R&D incentive to low R&D productivity firms and too little to firms with high R&D productivity. In contrast, Christie and Rotstein (2007) argue that the 'one size' approach of a 20 years statutory patent life 'fits all' inventions. The authors' argument is based on the review of the existing theoretical literature underpinned by the empirical evidence that only a very small minority of patent holders choose to utilise the maximum length of protection provided by the system.

1.64 Whereas the life of a patent determines the duration of monopoly power, the breadth of a patent (also referred to as the scope) determines the intensity of that power. While the concept of patent breadth is accepted in the literature, there is no consensus over how it should be defined. Gilbert and Shapiro (1990), for example, defined patent breadth as the ability of patent holders to raise price during the period of protection. Langinier and Moschini (2002), on the other hand, defined it as "the range of products that are encompassed by the claims of the patent". Further, Gillini (1992) defined patent breadth in terms of the cost of developing a non-infringing substitute of the patented innovation.

1.65 More recent literature on this topic has tended to focus on the interactions between the breadth and the life of a patent. Conclusions about the optimal configuration of patent life and breadth are sensitive to the way in which patent breadth is defined. The literature tends to distinguish, on the one hand, between socially optimal patent length and breadth under static environments, i.e. where the investment timing is assumed to be fixed and innovations are isolated events which have little bearing on future innovations (e.g. Gilbert

[9] See also Scherer (1972) for an interpretation of Nordhaus' work on patent life.

and Shapiro (1990); Klemperer (1990); Gallini (1992); and Denicolò (1996)) and on the other, dynamic environments, i.e. where innovations are sequential and have a high degree of 'cumulativeness' (e.g. O'Donoghue et al. (1998); Matutes et al. (1996); Gans and King (2006); Beschorner (2005)).

1.66 The most commonly cited papers analysing the trade-off between optimal patent life and breadth in the context of a static environment are those by Gilbert and Shapiro (1990), Klemperer (1990), Gallini (1992), and Denicolò (1996). These papers are discussed separately below.

1.67 According to Gilbert and Shapiro (1990), the optimal patent regime (in terms of minimising social costs) is one that confers a given reward to innovators by offering infinitely lived patents with the minimum breadth (i.e. market power) that is necessary to provide the given reward (they do not however, consider how much this reward is). This conclusion is heavily dependent on the authors' definition of patent breadth (the patent holder's ability to raise price). Thus, under this assumption, patent breadth is increasingly costly in terms of deadweight loss, the lower is the elasticity of demand, as this allows firms to exercise more market power. In contrast, they found that the trade-off when increasing patent life is constant between providing greater rewards to the patent holder and the incremental increase in the deadweight loss.

1.68 In contrast, Klemperer (1990) showed that depending on the structure of demand, a given reward to inventors can be provided using infinitely lived patent with narrow breadth or patents with short lives and wide breadth, i.e. either schemes can be optimal (however, like Gilbert and Shapiro, he did to consider the size of the reward). In Klemperer (1990) patent breadth was defined as the space between the innovation and the closest substitute rivals can produce without infringing the patent. Differently from Gilbert and Shapiro, who consider only the deadweight loses from a monopoly, Klemperer (1990) identified two forms of social cost arising from patent breadth. For sufficiently wide patents, the relevant social costs are those arising from the deadweight loss of a monopoly, while for narrow patents the relevant social costs are those which arise from the costs faced by consumers in substituting away from the patented product. The latter costs are defined as transport costs per unit distance per unit purchased in substituting to alternative variants of the patent holders good. Thus, Klemperer (1990) argued that patents with short lives and wide breadth are optimal if they discourage substitution away from the patented product to the inferior substitute.

1.69 Finally, Gallini (1992) defined patent breadth in terms of the flow of profits appropriated by the patent holder, and found that patents with short life and wide breadth can be optimal when they discourage costly imitation.

1.70 A key assumption shared in the previous papers (i.e. Gilbert and Shapiro (1990); Klemperer (1990); and Gallini (1992)) is that the socially optimal investment in R&D is assumed to be exogenous, and the analysis focused on identifying the best way to incentivise firms to undertake this pre-defined level of investment. Denicolò (1996), in contrast, took a more general approach that accounted for firms' strategic behaviour in

patent races by modelling explicitly the firms' incentive to carry out innovative activity. Within this setup the author was able to reconcile the seemingly conflicting results found in previous papers by showing that the socially preferred choice between breath and life depends on the nature of competition. In particular, if firms compete on price (in the Bertrand[10] fashion) the Gilbert and Shapiro (1990) results applies, i.e. the optimal patent design is one with infinitely lived patents of a minimum breath. However, if firms compete on quantity (i.e. in a Cournot[11] fashion), narrowing the breath of the patent would increase the output of less efficient firms, which might be socially undesirable. Therefore, in a Cournot setting, maximising patent breath and minimising patent length might be optimal.

1.71 More recently, the literature on the optimal configuration of life and breadth has focused on sequential innovations, i.e. on environments that are not static (which is arguably more realistic assumption of how innovations in many industries are actually developed). O'Donoghue et al. (1998) showed that when innovations are cumulative in character, there may be large discrepancies between the private and social benefits arising from the innovation. This discrepancy arises from the fact that while the innovation may be very valuable (i.e. due to the spill-over effects benefit future innovations) the future innovators themselves may pose a competitive threat. Thus in this context, they argue that patent length may in fact be irrelevant. Rather, what is more important is the *effective* life of a patent that is determined by the leading breadth of the patent (i.e. that which protects against products with a higher quality) as well as the statutory life of the patent. This is because breadth determines which products can replace the patented innovation.

1.72 The importance of the effective life is confirmed by Encaoua et al. (2006), who argue that policy instruments governing both breadth and life can be used to provide those innovations with high social value with long effective lives (as opposed to just a statutory life). O'Donoghue et al. (1998), compare two policy remedies with leading breadth: infinite patent life with finite leading breadth; and finite patent life with infinite leading breadth. Whether the former or the latter patent regime is superior depends on the rate of innovation. Where the rate of innovations in an industry is low then the former patent regime is preferable as it reduces market distortions and reduces R&D costs. If, on the other hand, the rate of innovation is relatively fast, then the latter patent regime will be superior as it would provide higher incentives to engage in R&D. This theoretical finding is empirically confirmed by Deng (2008), who compares the renewal process of EPO patents in the pharmaceutical and electronics sector. The author found that

[10] Bertrand competition is a model of competition used in economics to describe model of price competition between duopoly firms in the market which results in each firm charging a perfectly competitive price (i.e. one that is equal to marginal costs)

[11] Cournot competition is an economic model used to describe an industry structure in which each firm and its competitors make their output and pricing decisions on the assumption that the output and pricing decision of their competitors are given.

pharmaceutical patents depreciate faster than electronic patents and therefore have shorter life. However, pharmaceutical patents are endowed with higher initial returns and, compared to electronics patents, are therefore validated in more countries.

1.73 Green and Scotchmer (1995) analyse the trade off between patent life and breadth where innovations are sequential by modelling a game between a first and a second generation innovator. They argue that when innovation happens in two stages, then the first generation innovator may have insufficient incentives to invest, which may in turn preclude the entire stream of future technology arising from the initial invention. In their model, the breadth of the patent determines the division of profits in each period (since the breadth governs whether the second product infringes the first) and the length of the patent determine the total profits appropriated by the two innovators.

1.74 Finally, the economic literature has also provided quantitative indication concerning the optimal statutory life of patents. Nordhaus (1969), and Berkowitz and Kotowitz (1979; 1982) are often cited as the benchmark papers in these respect. On the one hand, Nordhaus demonstrates that, the welfare loss associated with overly long patents (e.g. beyond a ten years life-span) is minimal, hence a statutory protection of more than ten years would seem appropriate. On the other hand, Berkowitz and Kotowitz (1979; 1982) argue that the optimal lifetime would be approximately one and a half year. The reason behind such a divergence lies in the specific modelling assumptions. Nordhaus consider a world where there is no firms' rivalry in the innovation activity. In contrast, Berkowitz and Kotowitz's model assume free entry in the innovation market which, in turns, results in the possibility of long patent lengths leading to overinvestment in R&D.

1.75 The striking difference between the statutory duration of 20 years and very short patent life implied by Kotowtiz makes Kotowitz's finding highly debatable from a policy perspective (see e.g. Mc Fetrige and Rafiquzzaman (1986); and Beck (1986)). In a more recent paper Kotowitz and Schure (2006) re-assess the optimal patent length to be less than five years, which is still far below the statutory length.

1.76 An aspect which is overlooked completely in Nordhaus's and Kowotiz's analysis is the recognition that, in reality, patents are self-screened by the patent holders' renewal decision (this aspect is discussed in details in the next section). In contrast, Christie and Rotstein (2007) concluded from the evidence that only a very small minority of patent holders choose to utilise the maximum length of protection that the current statutory life of 20 years is adequate.

Summary and conclusion

1.77 The key questions that the literature on optimal patent life/breadth aims to address are:

(a) How big should the rewards be (i.e. how long should the length of protection be and how wide the scope of protection) in order to incentivise firms to undertake a socially desirable level of R&D?

(b) Which mechanisms (length or breath) is more effective (from a welfare perspective) in providing these incentives?

1.78 The seemingly contradictory answers provided by the literature share a common message, i.e., an optimal incentive scheme should be based on a mix of length and breadth, the composition of which depends on some key market characteristics (e.g., the nature of competition (Denicolò, (1996)), or the rate of technological depreciation (Encaoua et al. (2006)).

1.79 The implicit characteristic shared by all studies on optimal patent life/breadth is that the application process leading to the creation of patent rights is viewed as a black box. In these studies the emphasis is on creating incentives to invent, but no attention is paid to the process by which inventions are formally granted. For instance, the optimal patent life is typically calculated assuming that the birth of a patent coincides with the date of grant. However, this assumption seems unrealistic given the growing incidence of patent pending periods on the overall life of patents. To the best of our knowledge there is no study that analyses optimal patent life by taking the patent pending period explicitly into account.

1.80 Another aspect of the literature that, in our view, is problematic is the very idea of patent breadth. First, there is no consensus among economists on how patent breadth should be defined, and this gives the impression that, while being a useful theoretical dimension, the concept of patent breath cannot be effectively used as a policy tool. Second, some authors (see e.g. Bessen and Meurer (2006, 2008)) argue that, nowadays patents are characterised by often abstract and hidden claims which make the boundaries of patent protection unclear and uncertain. This implies that firms' decisions on R&D investments are unlikely to be based on the expected scope of protection, as these conjectures would be subject to an excessive degree of uncertainty.

1.81 Further, the literature assumes the existence of a single patent authority which grants patent rights that are valid only in a single representative market. However, patents granted by the EPO can be validated and enforced in multiple jurisdictions. This aspect adds an important additional dimension to EPO patents: besides being characterised by a given length and breadth, each EPO patent is characterised by a geographical scope (i.e. the number of jurisdictions in which the patent is validated). In fact, this geographical dimension seems to represent an important incentive scheme as evidence indicates that some applicants are willing to trade-off patent life for a wider geographical protection (see e.g. the finding of Deng (2008) where pharmaceutical patents tend to live shorter lives but are validated in several countries). Surprisingly, there is no study which analyses optimal incentive schemes by taking the three dimensional nature (i.e. *length-breadth-geographical scope*) of EPO patents into account.

1.82 Finally it is important to stress that studies on optimal patent life/breadth characterize only the overall envelope of incentives that are hypothetically available to inventors (i.e. maximum statutory life and scope of protection). The extent to which patent owners use

of these incentives in reality depends largely on their renewal decisions. A review of the ways by which fees can steer renewal decisions is provided in the next section.

The Role of fees in the patent system

Introduction

1.83 This section surveys the literature on the following:

(a) The role of renewal fees; and

(b) The role of procedural fees.

Renewal fees

1.84 In last two decades the analysis of renewal fees has been at the forefront of the economists' agenda in the literature on patent systems. In general, the literature in the area has tended to focus on the economic role of renewal fees, and on how these should be designed in order to maximise social welfare.

1.85 The seminal papers in this strand of the literature are Scotchmer (1999) and Cornelli and Schankerman (1999). The authors analyse renewal fees in a world where the costs and benefits of R&D activates are not observable by patent authorities but are private information to firms. The authors found that, within this informational setting, renewal fees increasing over time are optimal in that they act as a direct revelation mechanism. The argument is that renewal fees are equivalent to an incentive-compatible mechanism, and can act as a 'sorting device' so that only those patent holders with the most valuable patents have the incentive to pay higher fees in order to extend the life of the patent. The policy implication of these papers (which constitutes the theoretical foundation for the renewal mechanisms adopted in several patent offices) is that in an optimal renewal system, governments would offer innovators a menu of patent life-spans and associated fees, thereby allowing applicants to choose between different combinations of life-spans and fees.

1.86 The idea of renewal fees as 'sorting devices' is supported by Pakes (1986) who interprets the decision of holding a patent for an additional year as a bet on future but uncertain revenues. Pakes (1986) analysed the survival of patents in Europe and found that patents of higher economic value tended to be renewed for longer periods than those that were renewed for shorter periods. This finding is in line with his hypothesis that, to the extent that patent holders base their decisions on economic criteria, then they will only

renew their patent for another year if the costs in doing so are less than the value of holding the patent for that additional year. In general, the interpretation of renewal fees as a sorting device has generated an abundant literature on patent evaluation where renewal decisions are used as a proxy for the commercial value of patents.[12]

1.87 While the emphasis has traditionally been on the role played by renewal fees in sorting out *granted patents* of low economic value, Baudry and Dumont (2006) investigate the potential role that renewal fees can play in discouraging the filing (rather than the renewal) of 'lousy' *patent applications.* More specifically, they argue that it would be socially optimal to redesign the renewal structure by increasing the renewal fees at the front end, in order to deter very low value patents applications, and to increase the renewal fees towards the end of the patent in order to encourage the diffusion of innovation. The message is that, while higher progressive renewal fees guarantee socially optimal renewal decisions (which confirms the findings of Scotchmer (1999); and Cornelli and Schankerman (1999)), the screening of patent filings can be achieved by increasing of financial burden to the early patent life-time.

1.88 A recent paper by Gans at al. (2004) provides a thoughtful insight on the actual functioning of the renewal system. This paper differs from those cited above in two key aspects. First, the traditional literature on renewal fees (e.g. Scotchmer (1999); and Cornelli and Schankerman (1999)) assumes that inventors have perfect information on the profitability of their inventions before the patent application stage. This assumption is clearly restrictive and, indeed, Cornelli and Schankerman (1999) do concede that in practice patentees will only have information on the distribution of *expected* profits. Gans at al. (2004) relax this information setting by assuming that the commercialisation prospects of an invention become apparent to patent holders only once they are faced with the decision to renew a patent (i.e. the information is revealed only after the patent has lived for a certain period). Second, and more importantly, the traditional literature on renewal fees considers a world where patent authorities operate to maximise social welfare. In contrast, Gans et al. (2004) consider a situation where patent offices are self-funding and constrained by budgetary requirements. Within this setup, the authors demonstrate that the renewal fee structure of self-funding patent offices diverges from the welfare-maximising one. In particular, it is shown that the renewal fee structure that maximises revenues is 'flatter' and sub-optimally low compared to the one that would be set by a welfare maximising patent authority.

[12] A revew of this literature is beyonde the scope of this study. However, we refer tthe interested reader to Schankerman and Pakes (1986), Lanjouw (1998), Schankerman (1998), and Deng (2005) .

1.89 The analysis of patent renewal fees within the most general, and arguably most realistic, information setting is provided in by Baudry and Dumont (2009). As noted above, the analysis of Scotchmer (1999) and Cornelli and Schankerman (1999), relies on the very demanding assumption that at the moment of filing, applicants have perfect information over the future rents associated with their inventions.

1.90 Gans et al. (2004), relax this condition by assuming that inventors 'discover' the value of their patents only after the granting decision. However, the idea of an applicant who is totally ignorant prior to grant, and who becomes perfectly informed after the grant (as assumed in Gans et al. (2004)) is also debatable. The value added by Baudry and Dumont (2009), is represented exactly by the general information setting within which renewal fees are studies. The authors assume that at the moment of filings, patentees have only incomplete information, but learn more about the value of future rent as time goes by. The main results found within this richer set up are a generalisations of the findings obtained within a simpler information setting. More specifically, whereas in a world where patentees have perfect private information (e.g., like in Scotchmer (1999) and Cornelli and Schankerman (1999)) the optimal renewal system is a single profile where patentees must choose between a menu of patent life-spans and associated fees, in a world where patentees have imperfect information the optimal system is one where patentees can choose from a menu of profiles.

Procedural fees

1.91 Differently from renewal fees, the optimality of procedural fee schedules does not appear to have been at the forefront of the debate in the literature on patent systems. Only recently there has been concentrated attention on the extent to which patent fees have themselves influenced the increase in patent filings and voluminosity (De Rassenfosse and Van Pottlesberghe (2007; 2008); Harhoff, et al. (2007)).

1.92 De Rassenfosse and Van Pottlesberghe (2007), for example, assessed the impact of application filing fees set by member states of the EPC on the number of patent filings. Using data on priority filings in national patent offices in 2003, they found that the impact of national filing fees (for which they added up for each member state in the sample, all fees to the patent grant) on patent applications was statistically significant for all countries in the sample.

1.93 More specifically, they found that the price elasticity, on average, was approximately -0.5 (ranging between -0.45 and -0.56): a 10 per cent increase in filing fees will lead to a five per cent reduction in patent applications. They also found that the strength of the patent system (proxied by an index of protection) was also statistically significant and positive: stronger degrees of patent protection lead to more patent filings. They also found that the size of the country is relevant: protecting a market in a smaller country is more expensive in terms of fee per capita than protecting a market in larger countries. Taken together, the authors argue that the differences in fees across national patent offices and the negative patent fee elasticity results in the suboptimal treatment of inventors which as a result, has a significant impact on their filing behaviour.

1.94 The authors also attempt to account for national differences in the transfer rates of second filings at the EPO (i.e. a patent application with a priority filing at the national patent office of the applicant who then subsequently files the patent directly at the EPO or via the PCT route). They found that GDP per capita and the length of membership in the EPC positively affects the transfer rate of domestic filings to the EPO. Their analysis does not however, assess the impact of fees charged by the EPO on this transfer rate.

1.95 In their later work, De Rassenfosse and Van Pottlesberghe (2008) test whether the patent fees charged by the major patenting offices (e.g. the EPO, the USPTO and the JPO), have contributed to the surge in patenting activity over the past two decades. Using data on entry fees and fees up to grant between 1987 and 2007, they found that of the three major patent offices, the EPO has reduced its patent fees the most since the mid-1990s (both in absolute and in relative terms, i.e. per capita). This applies both to entry fees (which in their methodology includes all fees paid in the first 18 months after the filing date and which therefore tends to include both filing and search fees) and those up to grant. They found that the price elasticity of demand for patents is approximately -0.4 (ranging between -0.13 and -0.58), which is similar to the elasticities they report in their 2008 study on national patent offices. They conclude that the reduction in the EPO's fees contributed to the increase in patent volumes.

1.96 There are a number of features of the methodology used in the latter paper which severely limit the applicability of results to the EPO. In particular, the dependent variable was based on a pooled set of applications from all three of the major patent offices. Thus, the results on the demand elasticity cannot be applied to the EPO specifically with as much confidence as one would wish.

1.97 Harhoff et al. (2007) attempted to measure the impact of the role of fees and translation costs on applicants' decision to validate their patent at the country level once a patent has been granted by the EPO. They found that not only do validation, early renewal fees (i.e. years 4 to 6), and translation costs differ considerably across countries in Europe, but also that the both validation and renewal fees negatively affect the validation behaviour of applicants. Translation fees were also found to have negative impacts on validation behaviour (i.e. decisions on how many countries in which protection is finally sought) although the impact disappears when they include fees in the model.

1.98 As mentioned above, in contrast to renewal fees, there is limited discussion in the literature on optimal procedural fees. Encaoua et al. (2006) do however address the issue of procedural fees to some extent by arguing that a tax could be imposed on, for example, the breadth of patent applications (e.g. the number of claims and/or pages) and that this would be in line with the idea of using fees as a 'sorting device'. Although fees are currently charged on claims and pages by some patent offices (over a maximum ceiling), Encaoua et al. (2006) argue that these fees are applied as compensation to the patent offices for processing higher cost applications rather than as compensation to society for rewarding broader patent protection to inventors.

1.99 The basis of this conclusion, and arguably of all of those referred to above, is that patent fees, whether procedural or renewal, should reflect the costs that patents impose on society. In practice however, patent offices may have little choice in this. Gans et al. (2004), for example, found that self-funding patent offices, constrained by budgetary requirements, apply a fee structure which maximises revenue. This is likely to diverge from that which seeks to "maximise the social welfare of innovative activity". They argue that a patent office that is required to fund itself is likely to have a 'flatter' fee structure than that it would without this constraint. They argue that initial patent application fees will be set higher than that consistent with maximising social welfare, while renewal fees on the other hand will be set sub-optimally low.

1.100 Although its focus is not on determining the optimal procedural fee structure, the work carried out by De Rassenfosse and Van Pottlesberghe (2008) on determining the price elasticity of patent demand, referred to earlier, does suggest that there may be some rationale to amending fee structures, in order to reduce voluminosity of filings and applications which is considered problematic for a number of reasons (e.g. increasing backlogs and pendency periods).

Summary and conclusion

1.101 The literature reviewed shows that the attention economists have devoted to studying patent fees is clearly biased towards renewal fees, with relatively little consideration given to procedural fees. The reason for this is to be found in the traditional view that an optimal patent system should be widely accessible and, consequently, procedural fees should be set a low as possible. Therefore, it is not surprising that, while the literature on renewal fees provides clear welfare implications, there is a lack of welfare indications concerning the setting of procedural fees.

1.102 There seems to be a general consensus among economists on the role of renewal fees. In particular, most authors — irrespectively of the information setting they adopt (i.e. assumptions on what patentees know at the moment of grant) — agree that:

(a) The main rationale for renewal fees is to induce patent holders to give up their monopoly rights.

(b) Renewal fees act a revelation mechanism by which patentees with the least valuable inventions are sorted out.

(c) Optimal renewal fees should have a progressively increasing structure.

1.103 Even if we have no reason to question the general validity of the three statements listed above, it is important to stress that these are based on a set of assumptions that do not reflect the reality of today's patenting activity.

1.104 First, with the exception of Gans et al. (2004), renewal fees are studied with the assumption that the goal of patent authorities is to maximize social welfare, even if, in reality, many patent offices are self-funded.

1.105 Second, the welfare implications derive from a literature which is largely written with the US patent system in mind, i.e. a system with a single patent authority (the USPTO) responsible for setting fee levels. The reality of the European patent system is much more complex because of the multitude of institutional players involved, and the possibility of misalignment of incentives associated with it. For instance, the renewal fees set by national patent offices might be optimal at the national level, but not for the European area as a whole. Similarly, the procedural fees set by the EPO may impact welfare differently in different EPC member states. Moreover, in the European patent system applicants seeking protection in a given market are give two chances: if an application is rejected at the national level it might still be granted by the EPO, and vice versa. All these aspects make the European patent system very different from any other patent system in the world, yet, to the best of our knowledge, there is no analytical framework that captures these unique features.

1.106 Third, the literature on optimal renewal fees focuses on the role of fees as a sorting device for patent rights that already exist, but no attention is paid to the potential effect of renewal fees on the phases that precede the grant stage. The only exception in this respect is due to Baudry and Dumont (2006) who investigate the potential role that renewal fees can play in sorting out low-quality patent applications.

1.107 Finally, and most importantly, renewal fees and procedural fees have never been analysed simultaneously (again, Gans et al. (2004) is the exception). This gap in the literature on fees reflects the lack of a conjoint treatment of (granted) patent life, and patent pendency periods in the literature on optimal patent life. This missing link is problematic in particular for the two following reasons:

(a) Clearly there is a dynamic relationship between procedural fees and renewal fees. On the one hand, renewal fees affect the decision to file for a patent in the first place (see, e.g. Baudry and Dumont (2006)). On the other hand, procedural fees might influence both the quantity and quality of patent filings, thus affecting the quantity and quality of patent rights that will be subject to renewal decisions later on.

(b) Even if scant, the literature on procedural fees demonstrates that these fees have an impact on both the number of patent filings, and the applicants' behaviour within the application process. Giving the growing welfare concerns about patent backlogs, and the use of the patent application system in a manner different from that for which it was originally intended, there is an urgent need for economic studies of an optimal fee policy that takes account of the way procedural fees interact with renewal fees

Conclusions

1.108 This review of the literature provides a comprehensive picture of the economist's traditional view on the main function of the patent system, and on the role that patent fees play within it. We have been able to identify the two following pillars on which the traditional economist's view is based:

(a) The *traditional patent system* — is characterised by the following components:

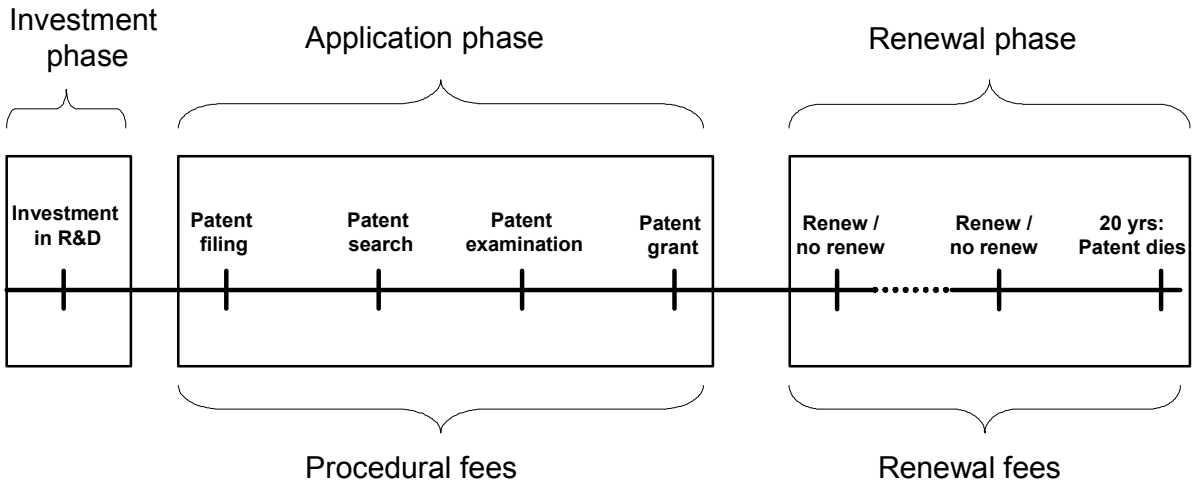
- A patent with a given statutory life and a defined scope of protection (breadth), the purpose of which is to incentivise firms to engage in R&D activity.
- A patent examination authority whose purpose is to grant predictable property rights in a reasonably short time.

(b) The *traditional patent fee* policy — is characterised by:

- Low procedural fees to make the system widely accessible.
- Renewal fees that have the primary goal to induce patent holders to give up their monopoly rights and that — at the same time — subsidise the examination activities carried out on unsuccessful applications.

1.109 These components can be summarised by the following graph which describes the life-cycle of a patent.

Figure 1.1: The patent life-cycle



1.110 The main conclusion that we draw from the literature review is that the traditional fee policy characterised by low procedural fees to encourage patent filings is challenged by the today's realities and by the findings of most recent studies. The main reasons are the following

(a) The traditional literature — which is also the one from which welfare implications are typically drawn— tends to focus only on two phases of the life-cycle depicted above, in particular:

- The literature on optimal patent length/breadth is mainly concerned with how patents should be designed in order to provide firms with enough incentives to invest in R&D (*investment phase*)

- The literature on optimal fees is mainly concerned with the design of a renewal schemes that act as a welfare improving sorting device for patent rights that already exist (*renewal phase*)

- The *application phase*, i.e. the process by which patent rights do actually come into life, is viewed as a black box whose functioning is assumed to be perfect and, thus, completely disregarded.

(b) Contrary to the traditional literature, most recent studies tend to focus on the *application phase* and reach the following general conclusions:

- The original policy rationale for setting low procedural fees seems outdated because the scarce resource is no longer patenting activity but the patent offices' capacity to process applications.

- The original function of patent offices (i.e. to grant predictable property rights in a reasonably short time) is put at serious risk both by the excessive workload that many offices bear and by applicants' practice to 'game' the application system.

- Procedural fees can play an important role in affecting the number of patent filings and shaping applicants' behaviour.

Consequently, future research should investigate ways to improve the functioning of the application system (which is far from being perfect as assumed by the traditional view), and on analysing the role that procedural fees could play in this respect.

(c) Most literature (irrespectively of how recent or dated it is) assumes the existence of a single patent authority and a single representative market where patent protection can be sought. This assumption is a reasonable simplification to describe the US patent system, but it is too restrictive when applied to the reality of the European patent system. In particular:

- In the European patent system several (often self-financing) national patent offices are responsible in setting (renewal) fees that apply to each patent granted by the EPO. This creates the possibility of misalignment of incentives which could result in suboptimal fee policies.

- The fact that each patent granted by the EPO can be validated and enforced in multiple jurisdictions adds (on top of *length* and *breadth*) an additional dimension (i.e. *geographic scope*) to EPO patents, making them a more complex entity than the two dimensional patents typically considered by the literature.

  A theoretical framework designed to reflect the reality of the European patent systems has not, as yet, been proposed by the literature.

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2 DESCRIPTION OF THE EPO AND NATIONAL FEE POLICY OVER THE LAST 10 YEARS

Introduction

Objectives

2.1 This Section package reviews patent fee policies over the last 10 years at the EPO and in a sample of six National Patent Offices (NPOs) in Europe. Particular attention is paid to the following:

(a) *Financing structures and the fee setting roles of EPO and NPOs* – i.e. identifying whether they are self-financing or are fully funded by the state, and their degree of autonomy in fee setting.

(b) *Purposes of and linkages between procedural and renewal fees* – i.e. identifying the principles that underpin NPOs' fee setting, identifying the linkages (where they exist) between procedural and renewal fees.

(c) *Recent challenges facing the NPOs* – i.e. identifying the most important challenges that the NPOs have faced over the last decade, and establishing the key drivers of these challenges.

(d) Current and historical descriptions of the fee structures of the NPOs and the rationale underlying procedural and renewal fee changes – i.e. identifying the types of procedural fees that are charged, the structure of renewal fees, how both types of fees have evolved over the past 10 years, and identifying the main factors underlying fee changes that have been identified – distinguishing between changes to the fee structure (e.g. changes that make search fees more expensive in relation to examination fees), and changes at the aggregate fee level (e.g. inflation-adjustment of all procedural fees).

Geographical Scope

(e) This report covers the following seven patent offices:

(f) The European Patent Office;

(g) The Swiss Federal Institute of Intellectual Property;

(h) The Norwegian Industrial Property Office;

(i) The Netherlands Patent Office;

(j) The Hungarian Property Office; and

(k) The UK Intellectual Property Office.

(l) The Italian Patent and Trademark Office

European Patent Office

Institutional Framework

2.2 The European Patent Office (EPO), the executive arm of the European Patent Organisation (EPOrg), and supervised by the Administrative Council, provides a uniform application procedure for individual inventors and companies seeking patent protection in the 36 Contracting States.

2.3 The EPOrg is an intergovernmental organisation which was established in 1977 following the entry into force of the European Patent Convention (EPC).

Financial Structure

2.4 The EPOrg is self-financing and legally and financially independent of the European Union. All EPOrg's revenues derive from procedural fees, its own renewal fees for pending European patent applications and from its 50 per cent share of the renewal fees from European patents granted by the EPO and validated in one, more or all of the designated contracting states. The EPOrg is a non-profit making organisation and any surplus is reinvested in its own infrastructure

2.5 The President of the European Patent Office may, pursuant to the Rules Relating to Fees, change the level of some fees at any time. The Rules Relating to Fees including the amounts of the most important fees (filing fee, search fee, examination fee, designation fee, claims fee, fee for grant etc.) may be amended, on a proposal of the President of the European Patent Office, by the Administrative Council.

Current and Historical Description of Fee Structure

2.6 EPO does not have control over national renewal fees (national renewal fees are discussed further on in this section). The discussion in this section focuses on those fees over which EPO has control, namely procedural fees and internal renewal fees.

2.7 The structure of EPO procedural fees is a complex one, not least because it processes patent applications under both the European Patent Convention (EPC) and the Patent Cooperation Treaty (PCT). A list of the most basic fees is provided in Table 2.1.

Table 2.1: Basic fees charged by EPO

Patent application stage	Fee
Filing and search	Filing fees
	National fees
	Transmittal fees
	Search fees (EP)
	Search fees (ISA)
	Claims fees
Examination, grant and opposition	Examination fees (EP)
	Examination fees (IPEA)
	Grant fees / Printing fees
	Opposition fees
Appeal and protest	EPC appeal fees
	PCT protest fees
Designation and renewal fees	Designation fees
	Renewal fees for patent applications

Inflation adjustment

2.8 One important change occurred in 2006 when the EPO made the first fee adjustment with the specific purpose of accounting for inflation, in response to a significant fall in real term fee levels between 1991 and 2006. Indeed, whilst the index of all EPO procedural fees increased by 10 per cent between 1991 and 2006, inflation at the Office's two main locations in Germany and the Netherlands was approximately 35 per cent. This is shown in Figure 2.1.

Figure 2.1: Index of EPO procedural fees and inflation

Source: EPO (2009), "Fee reform and sustainable financing of the European patent system, Document 4: Overview of the Current Financial Situation", CA/72/09 Add. 4

2.9 The impact of inflation on EPO's fee receipts is also illustrated in Figure 2.2, which shows the average procedural fees paid to the EPO by an applicant using the EP procedure in the period 1995 - 2009. The figure takes account of all fees from filing to grant, including renewal fees for years three to five and assumes that the application contains 15 claims. The change in fees over the period is minus six per cent in nominal terms and minus 30 per cent in real terms.

Figure 2.2: Average procedural fees

Source: EPO (2009), "Fee reform and sustainable financing of the European patent system, Document 4: Overview of the Current Financial Situation", CA/72/09 Add. 2

2.10 The introduction of International Financial Reporting Standards (IFRS) accounting procedures in 2005 was an important factor underlying the decision to adjust fees to account for inflation. This was because the move towards the new accounting practices highlighted negative equity of minus €1.2bn which under the previous accounting standards was a perceived positive equity of €3.5bn at end 2005 into negative equity of minus €1.2bn.

2.11 Following the implementation of IFRS, the EPO introduced biennial fee adjustments to compensate for inflation. The most recent such adjustment was made in 2008 and further increases are included in the budgetary planning for 2010 and 2012.

Other structural changes

2.12 Numerous important structural changes to the EPO fee structure have been implemented in recent years. The changes listed below are discussed in greater detail in the subsequent sections.

(a) Introduction of the written opinion for PCT international searches with higher search fees in January 2004.

(b) Introduction of the reduced fee for online filings in April 2004.

(c) Introduction of the Extended European Search Report with higher search fees and lower examination fees in July 2005.

(d) Change in structure of internal renewal fees in April 2008.

(e) Increase in claims fees for the 51st and subsequent claims in April 2009.

(f) From April 2009 a fee is to be paid together with the filing fee for 36th and subsequent pages of the application and hence is paid by all applicants. Prior to this date the fee was paid at the time of grant, only by those whose patents were granted and was based on the number of pages at time of grant.

(g) The structure of designation fees was altered in April 2009 such that a flat designation fee provides protection in all EPC member states. Prior to this date, applicants paid a designation fee per state in which protection was sought and the payment of seven designation fees provided for protection in all EPC member states.

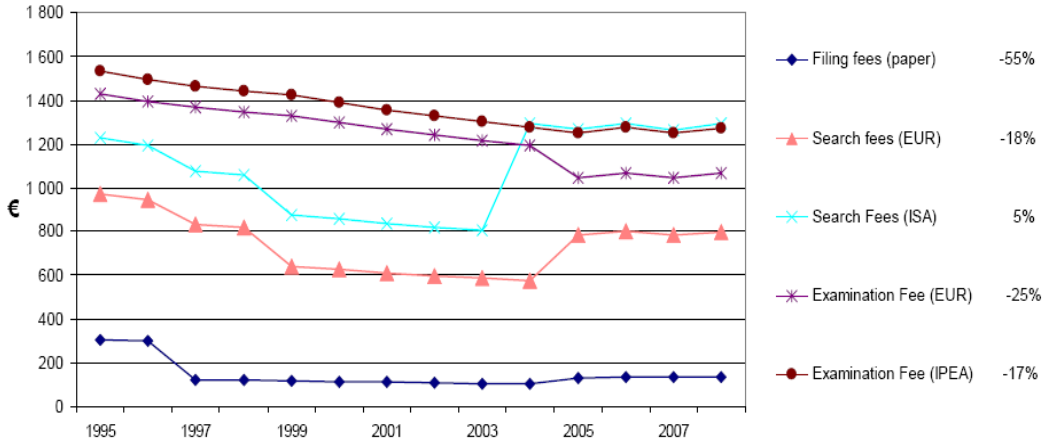
Procedural fees

2.13 There have been numerous changes to each of the procedural fees charged by EPO over the last 20 years. As noted above, these changes include both the introduction of a biennial inflation adjustment and amendments to the structure and/or nominal value of certain procedural fees. These are discussed in turn below.

Inflation adjustment

2.14 Figure 2.3 shows the evolution of real EPO procedural fees between 1995 and 2008.

Figure 2.3: Evolution of EPO procedural fees in real terms



Source: EPO (2009), "Fee reform and sustainable financing of the European patent system, Document 2: Income Drivers", CA/72/09 Add. 2

2.15 It is clear that increases in the index of procedural fees during this period (as shown in Figure 2.3 above) reflected structural changes (e.g. search fees were increased in

2004/2005 to reflect the added value of the product through the introduction of written opinions), and did not take account of inflationary pressure.

Changes in the nominal value of certain procedural fees

2.16 There have been numerous adjustments to the levels of procedural fees over the last twenty years. We focus on the most significant and most recent changes.

2.17 The level of filing fees has been subject to significant changes in recent years. In 1997, the fee was reduced by more than 50 per cent and a lower fee was introduced in 2004 for online filings through epoline. The structure of the filing fee was further amended in April 2009 such that it is now composed of a basic fee and an additional fee for the 36th and each subsequent page of the application. This had a bearing on the fees that must be paid prior to grant: previously, the additional page fee was paid at the grant stage whereas from April 2009 a flat fee applies for publication and grant of the patent.

2.18 Search fees — for both EP applications and where the EPO acts as ISA — were lowered twice between 1996 and 1999. The international search fee was subsequently increased in 2004 when the written opinion of the ISA was introduced. The European search fee was increased in 2005, following the introduction of the Extended European Search Report. These fee increases reflected the added value of those two products, since the applicant would now receive an opinion of the patentability of an invention at an early stage of proceedings.

2.19 Prior to 1996 it was necessary to pay designation fees upon filing an application, but since that date it has been possible to pay these fees up to six months after the mention of publication of the European search report. In 1997, a cap on the number of designation fees payable was introduced such that if an applicant pays seven designation fees, all EPC contracting states are deemed to be designated; subject to national validation requirements (in particular, translation into national language) patentees thereby automatically receive protection in all contracting states, if a European patent is granted on the basis of their application. The structure of this fee was further amended in April 2009 such that a single flat designation fee of €500 covers all contracting states.

2.20 EPO has observed an increase in the length and complexity of patent applications and has adjusted the claims-fee system in response.[13] The level of the claims fee was increased fourfold in April 2008 but from the same date it became necessary to pay the

[13] EPO (2009), "Fee reform and sustainable financing of the European patent system, Document 4: Overview of the Current Financial Situation", CA/72/09 Add. 4, Page 6

fee only as from the 16th claim, rather than the 11th. As of 1 April 2009, an additional fee of €500 applies for the 51st and each subsequent claim.

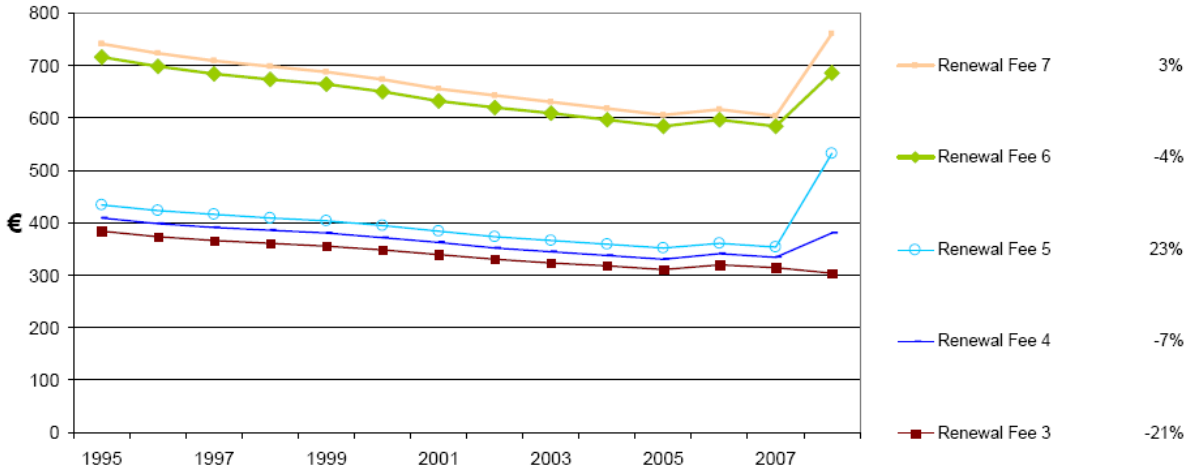
Renewal fees

2.21 In considering the revenue of the EPO, it is important to distinguish two separate types of renewal fees. Internal renewal fees must be paid whilst a European patent application is pending before the EPO and after entering the third year from the date of filing. EPO has direct control over the level of these fees and receives the total fee as income. External renewal fees are post-grant fees paid to national patent offices. EPO does not have any influence on the level of these fees, but receives 50 per cent of those fees paid for European patents which it had granted after substantive examination.

Level of internal renewal fees

2.22 Figure 2.4 below shows the evolution of real EPO internal renewal fees between 1995 and 2008. There was a steady fall in the real level of fees between 1995 and 2006 because renewal fees remained unchanged within this period. In 2006, an inflation adjustment was introduced and hence the real fee level increased slightly. In 2008, internal renewal fees were increased significantly, with the exception of the third year renewal fee which remained unchanged.

Figure 2.4: EPO internal renewal fees in real terms

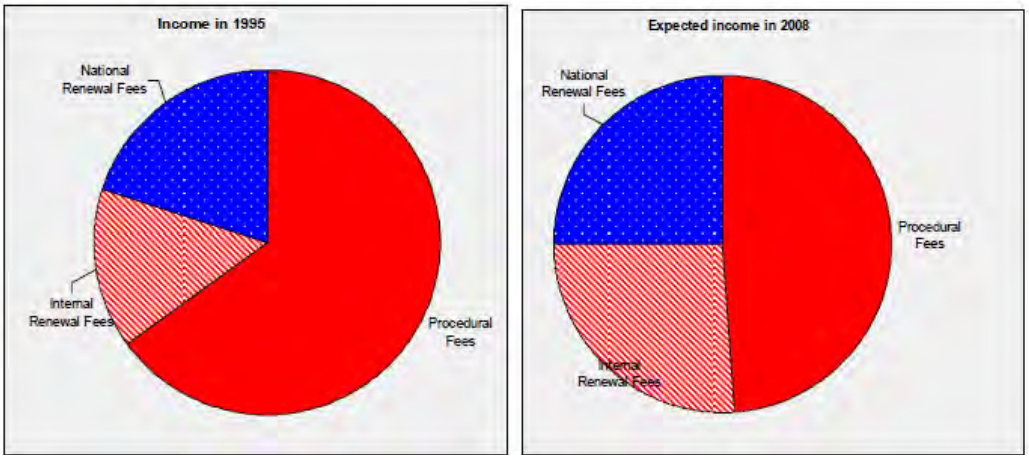


Note: The percentages on the right of this figure show the change in real fee level between 1995 and 2008

Source: EPO (2009), "Fee reform and sustainable financing of the European patent system, Document 2: Income Drivers", CA/72/09 Add. 2

2.23 Figure 2.5 shows that between 1995 and 2008, the share of total income provided by procedural fees fell from about two-thirds to less than half.

Figure 2.5: EPO fee income in 1995 and 2008



Note: The 2008 figure is based on expected income (annual accounts were not available when the analysis was conducted).

Source: EPO (2009), "Fee reform and sustainable financing of the European patent system, Document 4: Overview of the Current Financial Situation", CA/72/09 Add. 4

2.24 Between 1995 and 2008 there has been a significant increase in the relative importance of internal renewal fees, the revenues of which have grown by an average of 10 per cent per annum since 2001. There are two main reasons for this growth:

(a) The number of pending files has increased (by six per cent each year on average).

(b) The stock of pending files has grown older, with relatively more files reaching the age of six years and over.

2.25 The sixth year marks a threshold, because from then on the progressive fee schedule provides for rather higher fees than in the early years.

2.26 The increase in internal renewal fees does not explain the increase in revenue. The first adjustment for inflation occurred in 2006 and it was not until April 2008 that a further significant increase in the level of the fee was introduced (other than the 3rd year renewal fee).

Importance of national renewal fees to the EPO

2.27 Figure 2.5 shows that the relative importance of national renewal fees to EPO income increased only slightly between 1995 and 2008, but this masks important developments in the level of these fees over the period.

2.28 In recent years, a number of EPC member states have reduced their national renewal fees as part of a broader innovation policy. Nearly 70 per cent of EPO national renewal fee revenue comes from the 19 countries which have either reduced or frozen nominal fee levels. This has had a significant impact on EPO revenue. The ratio of national renewal fee revenue to total EPO revenue peaked in 2002 and if national governments

had maintained renewal fees at 2003 levels, the EPO would have received €54m additional income in 2009.

Swiss Federal Institute of Intellectual Property

Financing Structure and Fee Setting Role of the Institute

2.29 The Institute, founded in 1888, has become an autonomous, self-financing entity since it became an organisation incorporated under public law in 1996. Prior to 1996, the Institute was fully funded by the state and had only a minor role in setting fees. The Institute is independent of the Swiss Federal budget in every way and must therefore ensure that it covers its costs from fee income (principally, patent renewal fees and trademark fees). Switzerland became a Contracting state to the EPC on 7 October 1977.

2.30 Formally, fees are under the partial control of the Institute. In order to introduce fee changes, the Institute must submit its fee proposals to the Institute Council and then to the Government for approval. To date, no fee changes proposed by the Institute have been rejected. While there is a formal consultation with regards to changes in Patent Law, specific consultations on fee change proposals are not typically held.

2.31 As sources of revenue, patent renewal fees and trademark fees are considered as the main income sources for the Swiss Federal Institute of Intellectual Property.

Recent Issues Facing the Institute

2.32 Government targets and reductions in revenue and application numbers have been among the principle challenges facing the Institute over the last 10 years.

Revenue and application reductions

2.33 Application numbers have fallen considerably. Fifteen years ago, the Institute received in the region of 4,000 applications. More recently, it received approximately 2,000. Annual figures on national applications suggest that applications (national) have stabilised around the 2100-2200 level. The main reason for this is that applicants have switched away from the Institute and towards the EPO, attracted by the EPO in order to gain a wider coverage of protection.

Government targets

2.34 Targets imposed by the government have typically focused on legislative work (e.g. making changes to patent law), engaging with international organisations and participating in international agreements (e.g. WTO and free trade agreements), rather than on patent application targets.

2.35 In order to strengthen the patent system in 2008 the Institute began to offer optional prior art searches for the first time. Prior to that, searches of prior art were not provided by the Office.

Strategic patenting

2.36 Strategic patenting behaviour is not considered to be a major problem at the Institute, and thus neither is the associated uncertainty which may be created by this type of behaviour.

2.37 The Institute has no formal time limit in which applicants must decide whether or not to proceed with an examination. Its general approach is to send applicants a letter after approximately three years (if applicants have not yet requested an expedited examination). After receipt of the letter, applicants are given three months to proceed with their application. If the examination fee is not paid within this time limit, the application is deemed to be withdrawn. Thus it is the Institute, not the applicant that drives the timing of examinations; after the communication by the Institute there is no possibility of delaying an application any further.

Purposes of and Linkages between Procedural and Renewal Fees

2.38 The Institute adopts the 'traditional' fee structure. In order to promote accessibility, procedural fees are set much lower than the unit cost of procedural processes. Renewal fees are used to cross-subsidise application fees, typically by more than 50 per cent.

2.39 In contrast to the 'traditional' fee structure, however, renewal fees are set in a quasi-progressive way (as opposed to being progressive throughout the statutory period). Until recently, renewal fees were flat throughout this period.

2.40 There are no fundamental differences in the way in which renewal and procedural fees are set by the Institute, or in the purpose they serve: both are determined on the basis of internal costs. Indeed, according to Article13, Paragraph 2 of the federal statute "the fees for statutory activities shall be determined so as to cover the costs together with the remuneration for services and compensation for services to the public economy for each division or protective rights over an four-year average".[14]

2.41 A further important factor driving fee determination (both procedural and renewal) are the Institute's financial reserves. The Institute is expected to maintain these at a pre-defined level (i.e. that the reserves should not drop under the institute's income of one year – which is in the range of about CHF 40 million).

2.42 According to the Institute, renewal and procedural fees are two integral components of one fee policy.

[14] 1999/2000 Annual report of the Swiss Federal Institute of Intellectual property

Inflation adjustment policy

2.43 The Institute has no formal policy of adjusting procedural or renewal fees to account for annual changes in inflation.

Current and Historical Description of Procedural and Renewal Fees and the Rationale Underlying Fee Changes

Procedural fees

2.44 At present, the Institute charges the following categories of procedural fees:

(a) Application fee.

(b) Search fee.

(c) Claims fee.

(d) Examination fee.

(e) Fee for expedited examination.

A filing fee must be paid upon application. This fee includes up to ten claims, after which a claims fee is charged for each additional claim.

2.45 As can be seen in Table 2.2, fees have remained unchanged over the last 10 years. Search fees which were introduced in 2006 when the Institute began to offer prior art searches for the first time. Thus, the introduction of search fee should not be interpreted in the context of a fee policy, but in the context of a broader policy which was intended to increase the range of services provided.

2.46 However, some small procedural fees have been abolished, including:

(a) A fee for file inspection (abolished 1 January 2007).

(b) A fee for the suspension of a patent application (abolished 1 January 2000).

(c) A printing fee (abolished 1 January 2000).

Table 2.2: Procedural fees set by the Institute (CHF), 1998-2009

Type of fee	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
1. Application fee	200	200	200	200	200	200	200	200	200	200	200	200
Search fee (searches are optional for the applicant)	500	500	500	500	-	-	-	-	-	-	-	
- from 11th claim for each additional claim	50	50	50	50	50	50	50	50	50	50	50	50
File inspection fee	-	-	-	200	200	200	200	200	200	200	200	200
Suspension of a patent application fee	-	-	-	-	-	-	-	-	-	-	100	100
Printing fee (per page of the manuscript)	-	-	-	-	-	-	-	-	-	-	100	100
2. Examination fee	500	500	500	500	500	500	500	500	500	500	500	500
- fee for expedited examination	200	200	200	200	200	200	200	200	200	200	200	200

2.47 Prior to 2006, the Institute did not offer applicants the option of a prior art search. The search was introduced only in 2006 and has been enshrined in Swiss patent law since 2008. The search is not compulsory and is not part of the examination process. The Institute acknowledges that the lack of a compulsory search makes Swiss patents relatively weak (e.g. compared to those granted by the EPO). This is deemed acceptable because the litigation system in Switzerland is regarded as strong and therefore the responsibility of patent scrutiny is partially shifted to the litigation system.

2.48 The Institute provides no fee subsidies to applicants, national or otherwise.

The rationale underlying procedural fee changes

2.49 The level of financial reserves held by the Institute has been a key factor underlying the changes that have been applied to both procedural and renewal fees over the past 10 years. Although the Institute had no reserves to speak of when they first became a self-financing entity, they now currently stand at approximately CHF 70 million (compared with CHF 54 million during the reporting period 2002/03).

2.50 In general however, as renewal fees make up the bulk of their income adjusting renewal fees therefore is considered a much more effective tool (compared with procedural fees) in steering the Institute's revenue.

2.51 Over the past year, the Institute has faced an income shortfall of approximately CHF 7 million. It was noted however that, given the quoted level of reserves, such loses are thought to be sustainable, in the short term at least. The Institute does not, however, envisage making any fee adjustments (renewal or procedural) in the next 2-3 years.

2.52 Introducing high up-front costs as a way to steer the applicants' behaviour (as opposed to a system based on renewal fees), would not be a politically acceptable concept in Switzerland. Further, even if the Institute were completely free to set fees on its own accord, it is doubtful that increasing procedural fees would have an appreciable effect on the quantity and the quality of patents, unless such fees were increased very substantially.

Renewal fees

2.53 Prior to 1997, renewal fees at the Institute were progressive, with fees increasing on a yearly basis from the third to the twentieth year. In 1997 the Institute adjusted the fees, making them entirely flat. Despite the move to the flat fee structure, the aggregate level of fees payable over the entire statutory life of a patent remained relatively constant (i.e. CHF 9,600 in 1996 and CHF 9,540 in 1997). Further, in January 1998, fees for years three and four were abolished (see Table 2.3 below) leading to a reduction of 17 per cent over the entire statutory life. ...

Table 2.3: Renewal fees set by the Institute (CHF), 1996-2009

Year	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2009	-	-	100	100	200	200	310	310	310	310	310	310	310	310	310	310	310	310
2008	-	-	100	100	200	200	310	310	310	310	310	310	310	310	310	310	310	310
Δ 2007/08	-	-	*0%*	*0%*	*-35%*	*-35%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
2007	-	-	100	100	310	310	310	310	310	310	310	310	310	310	310	310	310	310
Δ 2006/07	-	-	*-68%*	*-68%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
2006	-	-	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310
2005	-	-	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310	310
Δ 2004/05	-	-	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*	*-26%*
2004	-	-	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
2003	-	-	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
2002	-	-	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
2001	-	-	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
2000	-	-	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420	420
Δ 1999/00	-	-	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*	*-21%*
1999	-	-	530	530	530	530	530	530	530	530	530	530	530	530	530	530	530	530
1998	-	-	530	530	530	530	530	530	530	530	530	530	530	530	530	530	530	530
1997	530	530	530	530	530	530	530	530	530	530	530	530	530	530	530	530	530	530
Δ 1996/97	*430%*	*342%*	*279%*	*231%*	*165%*	*121%*	*89%*	*56%*	*33%*	*15%*	*-2%*	*-15%*	*-24%*	*-34%*	*-41%*	*-47%*	*-56%*	*-62%*
1996	100	120	140	160	200	240	280	340	400	460	540	620	700	800	900	1,000	1,200	1,400

2.54 As can be seen from Table 2.3 above and Figure 2.6 below, in contrast to a number of other national patent offices, the Swiss renewal payment structure is still predominantly flat – entirely so until 2006. As shown in Figure 2.6, the Institute made four changes to its renewal fee schedule after 1998 in addition to the introduction of a flat fee structure in 1997 and the abolition of the 3rd and 4th year renewal fee in 1998.

(a) *1999/00* – fees for all renewal years were reduced uniformly by approximately 21 per cent, preserving completely the flat fee structure.

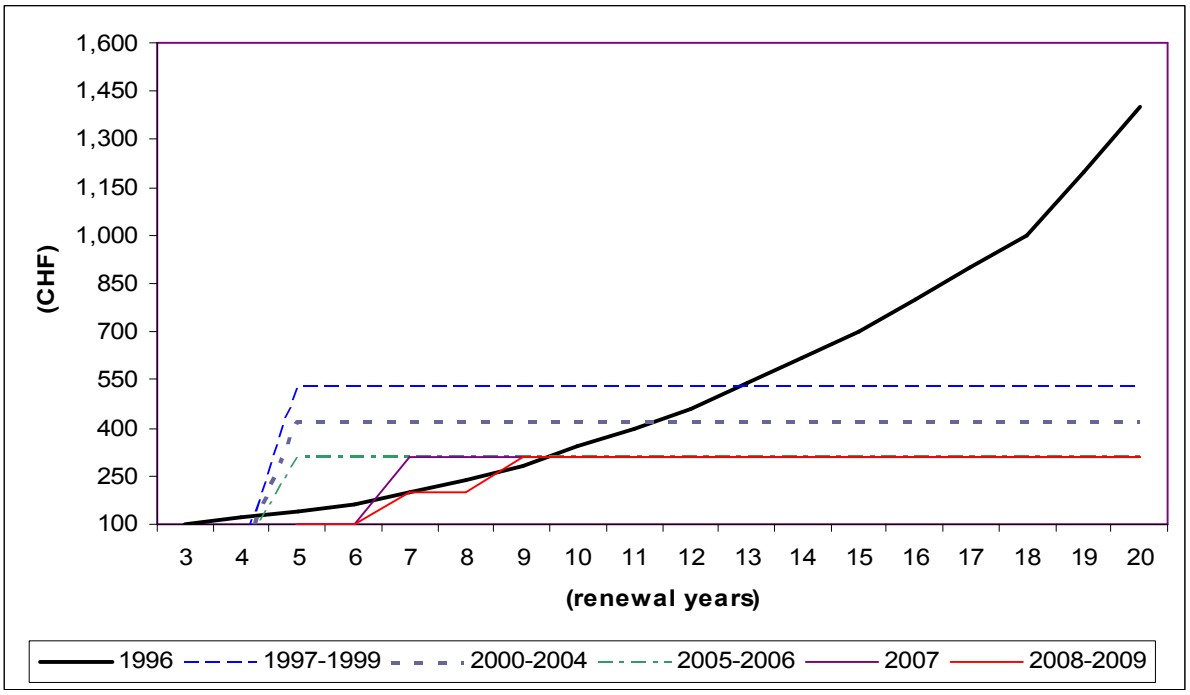
(b) *2004/05* – fees for all renewal years were reduced again by approximately 26 per cent, again preserving the flat structure.

(c) *2005/06* – in contrast to the other two changes, this particular change was a structural change, i.e. a reduction of approximately 68 per cent was applied to years 5 and 6 only.

(d) *2007/06* – similar to the latter case, the changes made in this year were also structural in nature, i.e. a reduction of approximately 35 per cent was applied to years 7 and 8 only, keeping all other fees intact.

2.55 While reducing renewal fees, the Institute has also been moving gradually towards a progressive renewal fee structure. Figure 2.6 below illustrates these changes.

Figure 2.6: Renewal fees changes (CHF), 1997-2009



Source: EPO

The rationale underlying renewal fee changes

2.56 As noted above, there have been three key features of renewal fee adjustments:

(a) the move to a flat fee structure between 1996 and 1997;

(b) the abolishment of the third and fourth year fee in 1998; and

(c) three reductions in fees, with the two most recent reductions being structural in nature.[15]

2.57 As noted above, prior to 1996, the renewal fee structure was actually progressive. The move to the flat fee structure was adopted to facilitate accounting practices in the Institute. Essentially, the flat fee structure is believed to facilitate the estimation of the expected revenue generated from all valid patents. This system is also believed to provide advantages for applicants, mainly in terms of comprehensibility and certainty etc.

2.58 Between 1997 and 1998, the Institute abolished renewal fees for years 3 and 4 on account of two main factors:

(a) the view that this would provide applicants with more time to consider the future of their patents; and

(b) avoiding further increases in reserve levels.

2.59 The principle factor that motivated the renewal fee reductions in 1999/00, 2004/05, and 2007/06 was the build up of reserves. In contrast to the first reduction in renewal fees, the two most recent reductions (i.e. in 2004/05 and 2006/07) were structural.[16] They re-introduced a degree of progressiveness, with the underlying intention of bringing the Swiss renewal fee structure more in line with those of most other patent offices.

[16] We define a structural change in this report as one in which there is at least a 30 per cent difference between the lowest and highest fee change across the renewal years.

Norwegian Industrial Property Office

Financing Structure and Fee Setting Role of the Norwegian Industrial Property Office

2.60 Since its establishment in 1911 the Norwegian Industrial Property Office (hereafter, "the NIPO) has been fully financed by the State. Norway became a Contracting state to the EPC on 1 January 2008.

2.61 The NIPO has separate income and cost budgets included in the State Budget for the Ministry of Trade and Industry (i.e. gross budgetting principle). Due to the effect of the EPC accession the drop in filings in 2009 and 2010 in particular, the proposed budget for 2010 (not yet finally decided upon by the NO Parliament) has higher budgetted costs than income. The income and cost budgets are, however, supposed to turn equal when the patent backlogs are reduced.

2.62 The setting of its fees is primarily the responsibility of the Ministry of Trade and Industry, to which the NIPO is, however, able to submit fee change proposals.

Recent Issues Facing the NIPO

2.63 The need to meet Government targets, and to address patent backlogs, and reductions in revenue and patent application, have been the main challenges facing the NIPO over the last 10 years.

Government targets

2.64 The main targets set by the government include the following:

(a) Financial targets – although the Office is publicly financed, it has to cover its costs over time.

(b) Reducing patent application backlogs.

(c) Quality and timeliness of services/products – the NIPO provides equal treatment to all applicants (in terms of quality).

(d) Ensure that ongoing measures are taken to maintain the alignment of its activities with those of the EPO, subject to National Law.

Patent backlogs

2.65 The reduction of backlogs has been cited as a key goal in most annual reports since 2002. A lack of human resources has been the principle diver of patent application backlogs. Anticipating fewer applications due to EPC accession, the NIPO did not increase the number of examiners in this period. This, combined with a high level of examiner turnover between 2005 and 2008, resulted in increasing backlogs. Patent fees (procedural and renewal) are not considered to have contributed to this particular

problem. The NIPO recognises that the increasing complexity of applications has contributed to backlogs in particular industry sectors.

Revenue/application reduction

2.66 Reductions in revenues have been a more recent problem (i.e. mainly from 2009), and have arisen mainly as a result of the abrupt drop in the number of PCT applications in the national phase. As a result, the NIPO's patent division is no longer considered the 'cash cow' that it had been prior to EPC accession.

Purposes of and Linkages between Procedural and Renewal Fees

2.67 The NIPO sets low procedural fees, especially for SMEs (defined as enterprises with less than 20-man years), in order to promote wide accessibility. The purpose of procedural fees is two-fold: some fees are meant to cover the costs associated with particular actions (e.g. filing fees for non-SMEs, search fees etc.), while other fees are meant to steer applicant behaviour (e.g. excess claims fees).

2.68 Renewal fees, on the other hand, are set to encourage the relinquishing of rights but also to subsidise procedural fees, so enabling the NIPO to cover its costs. According to the NIPO, approximately 80-85 per cent of the costs of processing a patent application – all overhead costs included – are covered by the procedural fees, with the remainder covered by renewal fees. This implies a relatively low high cross-subsidaisation rate. However, according to the NIPO, the term cross-subsidising may not be completely appropriate as for them, a cost coverage requirement implies that annual renewal fees must also be seen partly as payment for the search and examination work carried out during the application phase.

2.69 Renewal fees have a progressive structure to reflect the costs to society caused by market distortions resulting from the monopoly right conferred to the patent holder. When the NIPO makes proposals for fee changes, procedural and renewal fees are considered simultaneously, as they are linked by the NIPO's need to cover its costs.

2.70 According to the NIPO, renewal and procedural fees are considered as two elements of a total "package", since the guiding principle is to have a cheap entrance fee and a progressive cost for maintaining rights, thus stimulating the abandoning of unused patent rights.

Inflation adjustment policy

2.71 The NIPO has no formal policy of adjusting procedural or renewal fees to account for annual changes in inflation.

Current and Historical Description of Procedural and Renewal Fees and the Rationale Underlying Fee Changes

Procedural fees

2.72 The NIPO charges the following categories of procedural fees:

(a) Basic Application fee (paper and electronic).

(b) Search fee.

(c) Claims fee.

While the NIPO charges an excess claims fee it does not charge excess page fees. The examination fee is included in the search fee.

2.73 As can also be seen from Table 2.4, three changes have been made to procedural fees over the past decade:

(a) A 50 per cent increase in the search fee in 2002/03.

(b) A 10 per cent increase in the basic application fee in 2004/05.

(c) A three per cent increase in the search fee in 2004/05.

2.74 The search fee (which also incorporates the examination fee) was only charged in the present way from 2000 onwards. However, full searches and examination have always been carried out by the NIPO. Prior to 2000, an applicant paid just one combined basic and search fee, 1,000 NOK. In 2000 a separate search fee was introduced for larger enterprises, whereas the basic application fee was lowered for SMEs (and no search fee applied for this category).

2.75 The changes are also illustrated in Figure 2.7and in Figure 2.8 overleaf.

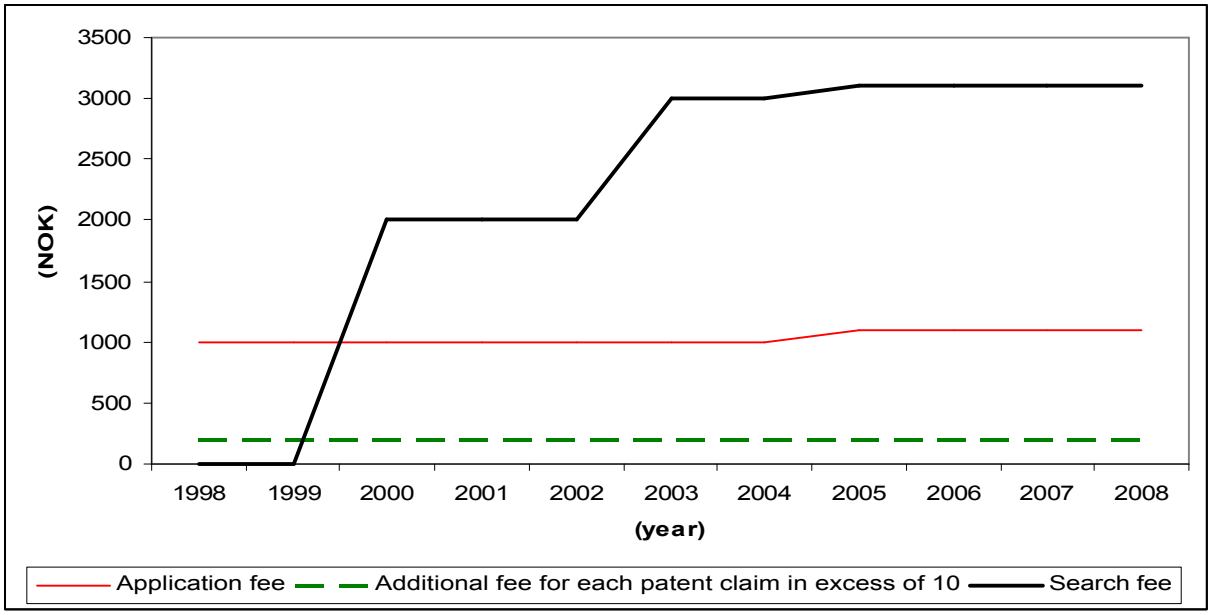
2.76 Since 2000, the NIPO has set a differentiated patent fee schedule for companies of 20 man years or less. In particular, while these companies are charged identical excess claims fees, they are charged a lower basic fee and pay no search fee. This does not however imply that SMEs do not have a search carried out as all applications at the NIPO are handled equally.

2.77 The differentiated fee was introduced to stimulate patent applications from SMEs. According to the NIPO, the differentiated fee schedule has not however, resulted in an increase in applications from SMEs. They noted that the most likely explanation for this is that for SMEs (and indeed any applicant), most of costs are likely to be in the form of attorney fees etc. and thus the patent fees themselves are only one relatively small component. While he acceded that there may be some political appeal for this differentiation of fees, the NIPO does not see the rationale for this and have recently therefore recommended that this differential be abolished.

Table 2.4: Procedural fees set by the NIPO (NOK), 1998-2009

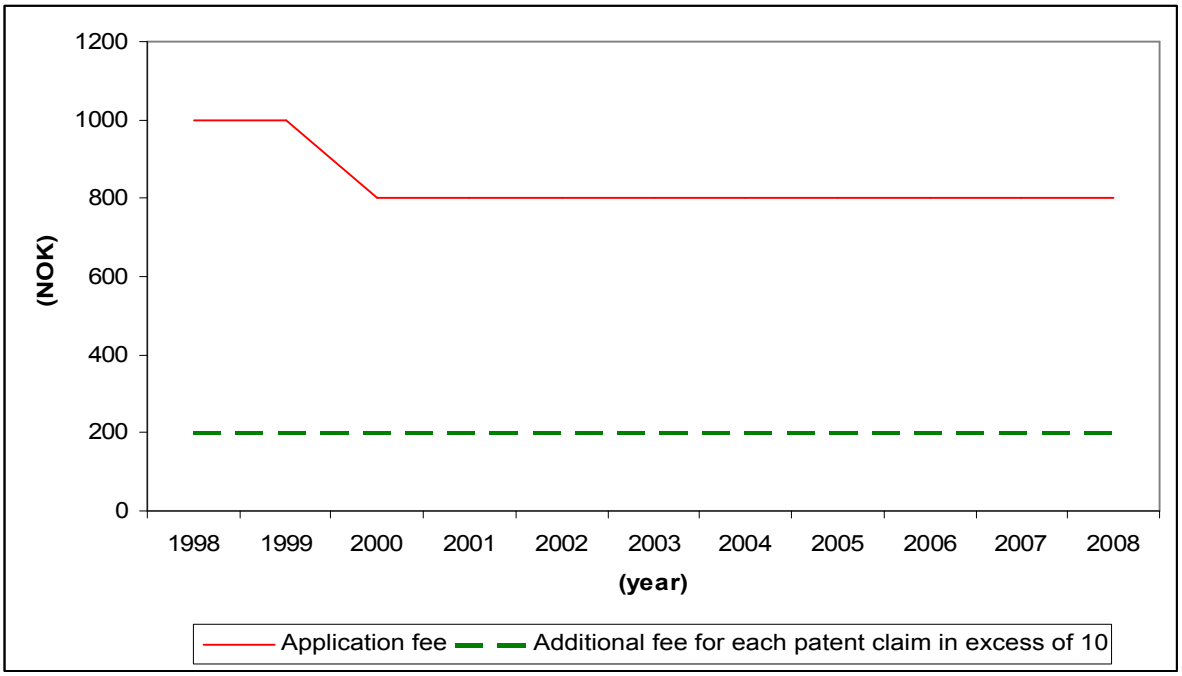
Type of fee	**2009**	**2008**	**2007**	**2006**	**2005**	***Δ 2004/05***	**2004**	**2003**	***Δ 2002/03***	**2002**	**2001**	**2000**	**1999**	**1998**
Application fees *(where the applicant is not a private person or a small company of less than 20 man years or less)*														
Basic Application fee	1100	1100	1100	1100	1100	*10%*	1000	1000	0%	1000	1000	1000	1000	1000
Search fee	3100	3100	3100	3100	3100	*3%*	3000	3000	*50%*	2000	2000	2000	-	-
Additional fee for each patent claim in excess of 10	200	200	200	200	200	*0%*	200	200	*0%*	200	200	200	200	200
Application fees *(where the applicant is a private person or a small company of less than 20 man years)*														
Basic Application fee	800	800	800	800	800	*0%*	800	800	*0%*	800	800	800	1000	1000
Search fee	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Additional fee for each patent claim in excess of 10	200	200	200	200	200	*0%*	200	200	*0%*	200	200	200	200	200

Figure 2.7: Changes in procedural fees (where the applicant is not a private person or a small company of less than 20 man years or less), 1998-2009



Source: Norwegian Industrial Property Office

Figure 2.8: Changes in procedural fees (where the applicant is a private person or a small company of less than 20 man years or less), 1998-2009



Source: Norwegian Industrial Property Office

2.78 Apart from the lower fees applied to SMEs, the NIPO does not provide any subsidies as a form of additional discount on the official fees.

The rational underlying procedural fee changes

2.79 The increases made to procedural fees (i.e. to the basic application and the search fee) during the period 2004/5 were aimed at increasing revenues. During this period the NIPO submitted proposals on fee changes. These proposals sought fee changes in order to bring them more in line with a cost recovery approach on each product area, but the most significant changes proposed were mainly concerned with an increase (of more than 10 per cent) in design and trademark fees. Thus a wider adjustment of patent fees (both procedural and renewal) was also implemented in order to achieve the financial goals intended by the original proposal.

2.80 More details were provided to us with regards to the fee adjustments that the NIPO initially suggested in the various areas in 2004 compared with those that were eventually implemented after input from the Ministry. The initial patent fee proposals included an increase only in the basic application fee for SMEs from NOK 800 to NOK1000. In the trademark and design areas, the major changes suggested were to increase the application fee, the search fee and fees for more than three classes in order to improve cost coverage at the Office. The suggested change would have lead to an increase in revenue of NOK 10 million, NOK 350 thousand and NOK 200 thousand for the Trademark, Design and Patent divisions respectively. The final fees, however, including changes to almost all fees in the patent area (including renewal fees), resulted in revenue increases of NOK 3 million, NOK 200 thousand and NOK 7-8 million for Trademark, Design and Patent divisions, respectively. The large revenue impact of a relatively small change in patent fees is attributable to the higher volumes of patent applications when compared to trademark and design applications.

2.81 Thus, due to the rejection of the NIPO's original proposal, the actual fee changes implemented, deviated considerably from the suggested changes that were initially proposed by the NIPO. This was an unprecedented event.

Renewal fees

2.82 As illustrated in Table 2.5 and Figure 2.9, the renewal fee structure applied by the NIPO is progressive, with seven fee bands. As can also be seen in the Table below, two changes were made to renewal fees over the past decade:

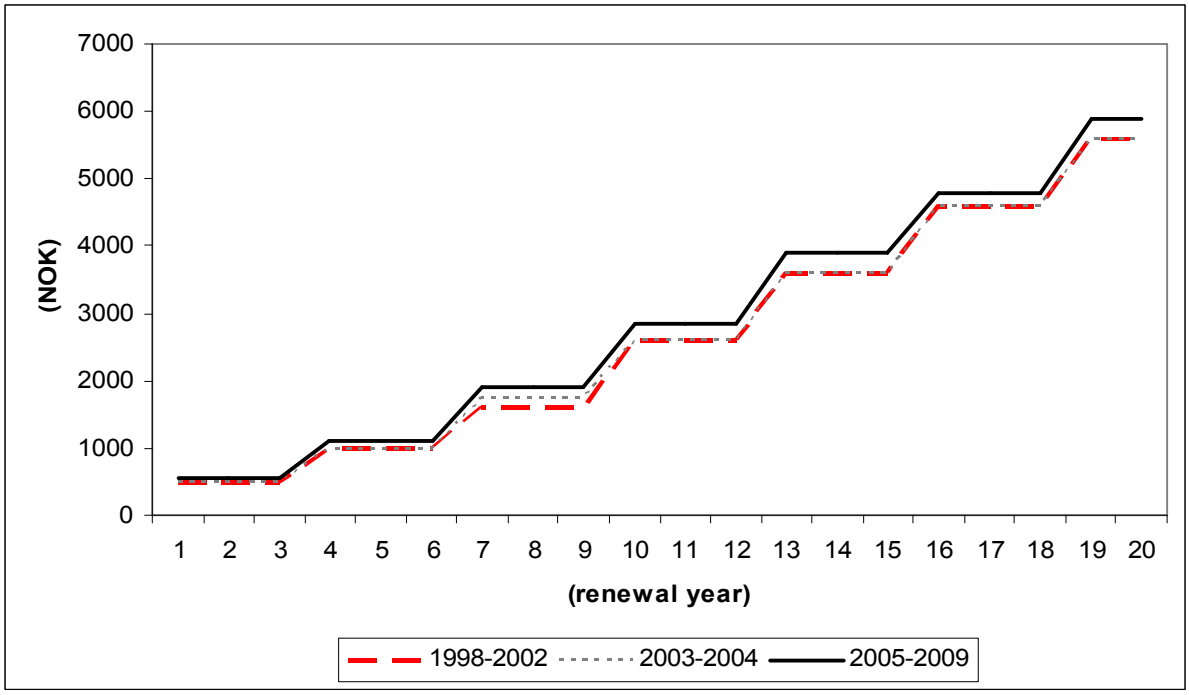
(a) an increase of nine per cent was applied to a small band of fees only (i.e. years 7 to 8), leaving the fees for all of the other renewal years unchanged; and

(b) Increases of between four and ten per cent were introduced in 2005/04 across different renewal years in the renewal fees.

Table 2.5: Renewal fees set by the NIPO (NOK), 1998-2009

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2009	550	550	550	1100	1100	1100	1900	1900	1900	2850	2850	2850	3900	3900	3900	4800	4800	4800	5900	5900
2008	550	550	550	1100	1100	1100	1900	1900	1900	2850	2850	2850	3900	3900	3900	4800	4800	4800	5900	5900
2007	550	550	550	1100	1100	1100	1900	1900	1900	2850	2850	2850	3900	3900	3900	4800	4800	4800	5900	5900
2006	550	550	550	1100	1100	1100	1900	1900	1900	2850	2850	2850	3900	3900	3900	4800	4800	4800	5900	5900
2005	550	550	550	1100	1100	1100	1900	1900	1900	2850	2850	2850	3900	3900	3900	4800	4800	4800	5900	5900
Δ 2004/05	*10%*	*10%*	*10%*	*10%*	*10%*	*10%*	*9%*	*9%*	*9%*	*10%*	*10%*	*10%*	*8%*	*8%*	*8%*	*4%*	*4%*	*4%*	*5%*	*5%*
2004	500	500	500	1000	1000	1000	1750	1750	1750	2600	2600	2600	3600	3600	3600	4600	4600	4600	5600	5600
2003	500	500	500	1000	1000	1000	1750	1750	1750	2600	2600	2600	3600	3600	3600	4600	4600	4600	5600	5600
Δ 2002/03	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*9%*	*9%*	*9%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*	*0%*
2002	500	500	500	1000	1000	1000	1600	1600	1600	2600	2600	2600	3600	3600	3600	4600	4600	4600	5600	5600
2001	500	500	500	1000	1000	1000	1600	1600	1600	2600	2600	2600	3600	3600	3600	4600	4600	4600	5600	5600
2000	500	500	500	1000	1000	1000	1600	1600	1600	2600	2600	2600	3600	3600	3600	4600	4600	4600	5600	5600
1999	500	500	500	1000	1000	1000	1600	1600	1600	2600	2600	2600	3600	3600	3600	4600	4600	4600	5600	5600
1998	500	500	500	1000	1000	1000	1600	1600	1600	2600	2600	2600	3600	3600	3600	4600	4600	4600	5600	5600

Figure 2.9: Changes in renewal fees (NOK), 1998-2009



Source: Norwegian Industrial Property Office

The rational underlying renewal fee changes

2.83 As noted above, renewal fees were subject to two changes over the last 10 years. The renewal fee changes which came into effect in 2004/05 are according to the NIPO, thought to have been based on the same issues identified above (i.e. political reasons). With regards to the earlier fee change in 2002/03 this was far less substantial and did not apply to all renewal years. It is believed that this particular adjustment in renewal fees was implemented in order to make the stepwise increases more gradual in the first years, yielding steps of NOK 750 (i.e. the increase between year 6 and 7), NOK 850 (the increase between year 9 and 10) and NOK 1000 (the increase between year 12 and 13), instead of step increases of NOK 600, NOK 1000 and NOK1000.

2.84 Earlier this year, the NIPO submitted new proposals to the Ministry recommending that changes be made to renewal fees. More specifically, they have proposed that renewal fees be changed from their current structure (i.e. a stepwise progression) towards a more

linear progression (i.e. where fees will increase year on year with constant yearly increases). It is believed that such a fee structure would increase the simplicity of the system and would help to facilitate for example, the forecasting activities of the office. Research carried out by the NIPO indicates that patents' mortality rate is fairly constant (about 10 per cent each year), and identified a discernable increase in the drop-out rate only at year 19 and 20 (13 per cent and 16 per cent, respectively) which coincide with a significant jump in renewal fees[17]. This is one reason why they do not anticipate that changing the current structure to a more linear progression would have an appreciable impact on the mortality rate. Although the mortality rate appears to be relatively constant under the current progressive structure, the possibility that it may be sensitive to changes in economic circumstance (i.e. by making applicant more sensitive to fees) is acknowledge by the NIPO.

The Netherlands Patent Office

Financing Structure and Fee Setting Role of the Netherlands Patent Office

2.85 The Netherlands Patent Office is fully financed by the State and has been since its establishment in 1912. Netherlands became a Contracting state to the EPC on 7 October 1997.

2.86 The Netherlands Patent Office is an Agency of the Ministry of Economic Affairs, which is responsible for determining its budget. The Ministry is also responsible for determining (unilaterally) the fees charged by the Netherlands Patent Office, which are themselves set within the regulation for patent law. While the fees are set by the Ministry of Economic Affairs, all fee income goes directly to the Treasury and the amount does not affect the annual budget of the Office.

2.87 With respect to the Office's fee income (which goes directly to the Treasury), 94 per cent of it is made up by renewal fee income while 6 per cent is accounted for by procedural fee income.

Recent Issues Facing the Netherlands Patent Office

2.88 Meeting government targets has been one of the main challenges facing the Netherlands Patent Office over the past 10 years. One of the key challenges for example, has been to increase the general level of awareness of the patent system, especially among SMEs.

[17] These forecasts are obtained through a very simple spreadsheet model.

2.89 Increasing the degree of awareness is a key function of the Netherlands Patent Office, with approximately half of the office staff contributing to this aim. The other half concentrates on carrying out search and granting procedures. Thus, the Netherlands Patent Office carries out bi-annual reviews of patent customers and SMEs, in order to measure and evaluate the level of awareness. Ensuring a sufficient level of awareness is in many ways more important an issue for the Netherlands Patent Office than processing patent applications.

Strategic patenting

2.90 In the Dutch patent system, applicants are given a 12-month period in which to request a search for prior art. This is one avenue through which companies are thought to be able to extend the application period for strategic reasons. However, strategic behaviour is not regarded as a particularly pertinent issue for Netherlands Patent Office.

2.91 While Netherlands Patent Office acknowledges that procedural fees could be increased with a view to steering applicant behaviour, a significant increase in procedural fees is not something that would be politically acceptable in the Netherlands.

Purposes of and Linkages between Procedural and Renewal Fees

2.92 The overall fee system applied by the Netherlands Patent Office is completely in line with the 'traditional' approach taken by many NPOs.

2.93 The Netherlands Patent Office's overarching aim is to maintain a low entry threshold whilst ensuring that patent holders are provided enough incentive to limit the length of time for which they seek to maintain their patents. Factors that are considered to be of less relevance in determining procedural fees include: maximising office revenues; managing patent application backlogs; and screening patent applications to ensure a minimum level of quality.

2.94 Renewal fees, on the other hand, increase progressively during the latter years of the statutory life in order to make it increasingly less attractive to maintain a patent.

2.95 With regards to the linkages between renewal and procedural fees, the Netherlands Patent Office considers them to be two components of a single fee policy as opposed to two separate policy tools.

2.96 Renewal fees subsidise procedural fees to some extent. However, as the total fee income of the Office is €32m while their budget expenditure is €16m (these are 2009 figures), and because the income from fees is completely independent of their annual budget, the Netherlands Patent Office does not calculate the level of cross-subsidisation between renewal and procedural fees.

Inflation adjustment policy

2.97 The Netherlands Patent Office does not have a policy of adjusting either procedural or renewal fees in line with inflation, because they have no financial requirement to do so.

System changes over the last 30 years

2.98 The introduction of the European Patent Office had a huge impact on the Dutch National Procedure. The majority of Dutch important companies (Phillips, Unilever, etc) in the 80's preferred to use the direct route to the EPO instead of having a first filing at the Dutch Patent Office. This might was partially due to the fact that the substantive examination at the Dutch Patent Office was even stricter in the 80's than the new created examination at the EPO.

2.99 In response to the dramatic fall in the number of applications for national patents (which migrated to the EPO), in 1995 a new Dutch Patent Act introduced a system of Dutch registration patents in which two types of 'registration' patents – i.e. patents that are granted on the basis of an application only – were established:

(a) A 6-year patent which required no prior art search or examination; and

(b) A 20-year registration patent for which a prior art search is necessary, although the applicant is not obliged to modify the application to reflect the results of the search. Differently from patent applications filed to the EPO, patents applied for in the Netherlands are not examined against the requirements of novelty, inventive step, and industrial application.

2.100 The new Dutch patent system was intended as a complementary system to the EPO (which was seen as inaccessible for SMEs), where weaker patents (especially the 6-years patents) would be complemented by a strong litigation system to enforce patent rights. Thus, one of the main aims of this system was to increase the accessibility for SMEs. Although SMEs appear to be a priority for the Netherlands Patent Office, they do not provide a separate (and reduced) fee schedule for SMEs and this is partly due to the belief that such a differentiated fee schedule would not induce the intended effects, as many companies would respond by setting up SMEs to take advantage of the reduced fee.

2.101 In 2008 however, following changes were made to Patent Law, the 6-year registration patent was abolished. This abolition came largely on the back of a 2004-5 evaluation of the system, which concluded that the 6-year registration patent created too much uncertainty (i.e. in terms of litigation proceedings etc.) to be worth having. At the time of abolition, there were 600 6-year patents. In response to this, the Netherlands Patent Office expected a substitution rate of 75 per cent (i.e. 450) into the 20-year registration patent. In practice, however, the number of 20-year registration patents increased by 900 – almost twice as many as they had anticipated. This was one of the main factors behind the significant increase in the number of applications since mid-2008 (and the corresponding increase in the number of searches carried out in-house).

2.102 Other factors that could have been responsible for this increase are:

(a) The reduction in procedural fees in 2008 (i.e. application filings increased from €90 to €120, the electronic filing fee fell from €90 to €80, and the national search fee fell from €340 to €100).

(b) Allowing applications to be filed in English.

2.103 The latter factor is considered particularly important; one-third of all applications are now filed in English. Further, the growth in applications appears to have come from Dutch applications. Thus, according to the Netherlands Patent Office's own calculations, the increases in the number of filings in English appear to have come mainly from Dutch applicants. It is important to stress that, under the new rules, only the conclusions of the prior search have to be translated into Dutch, which reduces the overall costs of translation significantly, especially in the event that an applicant decides to make a second filing to the EPO.

2.104 The Netherlands Patent Office is relatively small and therefore does not have all the knowledge and man-power required to carry out all of the requested searches. The number of examiners was increased both this and last year, but recruitment in this area is still considered a problem. Even where examiners are hired, it can take up to two years before they achieve the required productivity levels. Further, given the size of the Office and the small number of examiners, it is constrained in its ability to coverall fields of technology and activities with regards to conducing searches.

2.105 This issue has, and is currently being addressed by an agreement with the EPO whereby the Office out-sources all of its international patent applications and some of its national applications to the EPO, and lets the EPO produce a search and written opinion for these applications. In general, however, most national searches are carried out by the Office itself. For every search that the EPO carries out on behalf of the Office, the EPO is paid € 2136, therefore the Netherlands Patent Office subsidises EPO searches.

2.106 While the original targets in this area were to retain approximately 75 per cent of searches in-house and to out-source approximately 25 per cent, this proved difficult to achieve. The targets were therefore recently changed to two-thirds and one-third respectively. Outsourcing to the EPO allows the Netherlands Patent Office to guarantee high quality standards and at the same time to minimise excessive workloads and the backlogs associated with them. The Office do subsidizes these EPO searches, by paying the EPO more than the fee they receive from the applicant.

Current and Historical Description of Procedural and Renewal Fees and the Rationale Underlying Fee Changes

Procedural fees

2.107 The Netherlands Patent Office charges the following categories of procedural fees:

(a) A filing fee.

(b) A national search fee.

(c) An international search fee.

2.108 These fees and the changes in them over the last 10 years are set out in Table 2.6 below.

Table 2.6: Procedural fees set by Netherlands Patent Office (NLG for 1998-2001, EUR for 2002-2009), 1998-2009

Type of fee	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
Filing an application	120	120	90	90	90	90	90	90	200	200	200	200
Filing a patent electronically	80	80	90	90	-	-	-	-	-	-	-	-
Fee for a national search into the state of the art	100	100	340	340	340	340	340	340	750	750	1000	1000
Fee for an international search into the state of art	794	794	794	794	794	794	794	794	1750	1750	2000	2000

2.109 The Netherlands Patent Office does not charge excess page or claims fees. Changes to procedural fees have only been made once since 1998 and all of these took place in 2008. Reductions were made to all fees except those for an international search. The most considerable reduction concerned national search fees (from €340 to €100).

2.110 While the official fees are set as above, the Netherlands Patent Office does offer subsidies to applicants via the use of 'patent vouchers'. Patent vouchers were introduced in 2008 and represent a from of subsidy to cover patent related costs, such as e.g., costs for patent drawings, patent translations, PCT applications, patent taxes etc. Costs secondary to the patent applications cannot be compensated.

2.111 There are two types of patent vouchers: one of the value of € 7,500 (excluding VAT) and for which patent applicant must contribute for one third of the total value, and on of the value of € 2,500 (excluding VAT), and for which no additional requirements apply.

2.112 In order for a company to be eligible to the use of patent vouchers, the following conditions must apply: (1) the company must have a registered office in the Netherlands; (2) the company must have a maximum head count of 250FTE and a maximum turnover of € 50 million. Firma can apply for and use patent vouchers only once, and a voucher can be rejected if it is not uses for the patent related costs mentioned above.

Rationale underlying procedural fee changes

2.113 The reduction of national search fee and filing fee, as well the introduction of 'patent vouchers', were intended to make the system more attractive to prospective applicants.

The reduction in the above procedural fees coincided with the introduction of more progressive renewal fees, which were introduced partly in order to increase the incentive to maintain a patent for a shorter period (the average life of which in the Netherlands is approximately 10 years).

Renewal fees

2.114 As can be seen from Table 2.7 and in Figure 2.10 and Figure 2.11, renewal fees applied by the Netherlands Patent Office are progressive in nature, with fees rising on a yearly basis. The Netherlands Patent Office has made changes to renewal fees on two occasions:

(a) fees were increased by two per cent across the board in 1999/98, thereby leaving the structure unchanged; and

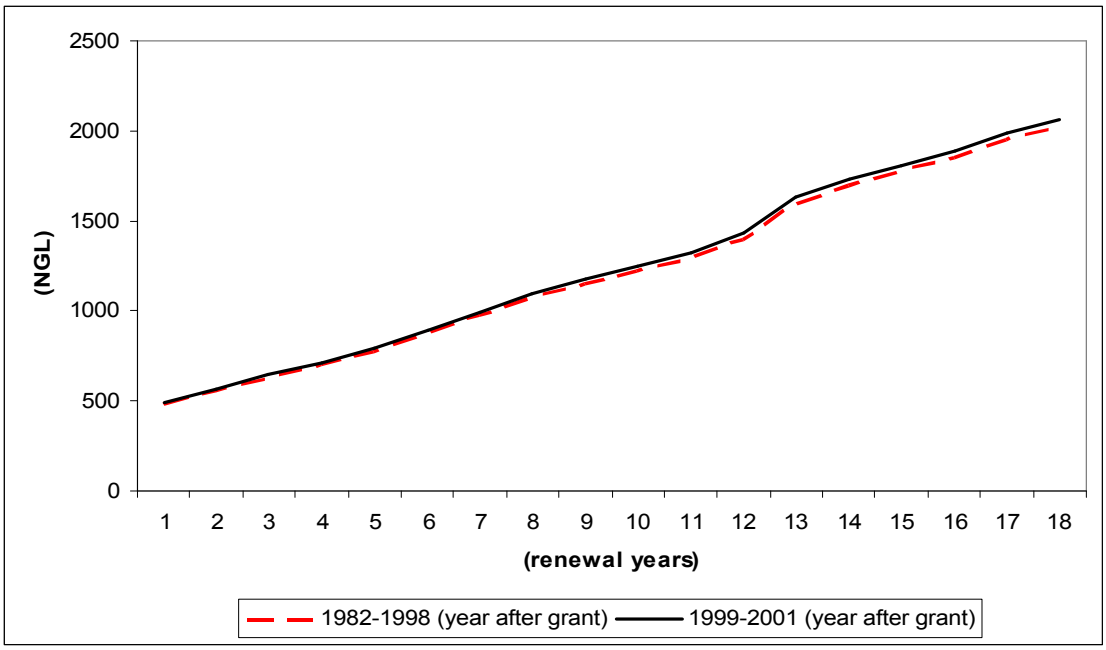
(b) fees were increased in 2002/03 – by lower amounts in the earlier years and higher in the later years (ranging from nine to 18 per cent).

2.115 Changes have recently been made to how the date of the first renewal fee is calculated. Prior to 2008, the first renewal year was determined as the first year after the grant of the patent. From 2008, however, an applicant became liable for paying their first renewal fee four years after the filing date. Further, under this new system the initial renewal fees start from a lower value but progress at a faster rate than under the previous system.

Table 2.7: Renewal fees set by the Netherlands Patent Office (NGL for 1982-2001, EUR for 2002-2009), 1982-2009

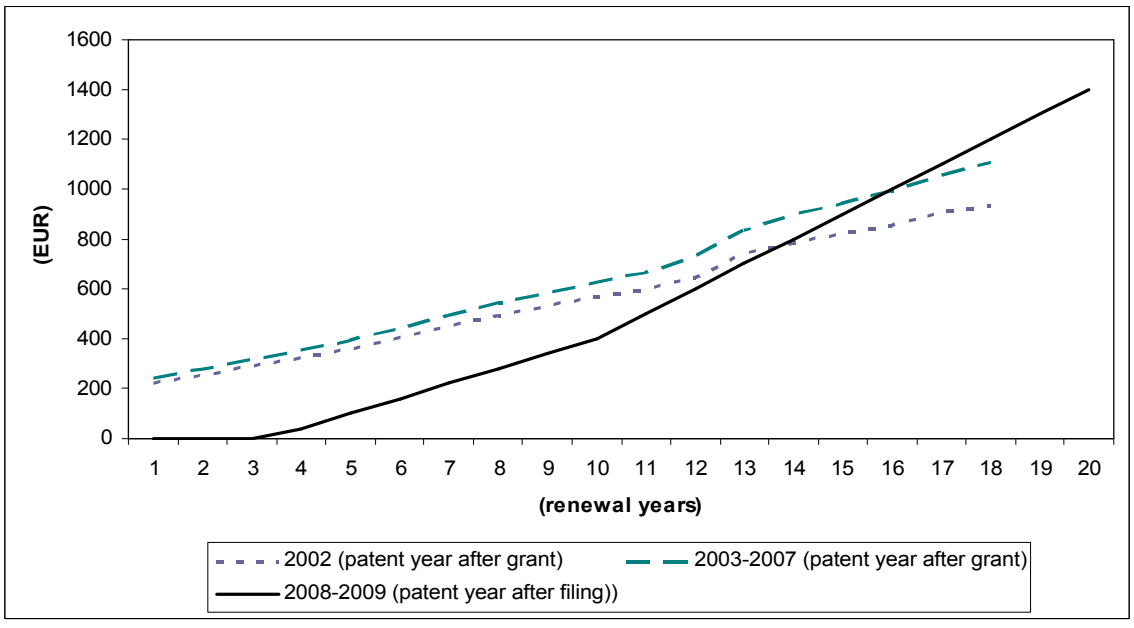
Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Patent year (after filing)																				
2009	-	-	-	40	100	160	220	280	340	400	500	600	700	800	900	1000	1100	1200	1300	1400
2008	-	-	-	40	100	160	220	280	340	400	500	600	700	800	900	1000	1100	1200	1300	1400
Patent year (after grant)																				
2007	242	279	318	353	390	443	492	541	581	624	667	726	835	897	944	992	1057	1106	-	-
2006	242	279	318	353	390	443	492	541	581	624	667	726	835	897	944	992	1057	1106	-	-
2005	242	279	318	353	390	443	492	541	581	624	667	726	835	897	944	992	1057	1106	-	-
2004	242	279	318	353	390	443	492	541	581	624	667	726	835	897	944	992	1057	1106	-	-
2003	242	279	318	353	390	443	492	541	581	624	667	726	835	897	944	992	1057	1106	-	-
Δ 2002/03	9%	9%	9%	9%	9%	9%	9%	9%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%		
2002	222	256	292	324	358	406	451	496	533	567	601	648	739	787	821	855	903	937	-	-
2001	490	565	645	715	790	895	995	1,095	1,175	1,250	1,325	1,430	1,630	1,735	1,810	1,885	1,990	2,065	-	-
2000	490	565	645	715	790	895	995	1,095	1,175	1,250	1,325	1,430	1,630	1,735	1,810	1,885	1,990	2,065	-	-
1999	490	565	645	715	790	895	995	1,095	1,175	1,250	1,325	1,430	1,630	1,735	1,810	1,885	1,990	2,065	-	-
Δ 1998/99	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	*2%*	-	-
1998	480	555	630	700	775	875	975	1,075	1,150	1,225	1,300	1,400	1,600	1,700	1,775	1,850	1,950	2,025	-	-

Figure 2.10: Renewal fee changes (NGL), 1982-2001



Source: EPO

Figure 2.11: Renewal fee changes (EUR), 2002-2009



Source: EPO

Rationale underlying changes in renewal fees

2.116 Two factors are thought to have prompted the changes that have been made to renewal fees over the last decade or so:

(a) 1998/99 changes – a one-off adjustment for inflation; and

(b) 2002/03 changes – adjusting the structure of renewal fees to make them more progressive (and thereby providing stronger incentives to allow patents to lapse).

2.117 The principle reason for changing the definition of the beginning of a patent 'life' was to bring the Dutch patent system more in line with those of other national patent offices.

2.118 At present, the Netherlands Patent Office does not see any challenges to the system it currently applies and does not expect to change it, at least in the next 3-4 years.

The Hungarian Patent Office

Financing Structure and Fee Setting Role of the Hungarian Patent Office

2.119 The Hungarian Patent Office is self-financed and has been so since 1 January 1970, when the entry into force of the Patent Act of 1969 gave a new foundation for the National Inventions Office (renamed the Hungarian Patent Office in the 1990s). Hungary became a Contracting state to the EPC on 1 January 2003.

2.120 Fee setting is only under the partial control of the Hungarian Patent Office. Based on the provisions set out in the Patent Act, in order to adjust fees, the President of the Hungarian Patent office presents a proposal (underpinned by an economical analysis) to the Minister who – if he agrees – issues the decree introducing the proposed changes. To date, no fee proposals put forward to the Minister have been rejected.

2.121 The main sources of revenue of the Hungarian Patent Office are patent renewal and trademark fees.

Recent Issues Facing the Hungarian Patent Office

2.122 Among the main challenges faced by the Hungarian Patent Office over the last 10 years have been reduced revenues, and patent backlogs, and the need to meet government targets.

Revenue reductions

2.123 Revenue reductions have arisen largely as a result of the entry into the EPC and the consequent migration of applicants to the EPO. However, the Hungarian Patent Office has been able to mitigate these reductions by generating additional revenues, using its spare capacity to carry out – for example – searches for other patent offices with which it has cooperative agreements.

Backlogs

2.124 Prior to joining the EPC, backlogs were a problem for the Hungarian Patent Office. The migration of applications to the EPO after Hungary became an EPC Member State reduced the backlog problem considerably. Prior to joining the EPC, approximately 50-60

per cent (and sometimes even 65 per cent) of non-PCT applications were foreign. Nowadays, filings originate mainly from Hungarian nationals.

2.125 The increasing complexity of applications contributed to the backlogs. Measures to discourage strategic delays have reduced backlogs. The only field where the backlog problem might still be material is the pharmaceutical sector, where strategic behaviour is a factor (see below).

Strategic patenting

2.126 Strategic patenting is regarded as a problem for the Hungarian Patent Office, which is one of the reasons why excess claims fees were introduced.

2.127 With regards to examination, the Hungarian Patent Office has a number of provisions in place to ensure that examinations are not subject to unnecessary delay, e.g. through offering applicants the possibility to accelerate their publication process. This has contributed to the fact that nowadays applicants at the Hungarian Patent Office regard their patent pendency period as relatively low: approximately 30-40 months.

Purposes of and Linkages between Procedural and Renewal Fees

2.128 In general, the fee policy of the Hungarian Patent Office is based on the 'traditional' system of charging low entry fees to ensure wide access opportunities (In Hungary, this is specially important for SMEs), and progressive renewal fees so that successful patents pay more and uneconomic patents are not renewed.

2.129 From the Hungarian Patent Office's viewpoint procedural and renewal fees are determined largely according to two key factors: its budgetary requirements (i.e. by virtue of its self-financing structure) and inflation changes. As a self-financing body, the Hungarian Patent Office must ensure that overall it covers its costs. Procedural fees are set proportionately with the costs (driven mainly by working hours) incurred during the processing of applications, however at a level far from being cost covering. Further, some procedural fees (e.g. excess claims fees) are used to steer applicant behaviour in certain ways. Managing backlogs is considered a relatively less important factor in determining the way in which procedural fees are set.

2.130 Renewal fees on the other hand serve two purposes. First, renewal fees subsidise procedural fees in order to ensure that the up-front fees are not prohibitively high in a way that restricts accessibility. Second, renewal fees are aimed at influencing the behaviour of rights holders, namely to ensure that they are faced with the right incentives to relinquish their rights if these rights are not exploited or are no longer of economic value. This reflects the recognition that monopoly rights give rise to market barriers and therefore impose social costs which can only be justified if the rights are exploited (and only for as long as they confer some economic value). In terms of the way in which these fees are set therefore, the Hungarian Patent Office applies a progressive structure to reflect the life of a patent (i.e. in terms of investment returns).

Inflation adjustment policy

2.131 Fees (both procedural and renewal) are not raised annually at the Hungarian Patent Office to reflect changes in inflation. However, when adjustment of these fees takes place (in irregular, 2-4 year intervals), inflation is taken into account as a factor influencing the extent of the raise.

Current and Historical Description of Procedural and Renewal Fees and the Rationale Underlying Fee Changes

Procedural fees

2.132 The Hungarian Patent Office charges the following type of procedural fees:

(a) Filing fee.

(b) Search fee.

(c) Progressive fees for excess claims.

(d) Progressive fees for excess pages.

(e) Examination fee.

(f) Divisional application fee.

(g) Progressive fees for amendment requests.

(h) Progressive fees for the extension of time limits

2.133 The Hungarian Patent Office charges different fees according to whether *not* the applicant is the same person as the inventor (all procedural fees quoted here apply only to applications where the applicant and the inventor are not the same person).

2.134 As the list above shows, the system of procedural fees of the Hungarian Patent Office is relatively sophisticated and includes some typologies of fees that are not charged by any of the other NPOs covered in this review. The evolution of these fees is displayed in the tables below.

Table 2.8 Filing and search fees set by the Hungarian Patent Office (HUF), 1998-2009

Type of fee	2009	2008	2007	2006	2005	Δ*2004/05*	2004	Δ*2003/04*	2003	Δ*2002/03*	2002	2001	2000	1999	1998
National Filing															
Filing and search fee plus:	34000	34000	34000	34000	34000	*6%*	32000	*33%*	24000	*0%*	24000	24000	24000	24000	24000
- fee for the 11th to the 20th claim (each)	1700	1700	1700	1700	1700	*6%*	1600	*14%*	1400	*17%*	1200	1200	1200	1200	1200
- fee for the 21st to the 30th claim (each)	3400	3400	3400	3400	3400	*6%*	3200	*14%*	2800	*17%*	2400	2400	2400	2400	2400
- fee for each additional claim	5100	5100	5100	5100	5100	*6%*	4800	*14%*	4200	*17%*	3600	3600	3600	3600	3600
PCT national phase															
Filing fee where Hungary is the designated State plus:	34000	34000	34000	34000	34000	*6%*	32000	*33%*	24000	*0%*	24000	24000	24000	24000	24000
- fee for the 11th to the 20th claim (each)	1700	1700	1700	1700	1700	*6%*	1600	*14%*	1400	*17%*	1200	1200	1200	1200	1200
- fee for the 21st to the 30th claim (each)	3400	3400	3400	3400	3400	*6%*	3200	*14%*	2800	*17%*	2400	2400	2400	2400	2400
- fee for each additional claim	5100	5100	5100	5100	5100	*6%*	4800	*14%*	4200	*17%*	3600	3600	3600	3600	3600
Filing fee where Hungary is an elected state plus:	17000	17000	17000	17000	17000	*6%*	16000	*33%*	12000	*0%*	12000	12000	12000	12000	12000
- fee for the 11th to the 20th claim (each)	850	850	850	850	850	*6%*	800	*14%*	700	*17%*	600	600	600	600	600
- fee for the 21st to the 30th claim (each)	1700	1700	1700	1700	1700	*6%*	1600	*14%*	1400	*17%*	1200	1200	1200	1200	1200
- fee for each additional claim	2550	2550	2550	2550	2550	*6%*	2400	*14%*	2100	*17%*	1800	1800	1800	1800	1800

2.135 The filing and search fees charged by the Hungarians Patent Office differ according to the filing route chosen by the applicant. Different fee amounts apply according to whether the filing route chosen is PCT or National, and amongst PCT applications a further distinction is made according to whether the Hungarian Patent Office is the designated or the elected office.

2.136 The excessive claim fees charged by the Hungarian Patent Office are based on a system which is unique when comported to those in place amongst the other NPOs reviewed. While some of the other NPOs (e.g. Switzerland, Norway and Italy) charge excess claims fee based on a two-tier system, the Hungarian Patent Office applies a progressive fee structure composed of three different bands.

2.137 All the fees considered in the table above (filing and search fees, plus excessive claims fees) increased of 33 per cent during the period the period 2002-2004. However, while for filing and search fees this increase was obtained though a single fee change in 2004, in the case of excessive claims fee the increase was achieved in two steps, i.e. a first increase of 17 per cent in 2003, and a second increase in increase of 33 per cent in 2004.

2.138 Finally, all fees reported in Table 2.8 were subject to a moderate increase (of approximately 6 per cent) in 2005 to account for the inflation rate realised in Hungary in that same year.

Table 2.9 Fees for Written Opinion and Examination (HUF), 1998-2009

Type of fee	**2009**	**2008**	**2007**	**2006**	**2005**	**Δ*2004/05***	**2004**	**Δ*2003/04***	**2003**	**Δ*2002/03***	**2002**	**2001**	**2000**	**1999**	**1998**
Written opinion in relation to the novelty search fee	-	-	28000	28000	28000	-	-	-	-	-	-	-	-	-	-
Examination fee	58000	58000	58000	58000	58000	*7%*	54000	*35%*	40000	*11%*	36000	36000	36000	36000	36000
Examination fee where written opinion has been requested	-	-	40000	40000	40000	-	-	-	-	-	-	-	-	-	-
Fee for granting and printing	32000	32000	32000	32000	32000	*7%*	30000	*25%*	24000	*9%*	22000	22000	22000	22000	22000
plus for the 6th and each page in excess of the description and drawings	3200	3200	3200	3200	3200	-	3000	*25%*	2400	*20%*	2000	2000	2000	2000	2000

2.139 As the table above shows, the major fee changes took place in the period 2002-2004. In that period the overall increases were 50 per cent for examination fee and excess pages fee, and 36 per cent for grant fees. These overall increases were obtained with two separate fee changes, the first one in 2003 and the second one in 2004.

2.140 Finally, all fees reported in Table 2.9 were subject to a uniform inflation-adjustment increase (of approximately 7 per cent) in 2005 to account for the inflation rate realised in Hungary in that same year.

2.141 In the period 2005-2007 the Hungarian Patent Office introduced the possibility to request a written opinion in relation of the novelty of search and charged this service was charged a fee equal HUF 28.000. Consequently, a discounted examination fee (HUF 40.000 instead of HUF 58.000) was offered to applicants who had previously requested a written opinion.

Table 2.10: Fees for Amendments and Extension of Time Limits (HUF), 1998-2009

Fees for amendments	**2009**	**2008**	**2007**	**2006**	**2005**	**Δ*2004/05***	**2004**	**Δ*2003/04***	**2003**	**Δ*2002/03***	**2002**	**2001**	**2000**	**1999**	**1998**
- for the first request	4800	4800	4800	4800	4800	*7%*	4500	*50%*	3000	*0%*	3000	3000	3000	3000	3000
-for the second request	8500	8500	8500	8500	8500	*6%*	8000	*33%*	6000	*0%*	6000	6000	6000	6000	6000
-for any further request	16000	16000	16000	16000	16000	*7%*	15000	*25%*	12000	*0%*	12000	12000	12000	12000	12000
plus for each subsequent claim if the amendment involves the inclusion of claims															
-fee for the 11th to the 20th claim (each)	1700	1700	1700	1700	1700	*6%*	1600	*14%*	1400	*17%*	1200	1200	1200	1200	1200
- fee for the 21st to the 30th claim (each)	3400	3400	3400	3400	3400	*6%*	3200	*14%*	2800	*17%*	2400	2400	2400	2400	2400
- fee for each additional claim	5100	5100	5100	5100	5100	*6%*	4800	*14%*	4200	*17%*	3600	3600	3600	3600	3600
Fees for extension of time limits															
- for the first request	4800	4800	4800	4800	4800	*7%*	4500	*50%*	3000	*0%*	3000	3000	3000	3000	3000
- for the second request	8500	8500	8500	8500	8500	*6%*	8000	*33%*	6000	*0%*	6000	6000	6000	6000	6000
- for any further request	16000	16000	16000	16000	16000	*7%*	15000	*25%*	12000	*0%*	12000	12000	12000	12000	12000
Fee for request for the continuation of the procedure	35000	35000	-	-	-	-	-	-	-.	-	-	-	-	-	-

2.142 The table above indicates that the Hungarian Patent Office has a rather sophisticated tariff structures in order to deal with those activities (i.e. amendments and extensions of time limits) that are responsible in extending the patent pending period.

2.143 The most interesting featured is probably represented by the progressive structures of the fees for amendments and the fees for the request of extensions of the time limits. In fact, these fee amounts are lower for the first amendment/request, but do progressively increase up to the third amendment/request. Moreover, when amendments involve the inclusions of additional claims these are charged with the same excessive claims fee structures that applies to the filing stage (see Table 2.8)

2.144 Like for other fees the major changes took place between 2002 and 2004. The overall change in this period is represented by: a 50 per cent increase in the fee for a first amendment/request, a 33 per cent increase in the fee for a second amendment/request, and a 25 per cent increase in the fee for a third amendment/request. Therefore, these fee changes implied an overall decrease in the progressiveness of the fee structure as a whole. The changes in excess claims fees are exactly the same as those indicated in Table 2.8.

2.145 Finally, all fees were subject to a further, and less significant, inflation-adjustment increase in 2007.

Table 2.11: Fees for Divisional Applications (HUF), 1998-2009

Fee for request for the division of a patent applications for each further application	**2009**	**2008**	**2007**	**2006**	**2005**	**Δ*2004/05***	**2004**	**Δ*2003/04***	**2003**	**Δ*2002/03***	**2002**	**2001**	**2000**	**1999**	**1998**
- if filed prior to the request for substantive examination	34000	34000	34000	34000	34000	*6%*	32000	*33%*	24000	*0%*	24000	24000	24000	24000	24000
- if filed following the request for substantive examination	92000	92000	92000	92000	92000	*7%*	86000	*34%*	64000	*7%*	60000	60000	60000	60000	60000

Notes: Figures above refer to the case where the applicant and the inventor are not the same person.
Source: HPO

2.146 During the 2002-2004 the fees for divisional applications filed before the request of the examination have increased of 33 per cent, while the increase has been of 43 per cent for divisional applications filed after the examination request.

Rationale underlying changes in procedural fees

2.147 As already stated before, inflation is taken account in order to determine increase in procedural fees. This is exactly the case with respect to the fee changes that occurred in 2005 which have been uniform across all fee categories, and which reflects the inflation rate realised in the same year (i.e. 7 per cent).

2.148 Concerning the fee changes that occurred in 2003 and 2004, these were of a magnitude which is significantly higher than the inflation rates for those years (i.e. approximately 5 per cent). This is partially due to the fact that fee adjustments take place in irregular intervals, and therefore, when they occur, they take into account the cumulative inflation of previous years. However, fee changes in 2003 and 2004 are not explainable solely in terms of inflation adjustment because the changes were not uniform across all fee categories.

2.149 In fact, from 2002 to 2004 examination fees rose (cumulatively) of 50 per cent, i.e. more than other fees, and this is explainable by the fact that the internal costs of carrying out examinations of more complex applications increased proportionally more that the cost associated with other services.

2.150 Similarly, the increase in excess claims fees for the period 2002-2004, despite being in line with that of other fees (i.e. 33 per cent) was mainly due to increases in internal costs from having to process increasingly complex applications (measured by both applications size and number of claims). Finally, it should be noticed that the Hungarian Patent Office did not always charge excess claims fees. These were introduced twenty years ago mainly to curb types of strategic behaviour, in particular:

(a) using claims as a weapon in patent wars; and

(b) reducing the unity of the patent.

Renewal fees

2.151 As with the case of procedural fees, the Hungarian Patent Office also charges different renewal fees depending on whether the applicant and the inventor are the same person (all renewal fees quoted here apply only to applications where the applicant and the inventor are *not* the same person).

2.152 As illustrated above renewal fees are progressive, and have been over the last 10 years or so. The Hungarian Patent Office has changed renewal fees seven times since 1996. The key features of these changes were as follows:

2.153 In August 1999, various increases were applied to renewal fees – with increases varying from 33 per cent in the early years to 11 per cent in the later years. These changes concerned both the overall level and the fee structure.

2.154 In July 2001, more structural changes were introduced into the fee schedule in a manner that increased the number of fee bands from four to five. The highest fee increase was applied to the final fee band (i.e. for years 17 to 20), which increased from HUF 9,000 to HUF 13,000. These changes concerned both the overall level and the fee structure.

2.155 In January 2003, further structural changes were introduced, increasing the number of fee bands again from 5 to 11, with the highest increases applying to years 3 to 4, 7 to 8 and 11 to 16. Again, these changes concerned both the overall level and the fee structure.

2.156 In May 2004, additional structural changes were introduced, although this time, the number of fee bands remained constant. The highest fee increases were applied to earlier years, e.g. with increases between 13 and 25 per cent for years 1 to 8, compared with increases of between 4 and 17 per cent between years 9 and 20.

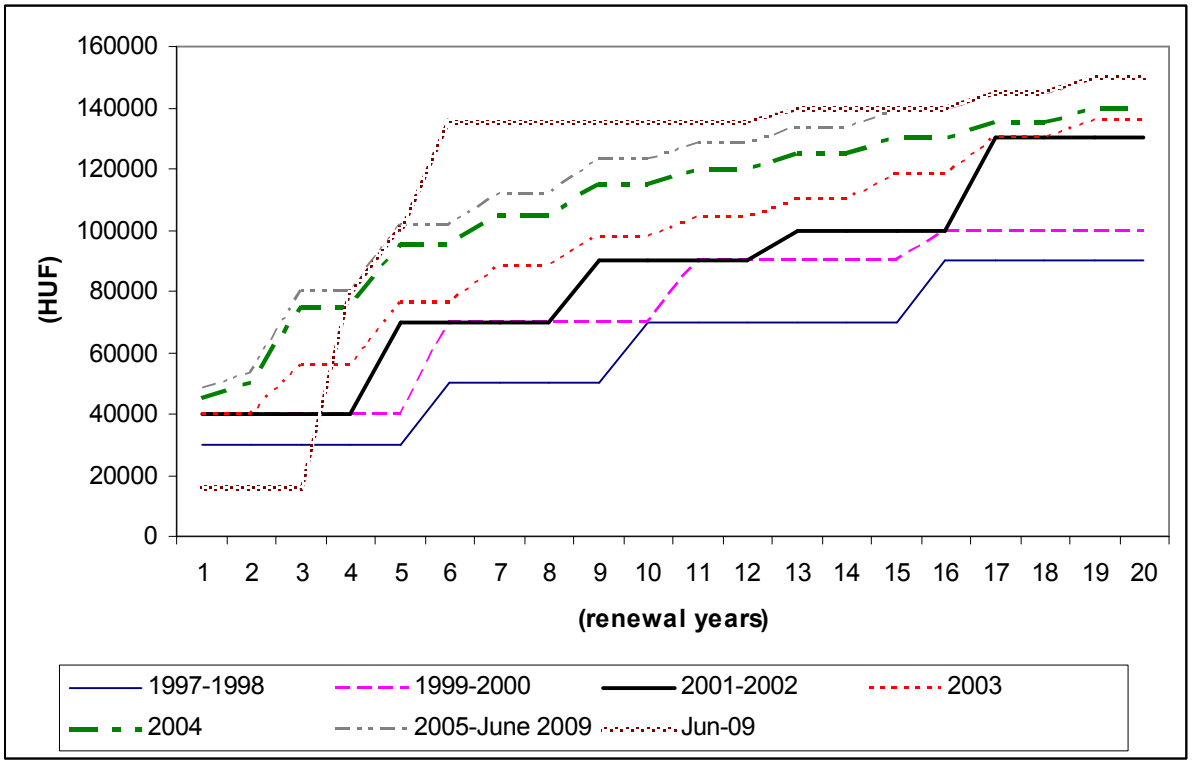
2.157 In April 2005, a flat increase of seven per cent was applied to all renewal years, keeping the fee structure intact.

2.158 In June 2009, fees were reduced heavily between years 1 to 3 (i.e. by an average of 72 per cent), and were increased for the middle years (e.g. by 33 per cent for year 6, by 21 per cent for years 7 to 8 and by 21 per cent for year 9), with the increase becoming smaller towards the 20th year.

T able 2.12: Renewal fees set by the Hungarian Patent Office (HUF), 1997-2009

Year	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Jun-09	16000	16000	16000	80000	100000	135000	135000	135000	135000	135000	135000	135000	140000	140000	140000	140000	145000	145000	150000	150000
Δ2008/09	*-67%*	*-70%*	*-80%*	*0%*	*-1%*	*33%*	*21%*	*21%*	*10%*	*10%*	*5%*	*5%*	*5%*	*5%*	*1%*	*1%*	*1%*	*1%*	*0%*	*0%*
2008	48000	53500	80000	80000	101500	101500	112000	112000	123000	123000	128000	128000	133500	133500	139000	139000	144000	144000	149500	149500
2007	48000	53500	80000	80000	101500	101500	112000	112000	123000	123000	128000	128000	133500	133500	139000	139000	144000	144000	149500	149500
2006	48000	53500	80000	80000	101500	101500	112000	112000	123000	123000	128000	128000	133500	133500	139000	139000	144000	144000	149500	149500
Apr-05	48000	53500	80000	80000	101500	101500	112000	112000	123000	123000	128000	128000	133500	133500	139000	139000	144000	144000	149500	149500
Δ2004/05	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*	*7%*
May-04	45000	50000	75000	75000	95000	95000	105000	105000	115000	115000	120000	120000	125000	125000	130000	130000	135000	135000	140000	140000
Δ2003/04	*13%*	*25%*	*34%*	*34%*	*25%*	*25%*	*19%*	*19%*	*17%*	*17%*	*15%*	*15%*	*14%*	*14%*	*10%*	*10%*	*4%*	*4%*	*3%*	*3%*
2003	40000	40000	56000	56000	76000	76000	88000	88000	98000	98000	104000	104000	110000	110000	118000	118000	130000	130000	136000	136000
Δ2002/03	*0%*	*0%*	*40%*	*40%*	*9%*	*9%*	*26%*	*26%*	*9%*	*9%*	*16%*	*16%*	*10%*	*10%*	*18%*	*18%*	*0%*	*0%*	*5%*	*5%*
2002	40000	40000	40000	40000	70000	70000	70000	70000	90000	90000	90000	90000	100000	100000	100000	100000	130000	130000	130000	130000
Jul-01	40000	40000	40000	40000	70000	70000	70000	70000	90000	90000	90000	90000	100000	100000	100000	100000	130000	130000	130000	130000
Δ2000/01	*0%*	*0%*	*0%*	*0%*	*75%*	*0%*	*0%*	*0%*	*29%*	*29%*	*0%*	*0%*	*11%*	*11%*	*11%*	*0%*	*30%*	*30%*	*30%*	*30%*
2000	40000	40000	40000	40000	40000	70000	70000	70000	70000	70000	90000	90000	90000	90000	90000	100000	100000	100000	100000	100000
Jul-99	40000	40000	40000	40000	40000	70000	70000	70000	70000	70000	90000	90000	90000	90000	90000	100000	100000	100000	100000	100000
Δ1998/99	*33%*	*33%*	*33%*	*33%*	*33%*	*40%*	*40%*	*40%*	*40%*	*0%*	*29%*	*29%*	*29%*	*29%*	*29%*	*11%*	*11%*	*11%*	*11%*	*11%*
1998	30000	30000	30000	30000	30000	50000	50000	50000	50000	70000	70000	70000	70000	70000	70000	90000	90000	90000	90000	90000
Aug-97	30000	30000	30000	30000	30000	50000	50000	50000	50000	70000	70000	70000	70000	70000	70000	90000	90000	90000	90000	90000

Table 2.13: Renewal fee changes, 1997-2009



Rationale underlying changes in renewal fees

2.159 Renewal fees have been the subject of far more change than procedural fees over the last 10 years. On average, fees have been changed every 1-3 years. The two key features of these changes were:

(a) increases in fees for each year band; and

(b) increases in the progressive structure of the fees.

2.160 The factors that prompted these changes were:

(a) cumulative inflation (e.g. between 1996 and 2008 the cumulative inflation was approximately 258 per cent);

(b) transitional changes in the economic environment; and

(c) membership of the EPC.

2.161 Membership of the EPC was a key factor in the changes that took place in January 2003. Not only did the Hungarian Patent Office amend the fees so that the structure would more accurately reflect the life cycle of a patent, it also brought the fee structure more in line with that applied by other NPOs.

2.162 In the middle of 2009, however, the fees were changed rather significantly. Not only were the number of fee bands level reduced from 12 to 8, the structure of fees became much more back-loaded; fees for years 1-3 were reduced significantly by shifting a portion of the fees to later years. This new fee structure was brought in on the back of the financial crisis, to offset any reduction in the attractiveness to patent. This was particularly aimed at SMEs who are among the core of both actual and potential applicants at the Hungarian Patent Office.

The UK Intellectual Property Office

Financing Structure and Fee Setting Role of the UKIPO

2.163 The UKIPO is self-financing and has been since it became an Executive Agency in 1990, and then a Trading fund in 1991. The UK became a Contracting state of the EPC on 7 October 1977.

2.164 Fee setting is only under the partial control of the UKIPO. In order to introduce fee changes, the UKIPO is obliged to present a business case to the Minister. The proposals are then subject to a formal consultation process. To date, no fee change proposal has been turned down.

2.165 The UKIPO's main sources of income are procedural fees, patent renewal fees and trademark fees.

Recent Issues Facing the UKIPO

2.166 Government targets, patent backlogs and reduced revenues are among the key challenges that have faced the UKIPO over the past 10 years.

Government targets

2.167 The UKIPO and the Government agree challenging but achievable targets on an annual basis. The two types of targets are:

(a) Financial – the UKIPO is expected to generate a four per cent return on capital employed (4 per cent a year for the 5 year period from 2009-2010).

(b) Quality – the UKIPO must fulfil targets as set out in their Corporate Plan (e.g. targets for the quality of the patent processing work they carry out). They also noted in their

most recent Corporate Plan[18] that they believe there may be scope for giving 'wider circulation' to using a 'patent quality index', which would provide an estimation of an application's suitability for efficient examination.

Reduced revenues and patent backlogs

2.168 While backlogs imply greater applications, falling revenues have been a problem for the UKIPO. This stems from the fact that a patent's output is not accounted as delivered until the process generating the revenue is triggered. Revenue challenges in this context therefore, are consistent with the existence of backlogs.

2.169 Backlogs have been caused mainly by increases in both the complexity and voluminosity of patent filings, and by understaffing at the Office (which is compounded by falling revenues, which have delayed recruitment this year).

Strategic behaviours and uncertainty in the patent system

2.170 The UKIPO does not believe that strategic behaviour (i.e. delaying examination) is a problem. Applicants at the UKIPO are given a maximum of two years after first priority filing (6 months after publication of the search report) to notify the UKIPO as to whether or not they will request an examination (and therefore, when they pay the examination fees). The UKIPO believes that this time period is not particularly long compared to the situation in some other offices which have a deferred examination system – indeed one year of this may be the priority period.

2.171 Thus, it is assumed that in general, applicants at the UKIPO do not use the two years after first priority filing to delay their applications. The UKIPO also imposes a compliance period of four and a half years, by which point applicants are expected to have fulfilled all the requirements to secure a patent. The UKIPO does not therefore face the same problems as the EPO e.g. with respect to delays caused by divisional applications. In some cases however, the UKIPO may extend this compliance period in circumstances in which it is responsible for delays.

2.172 These cut-off periods enable the UKIPO to restrict the level of uncertainly it faces. The UKIPO is also of the view that applicants who engage in strategic patenting activities are unlikely to be particularly sensitive to increases in procedural fees. Increases in procedural fees would, on the other hand, have a much greater effect on those applicants

[18] http://www.ipo.gov.uk/about-plan2009.pdf

with inventions that have less chance of survival (at least in the early years of the patent's life).

Purposes of and Linkages between Procedural and Renewal Fees

2.173 In each year, the UKIPO must cover its costs, including a return on capital investment which is set over a five-year period. Fees are set in a way that achieves this. As the fees charged and received for examination and searches are between one-eighth and one-tenth of the cost of carrying them out, income from renewal fees is used to meet the shortfall from procedural fees. The system applied by the UKIPO is therefore based on the 'traditional' system of charging low entry fees with rising renewal fees, so that successful patents pay more and less successful ones lapse prematurely.

2.174 The social costs arising from monopoly distortions caused by patents are not however considered by the UKIPO when determining fees. Cost recovery is the primary consideration, and under current Treasury rules the UKIPO would not be able to take into account social costs.

2.175 A recent review by Gowers[19] in 2006 recommended that the UKIPO should recoup a higher proportion of their costs from procedural fees. This has been one of the main considerations set out in the UKIPO's recent Consultation document on proposed fee changes (discussed further below).

2.176 The UKIPO has only recently begun to fill in knowledge gaps with economic evidence. It recently carried out two studies on fee elasticity, for both renewal and procedural fees, as part of this aim.

2.177 One of these studies assessed the impacts of the UKIPO's fee structure on patent customers.[20] The study included a survey of companies, universities and public sector research establishments PRSEs, as well as potential patentees. It concluded that there were no serious concerns about the level of fees and found no evidence in favour of introducing an alternative structure.

[19] Gowers Review of Intellectual Property (2006)
[20] NERA (2002) "Review of UK Patent Fees – Final Report for the UK Patent Office.

Current and Historical Description of Procedural and Renewal Fees and the Rationale Underlying Proposed Fee Changes

Procedural fees

2.178 The main procedural fees applied by the UKIPO include the following:

(a) Application fee (for both paper and electronic copies).

(b) Fee for a preliminary examination and search.

(c) Fee for substantive examination.

2.179 The UKIPO does not charge fees for either excess claims or pages.

Table 2.14: Procedural fees charged by the UKIPO (GBP), 1998- 2009

Fee	2009	2008	2007	2006	2005	2004	2003	2002	2001	2000	1999	1998
Application fee:												
- with paper form	30	30	30	-	-	-	-	-	-	-	-	-
Request for a preliminary examination and search in respect of any other application	130	130	130	130	130	130	130	130	130	130	£30	130
Paper filings												
Application fee	30	30	30	-	-	-	-	-	-	-	-	-
Request for a search under section 17(1) for an international application which has been searched in the international phase	80	80	80	100	100	100	100	100	100	100	100	100
Request for a search under section 17(1) for any other application	100	100	100	130	130	130	130	130	130	130	130	130
Request for a preliminary examination and search in respect of any other application	130	130	130	130	130	130	130	130	130	130	130	130
Request for a substantive examination	70	70	70	70	70	70	70	70	70	70	70	70
Filings using the e-filing/webfiling service												
Application fee	20	-	-	-	-	-	-	-	-	-	-	-
Request for a search under section 17(1) for an international application which has been searched in the international phase	70	-	-	-	-	-	-	-	-	-	-	-
Request for a search under section 17(1) for any other application	90	-	-	-	-	-	-	-	-	-	-	-
Request for a preliminary examination and search in respect of any other application	130	130	130	130	130	130	130	130	130	130	130	130
Request for a substantive examination	60	-	-	-	-	-	-	-	-	-	-	-

2.180 As can be seen in the fee table above, between 1998 and 2009 procedural fees have been changed on three occasions:

(a) The filing fee was abolished in 1998, before this it was £25;

(b) In 2007 the following changes were made:

- an application fee of £30 was introduced;
- the fee for a request for a search was reduced from £130 to £100;
- the fee for a request for a search for an international application was reduced from in 2007.

(c) In 2007, reduced fees were applied to the application fee, the search fee and the fee for requesting a substantive examination for applications using the e-filing/webfiling service.

Rationale underlying changes in procedural fees

2.181 The filing fee (i.e. the fee payable on filing an application in order to justify a filing date) was abolished in 1998 and has never been re-introduced. This was in part due to the fact that the WIPO Patent Law Treaty does not allow a fee to be imposed in order to secure a filing date.

2.182 At the UKIPO, there are two early stages of processing a patent application. One is "preliminary examination" (checking whether the right documents have been supplied in the right format), and the other is the search for relevant technical documents. Before 2005, section 17 of the UK Patents Act dealt with both of these stages. Accordingly, there was one fee (£130) which was paid in order to get both the preliminary examination and the search.

2.183 On 1 January 2005, the UK patents primary legislation was changed to separate out the process of preliminary examination from the search - with the former being dealt with in a new section 15A and the latter being dealt with in an amended section 17. To reflect this, the old £130 fee was separated into two fees - a £30 application fee payable in order to get the preliminary examination, and a £100 search fee. Neither of these must be paid on filing the application - but both must be paid by a certain deadline or the application is taken to be withdrawn.

Recent fee change proposals

2.184 The proposals on which the UKIPO consulted in 2009 were as follows:

(a) Increase the search fee from £100 to £200 and the examination fee from £70 to £150. According to the UKIPO's consultation document, even with these increases, these fees would still cover only a small portion of the overall cost of seeking patent

protection.[21] Further, these increases would not recover in full, the cost of carrying out these procedural processes. Rather, renewal fees would continue to subsidise, in part, the low up-front fees.

(b) Introduce a fee of £20 for each of the 16th and subsequent claims contained in an application at the time the search is carried out. According to the UKIPO's Consultation Document, the additional work caused by applications containing a significant number of claims is not currently reflected in any additional fees.

Renewal fees

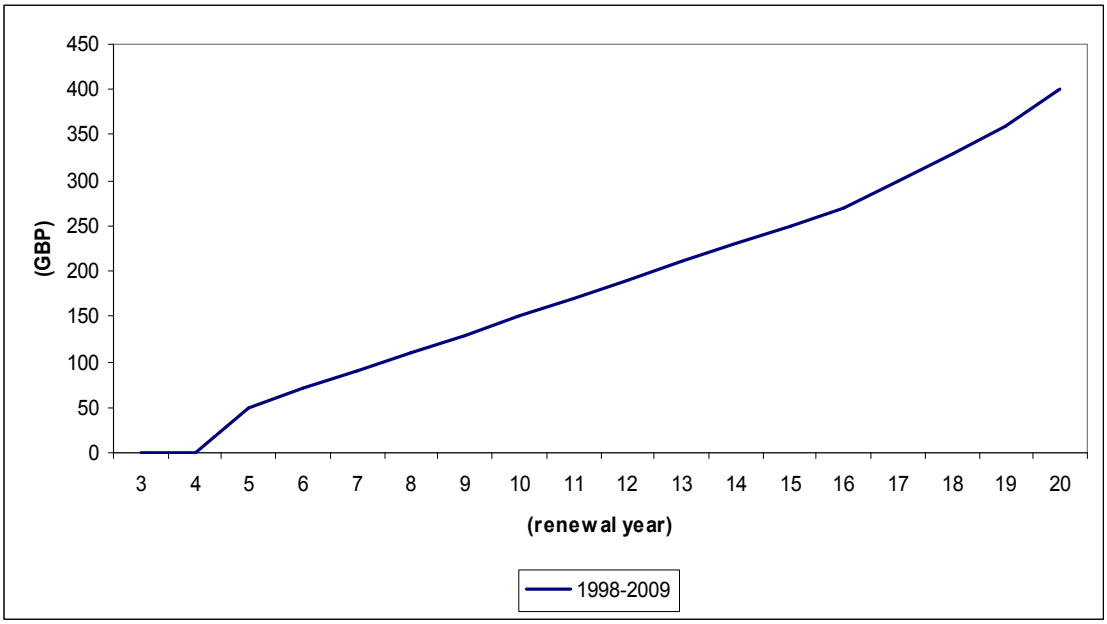
2.185 As illustrated in Table 2.15 and Figure 2.12, renewal fees are set progressively over the 20 year period, with fees increasing year on year. The UKIPO has not made any changes to its renewal fees over the past 10 years.

[21] The Gowers Review of Intellectual Property (2006) for example, noted that these fees tend to be insignificant compared with for example, patent agents fees, which were estimated to charge £300 per hour.

Table 2.15: Renewal fees (GBP) 1998-2009

Year	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2009	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400
2008	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400
2007	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400
2006	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400
2005	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400
2004	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400
2003	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400
2002	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400
2001	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400
2000	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400
1999	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400
1998	0	0	50	70	90	110	130	150	170	190	210	230	250	270	300	330	360	400

Figure 2.12: Renewal fees (GBP), 1998-2009



Recent fee change proposals

2.186 The UKIPO's recent Consultation document proposed to increase patent renewal fees, with minor increases in the early years, of between £10 and £20 in each of the first eight renewal years, and more substantial increases in the final seven years.

2.187 The rationale for this is to avoid imposing high costs on rights holders at a point where products may still be in development, thus increasing? uncertainty about products' commercial viability.

2.188 Fee changes (both procedural and renewal) are deemed necessary to ensure the sustainability of current system, but the intention is to ensure that the system remains accessible (i.e. by keeping some fees such as the application fee low enough to encourage applications).

The Italian Patent and Trademark office

Financing Structure and Fee Setting Role of the IPTO

2.189 The Italian Patent and Trademark Office became a Contracting state to the EPC in 1 December 1978.

2.190 The Italian Patent and Trademark Office is financed partly by the State and partly via income from procedural and renewal fees. Every year, the government approves rules for financial programs across the country. The government fixes the quantity of money for each Ministry which is then distributed to each activity of the Ministry. The government

provides a fixed yearly budget for the Office, the amount of which may vary by year depending on the total yearly budget of the central government in a given year.

2.191 In addition to a fixed sum provided to the Office by the government, the Italian Patent and Trademark Office supplements this income via the income it generates from procedural and renewal fees. This income is passed to the Office directly from the Treasury. In practice however, the revenue generated from these sources is far from sufficient to cover the internal costs incurred by the Office in a given year. This financing structure of the Italian Patent and Trademark Office represents the new structure that was implemented in 2007. Prior to this, the Italian Patent and Trademark Office did not retain any income from procedural and renewal fees directly. Despite the legal distinction in the financing arrangements which took place in 2007, in practice the overall effect on the yearly income of the Office has remained relatively unchanged.

2.192 Fee setting is under the partial control of the Italian Patent and Trademark Office. In general, the Office submits fee proposals that are based on their financial requirements, to the Finance Minister who is principally responsible for making fee change decisions. According to the Italian Patent and Trademark Office, the fee decisions taken by the Minister are driven mainly by political considerations. To date no fee change proposals submitted by the Italian Patent and Trademark Office have been rejected. The only exception in this respect is represented by the abolishment of fees that took place in 2006 which was not initiated by a request of the Office.

2.193 With regards to fee income, renewal and design fees account for the largest proportion.

Recent Issues Facing the Italian Patent and Trademark Office

2.194 The main challenges recently faced by the Italian Patent and Trademark Office include backlogs and government targets.

Backlogs

2.195 Backlogs, both in terms of trademark and patent applications, have been one of the main challenges that the Italian Patent and Trademark Office has been facing over the past few years and is a problem that has been driven mainly by limited staffing resources at the Office (exacerbated by the lack of technical expertise in certain areas). In 2006 for example, the Office had in the region of 10,000 trademark applications but relatively few examiners. The Office has in the past used resources from other offices to assist with addressing these targets. While backlogs are mainly a result of staffing issues, the problem has been exacerbated by the abolishment of procedural and renewal fees in 2006 which had a significant effect on increasing the number of patent applications. The re-introduction of fees in 2007 has however, helped to ease the situation by reducing the number of patent applications submitted to the Office.

Government targets

2.196 A key focus of the Finance Ministry is the protection of intellectual property rights. In particular, the Ministry is dedicated to strengthening patent and trademark rights in Italy and to encourage the research activities of Italian SMEs. Further, the government believes that patenting activity is synonymous to the research activities of Italian SMEs and thus amending patent policy is considered a key tool in directing research and development by this group.

Strategic behaviours and uncertainty in the patent system

2.197 Strategic patenting is not considered as a problem in the Italian Patent and Trademark Office

Purposes of and Linkages between Procedural and Renewal Fees

2.198 Renewal fees are set in a way that is intended to reflect the fact that the payment of these fees is indicative of the value of a patent. Further, they are set in a way that is intended to sustain Italian SMEs and are charged form the 5th year after the filing date of the application. According to the Italian Patent and Trademark Office, by this stage of a patent's life, the uncertainty regarding the economic value of the patent should be considerably reduced.

2.199 According to the Italian Patent and Trademark Office, internal costs are not a factor in determining renewal fees. Internal costs are not a critical consideration for the Office as they would be for a private institution.

2.200 In contrast to renewal fees, procedural fees are paid at the moment of filing, i.e. a point where the economic value of the potential invention is governed by a high uncertainty value. While renewal fees do subsidise procedural fees, it is not enough to cover in full the costs incurred by the Office in processing an application. Among the key factors underlying the determination of procedural fees is that of optimising application numbers (i.e. reducing the number of patent applications), as well as ensuring patent applications of minimum quality level.

Current and Historical Description of Procedural and Renewal Fees and the Rationale Underlying Proposed Fee Changes

Procedural fees

2.201 The Italian Patent and Trademark Office charges the following type of procedural fees:

(a) Application fee – for hard copy submissions, this fee depends on the number of pages, with six bands: 0-10 pages, 10-20 pages, 20-30 pages, 20-50, >50 pages, >100 pages.

(b) Translation fee.

(c) Excess claims fee.

2.202 Table 2.16 below illustrates the evolution of these fees over the last 10 years.

2.203 As can bee seen from the table below, in 2002, fees were converted from lira into euros directly, without any other fee adjustments being made. Between 1998 and 2009, procedural fees were adjusted on four occasions:

(a) In 2005, all procedural fees that applied at the time were increased by 30 per cent;

(b) In 2006, all procedural fees were abolished;

(c) In 2007 the following changes were made:

- not only were all procedural fees re-instated, they were increased by approximately 60 per cent compared with the fees that applied prior to 2006;
- the separate fees that had previous applied for applications of more than 50 or 100 pages was combined into one single fee;
- a new excess claims fee was applied, €40 for the 11th claim onwards; and
- a reduced fee for electronic application submissions was introduced.

(d) In 2008, the Office introduced a new translation fee charged to those applicants that submit a non-English translated application prior to being send to the EPO for the conducting of a search.

2.204 With regards to the excess claims fee that was introduced in 2007, when compared with the excess claims fees (in terms of euros) charged by some of the other NPOs covered in this review, the fee applied in Italy is the highest. In fact, when converted into euros at average exchange rates for 2009, Italy excess claims fee is approximately 300 per cent

higher than the average excess claims fee in Hungary[22], 74 per cent higher that that charged in Norway and 20 per cent higher than the fee in Switzerland. The fee applied by the Italian Patent and Trademark Office is also approximately 78 per cent higher than the claims fee proposed by the UK Intellectual Property Office in its most recent fee consultation.

[22] In contrast to Italy, Norway and Switzerland, Hungary has more than one fee band for excess claims fees.

Table 2.16: Procedural fees set by the Italian Patent and Trademark Office (ITL for 1998-2001, EUR for 2002-2009), 1998-2009

Type of fee	2009	2008	2007	2006	2005	Δ2004/05	2004	2003	2002	2001	2000	1999	1998
Application fee													
- For electronic submission	50	50	50	-	-	-	-	-	-	-	-	-	-
- For hard copy submissions (0-10 pages)	120	120	120	-	67	29%	52	52	52	100,000	100,000	100,000	100,000
- For hard copy submissions (10-20 pages)	160	160	160	-	101	29%	78	78	78	150,000	150,000	150,000	150,000
- For hard copy submissions (20-50 pages)	400	400	400	-	236	30%	181	181	181	350,000	350,000	350,000	350,000
- For hard copy submissions (more than 50 pages/ more than 100 pages)	600	600	600	-	472/809	30%	363/622	363/622	363/622	700,000/ 1,200,000	700,000/ 1,200,000	700,000/ 1,200,000	700,000/1,200,000
- Excess claim fee (from 11th claim onwards each)	40	40	40	-	-	-	-	-	-	-	-	-	-
Translation fee (prior to sending the application to the EPO for the conducting of a search)	200	200	-	-	-	-	-	-	-	-	-	-	-

Rationale underlying changes in procedural fees

2.205 As noted above, in 2005 fees were increased by approximately 30 per cent. The main factor underlying this fee change was inflation. The Office decided to make a one-off adjustment to fees to account for inflation over the period 1999 to 2004. In general however, the Italian Patent Office does not have a formal policy of adjusting fees to account for annual inflation.

2.206 The decision to abolish all procedural fees in 2006 was taken by the Ministry of Finance which reflected targets that the government established in 2006 to support industrial activity in Italy, with a particular view on SMEs. The Office itself was not consulted on the fee changes before they were formally decided upon.

2.207 Further, according to the Italian Patent and Trademark Office, in its decision to abolish fees, the Ministry did not take into the consideration the 50 per cent of renewal fees that go to the EPO. this is not 100% exact: if they do not charge fees, they have to pay us a so called minimum amount, please see Art. 39(1) According to the Office, if it had the discretion to decide on fees, it would not have implemented the abolishment. Not only did the abolishment of procedural fees increase the number of patent applications to the Office (contributing to its backlog problem), it also resulted in lowering the quality of applications (i.e. in terms of fulfilling formal requirements).

2.208 According to the Italian Patent and Trademark Office, the decision to re-introduce fees was driven by a change in focus of the governments' economic policy. Not only were fees re-introduced however, they were also increased above the post abolishment level. Procedural fees were increased in order to fund the cost of carrying out prior art searches which they anticipated would be introduced the following year in 2008. The prior art searches that were introduced in 2008 are carried out by the EPO. While the Italian charges a translation fee of €200 to applicants that have not provided a translation in English, it has to pay the EPO in the region of €2300 in order for the search to be carried out. This means that in fact a fee of €200 does not apply to applicants who have requested a search and who have filed in English. Thus, the Italian Patent and Trademark Office decided to increase the other procedural fees in order to subsidise the search cost. Further, they introduced these changes a year before the search service was actually introduced so that they could build up the necessary funds to pay the search costs to the EPO when they became due.

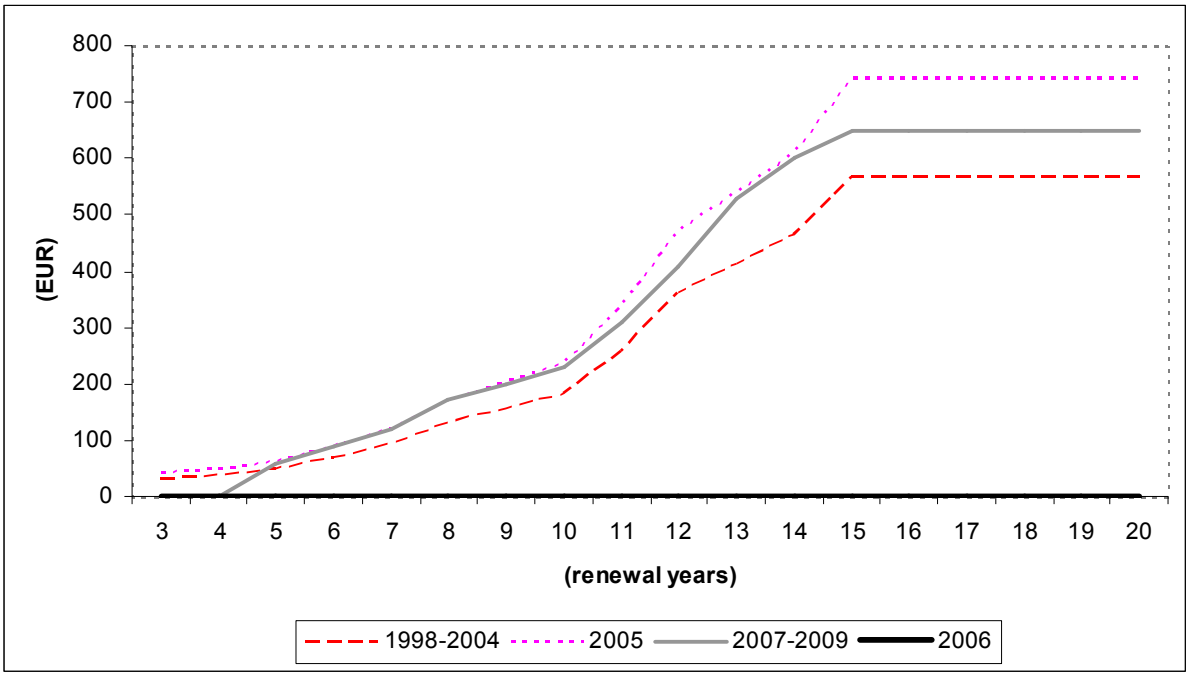
As illustrated in

2.209 Table 2.17 and Figure 2.13 below, renewal fees are progressive (increasing on a yearly basis) up till year 14 after which the fee is flat.

Table 2.17: Renewal fees set by the Italian Patent and Trademark Office (ITL for1998-2001, EUR for 2002-2009)

Year	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2009	-	-	60	90	120	170	200	230	310	410	530	600	650	650	650	650	650	650
2008	-	-	60	90	120	170	200	230	310	410	530	600	650	650	650	650	650	650
2007	-	-	60	90	120	170	200	230	310	410	530	600	650	650	650	650	650	650
Δ 2005-07	*-100%*	*-100%*	*-2%*	*2%*	*-1%*	*1%*	*-1%*	*-3%*	*-8%*	*-13%*	*-2%*	*-1%*	*-12%*	*-12%*	*-12%*	*-12%*	*-12%*	*-12%*
2006	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2005	40	47	61	88	121	168	202	236	337	472	539	607	741	741	741	741	741	741
Δ 2004-05	*29%*	*31%*	*33%*	*31%*	*30%*	*30%*	*30%*	*30%*	*31%*	*30%*	*31%*	*31%*	*30%*	*30%*	*30%*	*30%*	*30%*	*30%*
2004	31	36	46	67	93	129	155	181	258	362	413	465	568	568	568	568	568	568
2003	31	36	46	67	93	129	155	181	258	362	413	465	568	568	568	568	568	568
2002	31	36	46	67	93	129	155	181	258	362	413	465	568	568	568	568	568	568
2001	60,000	70,000	90,000	130,000	180,000	250,000	300,000	350,000	500,000	700,000	800,000	900,000	1,100,000	1,100,000	1,100,000	60,000	568	568
2000	60,000	70,000	90,000	130,000	180,000	250,000	300,000	350,000	500,000	700,000	800,000	900,000	1,100,000	1,100,000	1,100,000	60,000	568	568
1999	60,000	70,000	90,000	130,000	180,000	250,000	300,000	350,000	500,000	700,000	800,000	900,000	1,100,000	1,100,000	1,100,000	568	568	568
1998	60,000	70,000	90,000	130,000	180,000	250,000	300,000	350,000	500,000	700,000	800,000	900,000	1,100,000	1,100,000	1,100,000	568	568	568

Figure 2.13: Renewal fee changes, 2002-2009



Notes: Renewal fees were abolished in 2006
Source: EPO, Italian Patent and Trademark Office

2.210 As can be seen in the Figure above, between 2002 and 2009, renewal fees were changed on three occasions:

(a) In 2005, renewal fees were increased by approximately 30 per cent across all years;

(b) In 2006 all renewal fees were abolished; and

(c) In 2007 the reintroduced renewal fees were reduced by between one and 13 per cent compared to the level of 2005.

Rationale underlying changes in renewal fees

2.211 With regards to the fee increase in 2005, the reason underlying this change was the same as that underlying the 30 per cent increase in procedural fees in 2005: a one-off adjustment for inflation.

2.212 The rational underlying the abolishment of renewal fees in 2006 was the same as that identified for the abolishment of procedural fees in the same year. According to the Italian Patent and Trademark Office, an unintended consequence of this was that in the following year when renewal fees were reinstated, a number of patent holders lost their property rights. This was because, while fees were abolished, patent rights were renewed without having to receive notification from the patent holders. However, in the following year, a

number of patent holders did not notify the Office that they wanted to renew as they were unaware that fees had been reinstated. In the absence of such notification, the Office automatically assumes the patent holder does not wish to renew his rights and so withdraws that patent right.

Conclusions

2.213 We draw here our conclusions based on the review of fee policy carried out in this section, and the literature review conducted in Section 1.

2.214 All the patent offices in our sample adopt, to some varying degrees the traditional fee policy approach: low procedural fees to make the system widely accessible and renewal fees that not only induce patent holders to give up their monopoly rights but also cross-subsidise entry fees. Indeed, for the entire sample of NPOs, revenue from renewal fees constitutes a much higher proportion of income than procedural fees revenue.

2.215 It seems to be very unlikely (if not impossible) that NPOs would move away from this traditional fee policy structures in the near future. In fact all offices indicated that charging high procedural fees would be politically unacceptable, even though one of the Offices reviewed (the UK-IPO) stated that fee policies based on increases in procedural fees are not necessarily unfeasible. Another important aspect that limits the possibility of NPOs embarking new policies which make use of procedural fees as sorting/steering device is due to the financial agreement existing between NPOs and the EPO. NPOs revenues are largely driven by renewal fees on patent that have been granted by the EPO, thus, there is not direct link between the fee income and patent processing work. Consequently NPOs are unlikely to feel the urge of adopting radical changes in fee policies because the pressure associated with the increasing strategic use of the patent application system (which would call for such changes) is being experienced mainly by the EPO.

2.216 Having noted the common features of the fee policies adopted by NPOs, we have also been able to identify as series of features that are distinctive to each NPO. These can found along the following dimensions:

(a) Financing structure

(b) Relative and absolute levels of procedural and renewal fees

(c) Intended goals of procedural and renewal fees

Financing structure

2.217 We have identified three broad typologies of financing status in which NPOs can be grouped

(a) *Fully financed by the state* — NPOs which do not retain any income from procedural and renewal fees. This financing status is shared by the Norwegian industrial Property Office and the Netherlands Patent Office

(b) *Partially financed by the state* — NPOs which are publicly financed but retain some income from procedural and renewal fees. This financing structure is in place at the Italian Patent and Trademark Office.

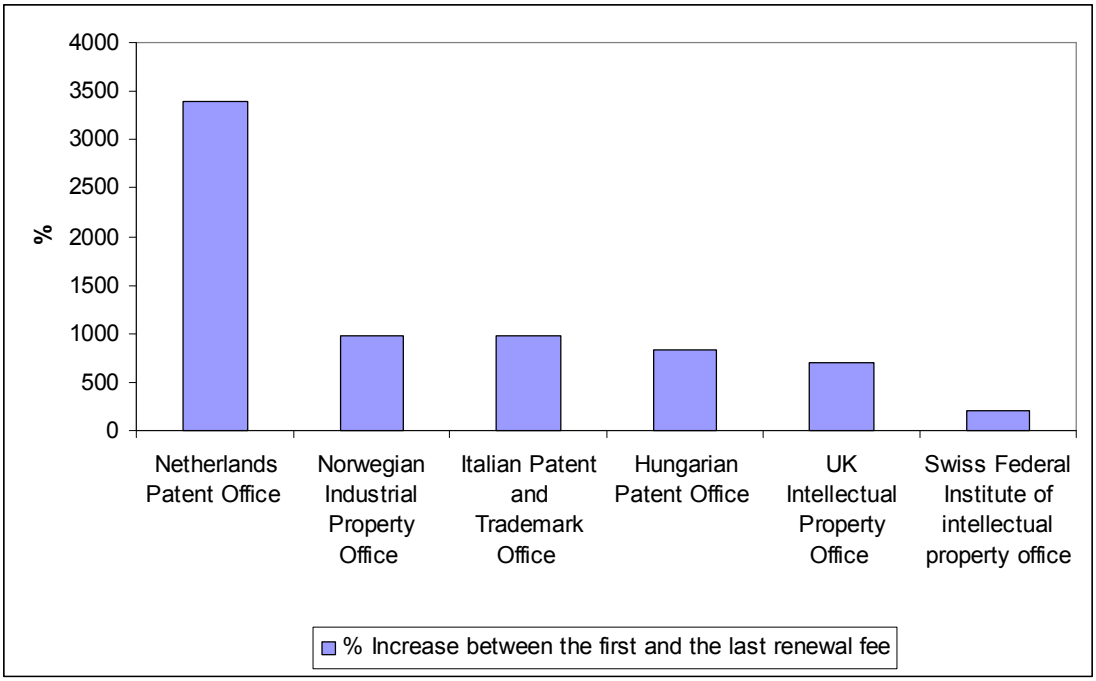
(c) *Self-financed* — NPOs for which the income is generated from procedural and renewal fee payments. Among the NPOs considered, the UK Intellectual Property Office, the Hungarian Patent office and the Swiss Federal Institute of Intellectual Property are fully-financed.

Relative and absolute levels of renewal and procedural fees

2.218 Renewal and procedural fees set by the NPOs share the following common features: (1) procedural fees generate a significantly smaller share of Offices' income when competed to renewal fees, and (2) renewal fees are progressively increasing (with the exception of the Swiss Federal Institute of Intellectual Property). However, differences across patent offices exist in relation to, both, the degree of progressiveness of renewal fees, and the amount of procedural fees relative to that of renewal fees. These two points are illustrated below.

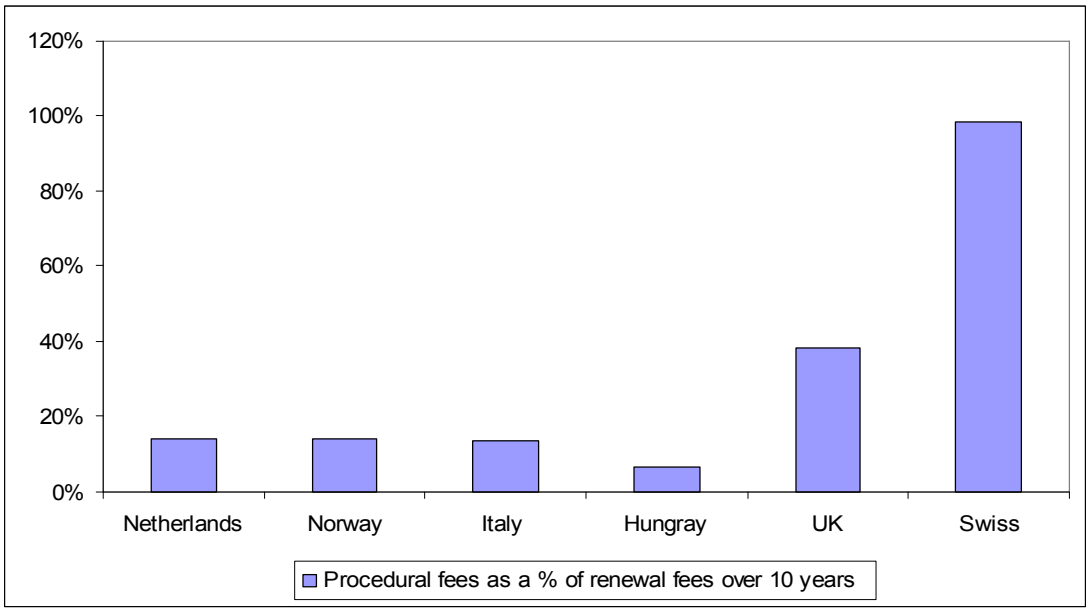
2.219 Figure 2.14 below indicates the percentage difference between the first and the last renewal fee (according to the most recent fee schedules) for each of the Offices. Such percentage index can be interpreted as an index of the progressiveness of the renewal fee schedule.

Figure 2.14: Progressiveness of renewal fees (increase between the first and last renewal fee), 2009



2.220 For each one of the six NPOs considered, we have also calculated the aggregate application cost (i.e. from filing to grant) for an application with 10 claims, and expressed it as a percentage of the cost of renewing an application for 10 years. The results are summarised in Figure 2.15 below.

Figure 2.15: Procedural fees as a percentage of renewal fees, 2009



2.221 Two broad conclusions can be drawn. First, from a visual inspection of Figure 2.14 it appears that, among the offices we have considered, those that are self financed have a 'flatter' renewal fee schedule than those that are fully (or partly) financed by the state. Second, Figure 2.15 also suggests that, in general, self-funding patent offices tend to have a larger procedural fees-to-renewal fees ratio than fully-funded offices.

2.222 Interestingly enough, these stylised facts are reminiscent of the theoretical predictions put forward by Gans et al. (2004). We recall here that the authors consider a situation where patent offices are self-funding and conclude that, when budgetary requirements apply, procedural fees will be set too high from a social-welfare maximising perspective, while renewal fees will be set too low. Moreover, they show that imposing a budgetary requirement will lead to the office setting a 'flatter' renewal fee schedule than is consistent with optimality.

The main motivations fro setting procedural and renewal fees

2.223 NPOs differ also with regards to the primary objectives that fees are supposed to reach. These differences, in relation to renewal fees, are summarised in the table below.

Table 2.18: The motivations for setting renewal fees

	Maximise welfare	Cost recovery	Steering income
NO	X	X	
NL	X	X	
ITA	X		
HU	X	X	
UK		X	
CH		X	X

2.224 In line with the principle of the traditional patent fee policy (where granted patents subsidise unsuccessful applications) almost all NPOs recognise the cost recovery role of renewal fees. Interestingly, self-financed offices indicated that the social welfare considerations are not taken into account when setting renewal fees and the Swiss Federal Institute of Intellectual Property indicated explicitly that renewal fees are set with the primary purpose of influencing the Office's income.

2.225 The evidence gathered so far suggests that NPOs' financing status has an impact on, both, the setting of fees and the broad goals of the fee policy. In particular, self-funded offices tend to have higher procedural fees (relative to renewal fees), flatter renewal fees schedules, and generally adopt renewal fee policies which abstract from explicit welfare considerations.

2.226 The NPOs' differences concerning the intended goals of procedural fees are summarised in the table below.

Table 2.19: The main motivations for setting procedural fees

	(Partial) cost recovery	Screening applications' quality	Influencing the no. of filings	Steering applicants' behaviour
NO	X	X		X
NL	X		X	
ITA	X	X		X
HU	X			X
UK	X			X
CH	X		X	X

2.227 For all NPOs considered, an important motivation for setting procedural fees is represented by the recovery (at least partially) of the applications' processing costs. Some NPOs recognise the potential screening role that procedural fees play in either influencing the number of patent filings, or ensuring a minimum quality level of applications. Finally, several offices charge fees, such as excess claims/pages fees, fees

for amendments, or fees for the request of extensions of the time limits, which have the potential of steering applicant's behaviour.

2.228 The Hungarian Patent Office, in particular, has a rather sophisticated tariff system the most interesting feature of which is probably represented by the progressive structures of the fees for amendments and the fees for the request of extensions of the time limits. These fee amounts are lower for the first amendment/request, but do progressively increase up to the third amendment/request. The rationale for having progressively increasing fees for amendment and request of extensions could be very similar to the one for having progressive renewal fees, i.e. the 'revelation principle'. With each additional request of extensions applicants reveal that they benefit from prolonging the procedural phase and, consequently, they are charged more for doing so. In order to verify the validity of such interpretation a further investigation is required, and this task is carried out in the next section.

3 RELATIONSHIP BETWEEN EPO PROCEDURAL FEES AND THE DEVELOPMENT OF EUROPEAN APPLICATIONS

Introduction

3.1 This document sets out the analysis we have conducted concerning the effect of EPO procedural fees on the development of a European application. The EPO's application procedure is a step-by-step process, from initial application to the final decision to grant a patent. Each stage of this process has its own logic, and it is subject to a specific set of fees. Therefore the question to be explored in this document is whether and to what extent the magnitude of these fees influences applicants' decisions to file, to proceed further in the application process, and how.

3.2 This section is composed of section of the following sub-sections:

(a) Descriptive statistics.

(b) General methodology.

(c) Analysis of the decision to enter the search phase.

(d) Analysis of the decision to enter the examination phase.

(e) Analysis of the decision to request further processing in the examination phase.

(f) Analysis of the decision to enter the grant phase.

(g) Case study: the decision of entering the search phase for French applications

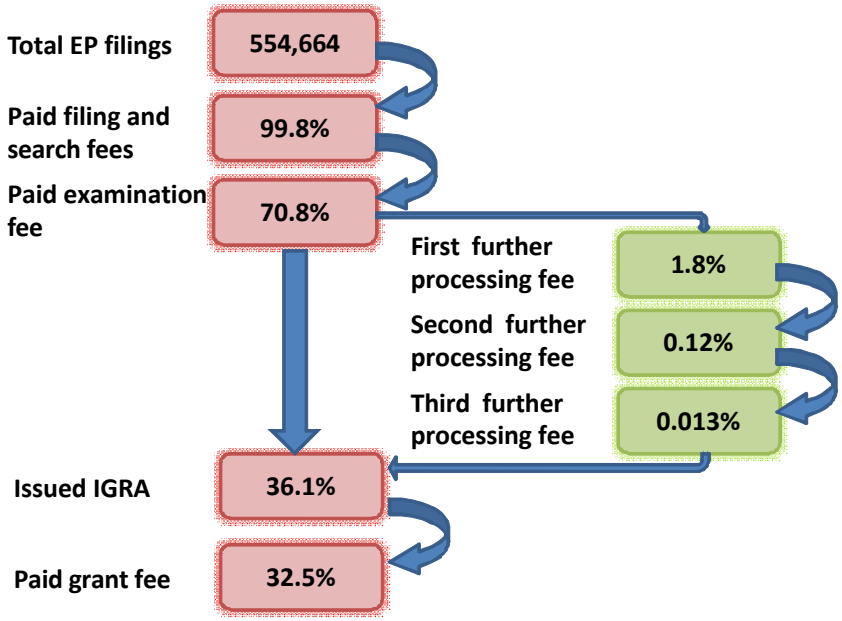
(h) Conclusions.

Descriptive statistics

3.3 In this section we provide a description of the progress of applications through different stage of the application process.

3.4 The figure below analyses the percentage of applications that are in each stage of the application procedure. Statistics in this figure are of the form Percentage = (number in current stage/total number of EP filings)*100.

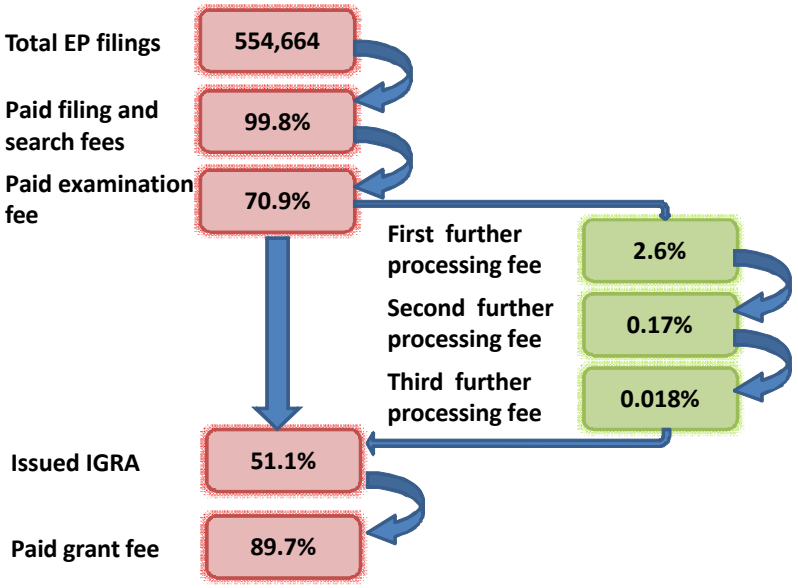
Figure 3.1: Applications in each phase as percentage of all EP filings



3.5 It is evident from the figure above that approximately one third of applications in our dataset are eventually granted.

3.6 It might also be informative to compare the number of applications in one stage with the number of applications that were alive in the previous phase. The figure below does precisely that. Statistics in this figure are of the form Percentage = (number in current stage/number in previous stage)*100.

Figure 3.2: Applications in each phase as percentage of those in previous phase



General methodology

The key questions

3.7 For applications following the EP route, the EPO is responsible for each step of the application procedure, which consists of the three following stages:

(a) The search stage.

(b) The examination stage.

(c) The grant stage.

3.8 Each stage is subject to a specific set of fees, and the most important fees for EP applications are:

- Filing fee.
- Search fee.
- Claims fee.
- Examination fee.
- Designation fee.
- Fee for grant and printing.
- Fee for further processing.
- Internal renewal fees.

3.9 Some of the fees reported above need to be paid in order for an application to proceed to the next stage (e.g. filing, search, and claims fees must be paid to enter the search phase), while other fees might affect the behaviour of applicant who have already entered a certain stage (e.g. fees for further processing might affect the decision of whether or not to request further processing in the examination phase). The analysis we provide here addresses both types of decision. In particular it deals with the following questions:

(a) To what extent do relevant fees affect the decisions of requiring a search for applications that have been filed?

(b) To what extent do relevant fees affect the decision of entering the examination phase for applications that have already received a search outcome?

(c) To what extent do relevant fees (i.e. fees for further processing) affect the decision of requesting further processing during the examination procedure for applicants that have already entered the examination phase?

(d) To what extent do relevant fees affect the decision of obtaining a formal grant for applications to whom the intention to grant a patent has already been dispatched?

3.10 Moreover, we have also analysed the decision facing French applicants that seek protection in a number of EPC contracting states. These applicants face a choice of filing direct with the EPO or filing with the French national patent office and, in both cases, receiving a search report drawn up by the EPO. Regardless of which option the applicant chooses, the search is conducted by the EPO since the French national patent office has delegated its national searches to the EPO. It is therefore interesting to investigate the reasons that applicants file at the EPO rather than at the French patent office.

Data sources

3.11 The analysis has been based on three different sources:

(a) The first dataset (hereafter called "Application Dataset"), provided by the EPO, contains information on the characteristics of each patent application for the period 1998-2008, and it mainly is taken from EPASYS.[23] Despite not containing the amount of fee payments of each applicant, the "Application Dataset" has information on the date of the receipt of the most important set of fees (i.e. those fees that must generally be paid in order to proceed within the application process), and has therefore been used also to identify which applications proceeded to each stage of the application process.

(b) The second dataset ("Fee Dataset" hereafter), also provided by the EPO, contains information on the fee amounts paid for each application together with the dates of payments. Merging the "Application Dataset" and the "Fee Dataset" has enabled us to analyse the effect of relevant procedural fees on the applicant's decision to proceed in the application process.

(c) We have constructed a third the dataset (the "Macroeconomic Dataset") which contains general macroeconomic indicators of all the countries from which the patent filings are generated.[24]

3.12 We have merged the three datasets in order to obtain a dataset ("Dataset" hereafter) which allows us to analyse the effect of relevant fees on applicants' decisions, while

[23] EPASYS is the EPO's internal database and contains several infromation concering the characteristics of each application.

[24] The macroeconomic database was constructed using Penn World tables and the Oanda exchange rate website. The internet links for these websites are http://pwt.econ.upenn.edu/ and http://www.oanda.com/ respectively.

controlling for other variables (application specific or macroeconomic variables) that might also influence such decisions.

Description of the variables

3.13 We provide here a brief description of the variables used to specify the models. The entire set of variables can be grouped into seven categories as described below:

(a) ***Application characteristics*** — these variables are derived from the 'Application Datasets' and describe application-specific features. Variables of this type include:

- *Filing route*, which indicates whether the EP application is a second filing from a national priority application, or is a direct filing to the EPO.
- *Language of proceedings*, which can be EN, FR, or DE.
- *EPC filing language*, which is a dummy variable indicating whether the filing language is different from EN, FR, or DE, and the application, comes from an EPC country. The construction of this variable is justified by the fact that, if the national language (other than EN, FR, DE) of an EPC contracting state is used, the filing fee and the examination fee are reduced by 20 per cent.
- *Non-EPC filing language*, a dummy variable indicating whether the filing language is different from EN, FR, or DE, and the application does not come from an EPC country (hence, the 20 percent discount explained above does not apply).
- *Electronic filing indicator*.
- *Use of a filing representative*.
- *Deliberate use of a filing representative*, which is a dummy variable that takes value 'one' if the applicant country code is an EPC State, and there is an entry for filing representative country code variable. The construction of this variable is justified by the fact that, if the applicant country code is not an EPC state, the appointment of a representative is compulsory and not a deliberate decision. It is important to stress that, since many large firms have patent divisions in multiple geographical areas and are also likely to have patent attorneys in house, the deliberate use of a filing representative might be a proxy for firm size, i.e. the use of a filing representative might be indicative of the lack of an internal patent division, hence of the relatively small size of the firm.
- *Number of claims* (latest, as proxy for number of claims at filing). This variable is only a proxy for the number of claims at filing because the number of claims variable in the 'Application Dataset' is constantly updated.
- *Geographical scope* indicates the number of designated states. A variable is provided in the application dataset which indicates the "number of countries of

designation of the application". This variable represents the number of states listed at the filing stage and hence may not equal the number of countries for which the designation fee is actually paid. Indeed, it seems to be a reasonably common practice for applicants to indicate that they would like to designate all countries at the filing stage and subsequently pay the designation fee for fewer than seven countries. Therefore, where we have information on the number of countries for which the designation fee was paid, we use this variable directly whilst for those applications where we do not have such information we use the number of designated states at the filing stage as a proxy for the number of states for which the designation fee would have been paid.

(b) ***Geographical origin*** — is determined by the country code of the applicant, as reported in the 'Application Dataset'. We have distinguished the three largest European markets (DE, FR, UK), the three non-European countries responsible for the largest number of EP filings (USA, Japan, and Korea), and the other country codes have been aggregated in order to account for broader economic areas. The list of geographical areas considered is therefore:

- *France*
- *Germany*
- *The UK*
- *Other non-EPC countries*
- *The USA*
- *Japan*
- *South Korea*
- *Other non-EPC countries*

(c) ***Technological sectors*** — the international patent classification variable contained in the 'Application Dataset' (which reflects a very refined classification consisting of several different technological areas) has been aggregated to account for fewer and broader technological areas:

- *IPC (A) - Human necessities*
- *IPC (B) - Performing operations*
- *IPC(C) - Chemistry and Metallurgy*
- *IPC(D) - Textiles and Paper*
- *IPC(E) - Fixed constructions*

- *IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting*
- *IPC(G) - Physics*
- *IPC(H) - Electricity*

(d) ***Search outcome*** — by providing applicants with preliminary information on the quality of the application, the search outcome might influence applicants' decisions to proceed to the examination stage. Where a document cited in the European search report is particularly relevant, it should be indicated by the letter "X" or "Y". The 'Application Dataset' contains information on the two following search outputs:

- *Number of 'X' documents.*
- *Number of 'Y' documents.*

Category 'X' is applicable where a document is such that when taken alone, a claimed invention cannot be considered novel or cannot be considered to involve an inventive step. Category 'Y' is applicable where a document is such that a claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other documents of the same category, such combination being obvious to a person skilled in the art. The most immediate interpretation of is that both 'X' and 'Y' documents of the search are indicative of the relatively negative outcome of the search. However, in patent attorney thinking, while the citation of many 'X' (possibly novelty destroying) documents may induce the withdrawal of the application, the citation of 'Y' documents (possibly no inventive step) might also be perceived as a good reason to fight for the grant of the patent.

In July 2007 the Extended Search Report was introduced (and its introduction coincided with an increase in search fee to account for the improved quality of the service provided). In order to control for the potential impact of this change the following variable has also been included.

- *Introduction of the extended search report*, a dummy variable that takes value one after the date of the introduction.

(e) ***Macroeconomic indicators*** — these are economic indicators for all the countries from which patent filings are generated:

- *Population.*
- *Real GDP per capita.*
- *Growth rate of Real GDP per capita.*
- *Consumption share of real gross domestic product per capita (current price).*
- *Government share of real gross domestic product per capita (current price).*

- *Investment share of real gross domestic product per capita (current price).*
- *Openness (in constant in current prices).*
- *Yearly average currency exchange rate index of national currencies against the euro.*[25]

(f) ***Fees*** — includes relevant fees that might affect the decision to proceed further in the application process, or the decision to extend the examination phase. These are:

- *Filing fee.*
- *Search fee.*
- *Examination fee.*
- *Designation fee per country.*
- *Grant fee.*
- *Fee for further processing.*

The designation fee per country has been constructed from fee payments data and information from EPASYS on the dates of designation fee payments. The EPASYS information enabled us to calculate the number of states designated in the application, noting that prior to April 2009 all states were deemed designated if seven designation fee payments were made. Our interest is in the impact of the designation fee upon the likelihood of progressing to the next stage of the application, independent of the number of states designated (since this effect is picked up by a different variable). Therefore, we constructed the variable by dividing the total fee paid by the number of countries for which the fee was paid if fewer than seven countries were designated and by dividing the total fee paid by seven where all countries were designated.

Claims fees and internal renewal fees have not been included for the following reasons.

First, the 'Application Dataset' does not provide the dates of payments for these fees, and the excess claims/pages fees available from the 'Fee Dataset' would also be of

[25] This variable accounts for the fact that national currency exchange rates fluctuations affect the real costs associated with fee payments to applicants outside the euro-area. For the period 1988-2001, i.e. before the introduction of the euro, we have used the national currency exchange rates with the ECU.

no use because it contains only the fees that have been paid, not those that 'should' have been paid. Second, and more importantly, if excess claims fees are not paid, the claims for which no fee has been paid are deemed to be abandoned but the application continues to exist and is not deemed withdrawn. Therefore, the dates of payments of filing fees and search fees are sufficient to filter out all the applications that do not reach the search phase.

Internal renewal fees have not been included because it is conceptually difficult to understand why they should have an impact on the decision of whether to progress an application to a particular stage, given that the fees are not stage-specific. For example, some applications may progress extremely quickly such that, say, the first internal renewal fee would need to be paid only in the examination phase. Other applications may proceed more slowly and hence the first renewal fee would need to be paid in the search phase and hence it cannot be reasonably assumed that internal renewal fees will affect the decision to progress to any one stage.

(g) ***Other control variables*** — these variables serve as additional control for possible structural changes.

- *Year effects*, i.e. dummy variables that account for year-specific fixed effects (e.g. discovery of new technologies, or the expiry of relevant patents) that might influence filing behaviours.

Construction of 'artificial' fee values

3.14 The primary interest of this Section is to determine the impact, if any, of procedural fees on the decisions of applicants of whether or not to progress an application to the next stage of the application process.

3.15 To implement a discrete choice regression model, the dataset must contain some observations where the application has proceeded to the next stage and others in which the application has not progressed. For those observations that progress to the next stage, we can observe the actual fee paid but for those that do not progress we do not have any information on the fees that the applicant would have paid had the application proceeded to the next stage and hence there is a "missing value" in the dataset. If a particular application has a missing value for one of the variables in the regression, it is excluded from the regression. Therefore, we can only assess the impact fees have upon the decision to progress an application if we make an assumption about the fees that non-progressing applications would have incurred and replace the missing values in the dataset with this assumption.

3.16 Given the availability of good quality data from the fees database, we sought to develop a methodology which utilised this data rather than basing the assumed fee payments on official EPO fee rates. Given the filing date of an application, we assumed that the non-progressing application would have faced a fee at the next stage equal to the modal (most common) fee amount paid for applications filed in the same year which did enter the next stage of the application process. We chose to use the modal fee rather than the

mean fee because it is immune from the influence of outliers and more closely represents the expectations of the applicant.

3.17 The rationale for using the fees dataset rather than official fee rates was fourfold:

(a) Inferring fees amounts that would have been paid from actual payment data is natural, given the availability of such data.

(b) To infer fee amounts from the official fee schedule would require us to make arbitrary assumptions. For example, we would need to make a guess about the date on which a particular fee would have been paid so as to take account of fee changes. This is not a trivial issue because there is a wide time window in which some fees can be paid (e.g. the examination fee can be paid at the moment of filing).

(c) Inferring fee amounts from the official fee schedule would lead estimated fee amounts that have less variation that those actually paid because we would not account for all potential discounts. This could distort the regression results.

(d) Inferring hypothetical fee payments from the mode of actual fee payments has clear methodological justification. The procedure can be interpreted as an assumption that applications for which a certain fee has not paid are indeed equivalent to those that have paid the fee except for all those characteristics (included in the regression) that we have already controlled for.

3.18 'Artificial' fee values were created for missing values in the dataset for the following fees:

(a) Filing fee.

(b) Search fee.

(c) Examination fee.

(d) Grant and printing fee.

(e) Further processing fee.

3.19 A different approach was used to complete missing values of the designation fee per country. In this case, we considered that using the modal value of the fees actually paid would create greater uncertainty in the estimates than would the use of official fees. Further, where an applicant has not paid the designation fee for any country, there is an argument that the relevant fee for his decision-making is the official designation fee. Indeed, this is the 'incremental' cost that would be faced by the applicant if he chose to designate an additional country given that he has initially not paid the fee for any country. On this basis, we use the official EPO designation fee for applications in which a designation fee has not been paid.

3.20 Finally, we noted earlier that when the filing language (other than EN, DE, or FR) of an EPC contracting state is used by an applicant from an EPC country, the filing fee and the examination fee are reduced by 20 percent. Therefore the artificial the 'artificial filing fees' and the 'artificial examination fees', were reduced of 20 percent for these applications.

Model specification

3.21 The econometric analysis has been conducted through a *discrete choice model.* The aim of discrete choice models is to analyse the choice made by individuals among a finite set of alternatives. In relation to the analysis of applicants' propensity to proceeded further in the application process, we have used a binary model which estimates to what extent an applicant's decision to proceed to the next stage of the procedure (i.e. the dependent variable is "*YES = proceed*", "*NO = do not proceed*") is affected by the relevant procedural fees, and some control variables. Similarly, the analysis of requesting further processing in the examination stage has also been conducted by constructing a binary variable that indicates whether or not a further processing charge has been paid.

3.22 The most widely used discrete choice models in econometrics are the Logit and Probit models. Both models are binary choice models because the dependent variable, *y*, can take only two values. In the context of this study the models can be expressed as follows:

$$\Pr(y_i = "proceed\ to\ the\ next\ stage" \mid Fee_i, Xs_i) = F(Fee_i, Xs_i, b)$$

or,

$$\Pr(y_i = "request\_further\_proc" \mid \mathrm{Fee}_i, Xs_i) = F(Fee_i, Xs_i, b)$$

3.23 which reads as follows: for an applicant (i) the probability to proceed to the next stage (or to request further processing) depends on the a set of relevant fees, (Fee_i), and a set of control variables Xs_i, and such probability is a function of some parameters, *b.* The difference between a Logit and a Probit lies in the particular distribution function imposed on $F(\cdot)$ — the normal distribution leads to a Probit and the logistic distribution leads to the Logit. The results below are based on Probit models – we do not present Logit models because both typically yield very similar results.[26] Furthermore, it seems natural to assume that there is an underlying normal distribution of decisions of whether or not to progress to the next stage of the application process (a few applications will definitely not

[26] Indeed, there is generally a systematic relation between the coefficients from Probit and Logit models in that Logit coefficients tend to be 1.7 times greater than do Probit coefficients.

wish to progress, a few definitely will want to but the majority will be in-between the two extremes).

Interpreting regression results

3.24 To interpret the regression results presented in the Tables below, a little background knowledge of econometrics and statistics is required. In this section, we seek to provide the necessary knowledge to understand the discussion that follows.

3.25 The tables below consist of the following columns:

Variable	dy/dx

3.26 The "Variable" column contains the explanatory variables of the regression model. Explanatory variables are those factors which we believe might have an impact on the decision of an applicant of whether or not to proceed, say, to the examination phase given that a search report has been published.

3.27 The "dy/dx" column shows the 'marginal effect' of the explanatory variable on the likelihood that the applicant progresses to, say, the examination phase. A positive value for the coefficient shows that an increase in the value of the variable makes it more likely that the application proceeds whilst a negative coefficient means that an increase in the value of the variable makes progression less likely. The greater the magnitude of the coefficient (either positive or negative), the greater the impact on the likelihood of progression to the next phase. For example a coefficient of -0.01 means that a unit increase in the relevant variable leads a one per cent decrease in the probability of an application progressing to the next stage.

3.28 Statisticians and economists use significance tests to determine whether or not a particular explanatory variable has an impact on the dependent variable. In the tables of results, a single asterisk next to an entry in the dy/dx column indicates that the coefficient is significantly different from zero at the 5 per cent level, whilst a double asterisk indicates that it is significant at the 1 per cent level. We have greater confidence that the dependent variable does truly impact on the dependent variable if it is significant at the 1 per cent level than we do if it is significant at the 5 per cent level. Nonetheless, 5 per cent is accepted as being sufficient to determine significance and we follow this convention.

3.29 For the sake of clarity, some coefficients in the results tables below are reported in scientific form, such as -2.01E-5, which could be written as -0.0000201 or $-2.01*10^{-5}$.

Dummy variables

3.30 Some of the variables included in the regression are 'dummy variables', which take a value of either zero or one. For example, a dummy variable indicating whether or not the application was filed electronically would take a value of one for all those applications

which were filed electronically and zero for those applications not filed electronically. Dummy variables are indicated by an asterisk in the results tables below.

3.31 Interpreting the coefficients on dummy variables is slightly more complex than is the interpretation of the coefficients on standard numeric variables. In the context of the step-by-step analysis, the coefficient on a dummy variable indicates the change in the probability of progressing to the next stage, given a change in the value of the dummy variable from zero to one. For example, a positive coefficient on the Electronic Filing Indicator variable in a regression examining whether French applicants file directly at the EPO should be interpreted as follows:

applications filed electronically are more likely to be filed directly at the EPO than at the French patent office compared to applications filed non-electronically.

3.32 An added complication arises where dummy variables are used to indicate whether or not an application has one given characteristic from several characteristic options. In this case it is always necessary to omit one option from the regression and hence the coefficients on the other dummies are interpreted relative to the omitted option. For example, the procedural language of an application can be English, French or German. The regressions below include dummy variables for English and French but omit German. Therefore, a positive coefficient on the English language dummy variable in the examination stage regression should be interpreted as follows:

relative to applications for which the procedural language is German, applications for which the procedural language is English are more likely to progress to the examination phase.

3.33 A similar interpretation is required for variables which indicate the broad International Patent Classification class and the nationality of the applicant.

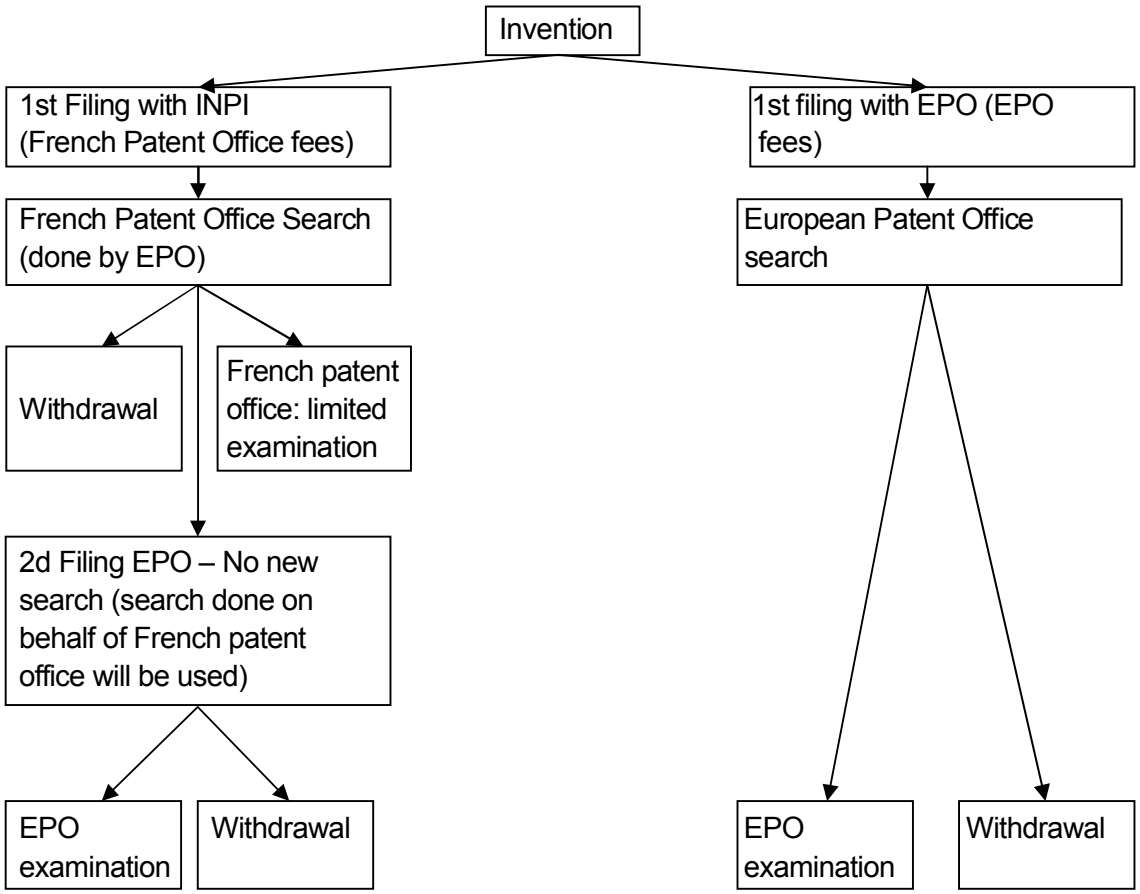
Analysis of the decision of where to file for French applicants

3.34 This section considers the decision of where to file a patent application. It focuses solely on French applicants because, as explained in greater detail below, a natural control exists for this group of applicants in terms of the type of search conducted.

Identification of the dependent variable

3.35 French applicants seeking protection in a number of EPC contracting states face a choice of filing direct with the EPO or filing with the French national patent office and getting a search report drawn up by the EPO. Regardless of which option the applicant chooses, the search is conducted by the EPO since the French national patent office has delegated its national searches to the EPO.Figure 3.3 below illustrates the decision facing a French applicant.

Figure 3.3: Decision Tree for a French Applicant



3.36 The search fee charged by the French patent office is significantly less than that charged by the EPO and yet the product is identical (i.e. a European search conducted by the EPO). The only difference between the two products is that for applications filed directly to the EPO, the search report is drawn up after six months whereas there is a period of nine months between filing and the drawing up of the search report for applications filed at the French patent office. Applications filed at the EPO incur a search fee of approximately €1,050 whereas the fee for an application at the French patent office is approximately €500.

3.37 Given this, it is somewhat unsurprising that the majority of French applications which were also invented on the French territory first file at the French patent office in order to take advantage of the lower fee for the search report. However, a minority of applicants would wish to have the search report at the possible date and hence file directly at the EPO irrespective of the amount of the search fee.

3.38 The situation is rather different for French applications where the invention has been developed in one or more R&D laboratories in countries other than France. In this case, the easiest solution is to file a first application at the EPO, in the English language, in order to simplify the communication with the inventors (who may be American, Chinese,

German, etc.) during the procedure. If this type of application were filed at the French patent office would have to be translated into French and the cheap search fee would then not be attractive.

Analysis

3.39 The purpose of our analysis is to understand the factors that drive the decision of French applicants about whether to file at the EPO or at the French patent office.

3.40 Our approach to this analysis has been to consider only French applications that eventually file at the EPO. We constructed a binary variable indicating whether the first filing for such applications is national application or European Patent Applications and this is used as the dependent variable in the regression analysis.

3.41 The table below provides the estimation results for the Probit model.

Table 3.1: Decision of French Applicants to File at INPI or EPO

Variable	Marginal effect
Difference between EPO and INPI search fee	3.86E-06
Electronic Filing Indicator	0.00706**
Number of Claims	0.000135**
Number of Designated States	-7.9E-05*
Use Filing Representative	0.003662**
French inventor	-0.22579**
IPC (B) - Performing operations	1.11E-05
IPC(C) - Chemistry and Metallurgy	0.039837**
IPC(D) - Textiles and Paper	0.007107
IPC(E) - Fixed constructions	-0.00178
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	-0.0025
IPC(G) – Physics	0.059338**
IPC(H) - Electricity	0.037344**

(*) significant at 5 per cent level

(**) significant at 1 per cent level

3.42 The results show that fees do not matter to French applicants when making their decision of where to file. More specifically, the coefficient on the difference between the EPO and INPI search fees is insignificant and hence the magnitude of this variable has no impact on the applicant's decision of where to file their application.

3.43 Possibly the most interesting result presented in Table 3.1 is the coefficient on the dummy variable indicating whether or not the inventor is French. We found that of 31,500 applications made by French applicants, approximately 1,000 were invented by non-French nationals. We noted above that in such a scenario, the easiest solution for the applicant is to file directly to the EPO. This hypothesis is confirmed by the results presented in Table 3.1. Indeed, the fact that the coefficient on the French inventor dummy variable is negative shows that where the inventor is French, he is less likely to file directly to the EPO whilst filing to the EPO is far more likely if the inventor is not French. Indeed,

applications in which the inventor is French are approximately 23 per cent less likely to file at the EPO than are those applications in which the inventor is not French.

3.44 This result can be explained intuitively by noting that for French applicants developing their invention worldwide in different R&D laboratories the easiest solution is to file directly at the EPO in the English language in order to simplify the communication with non-French inventors during the entire procedure.

3.45 We could not include in the regression a variable indicating the language in which the application was filed because applications to the French patent office can only be filed in French and hence observing a non-French filing language would perfectly predict that the application is filed at the EPO. However, we can prove the hypothesis that French applicants filing at the EPO are most likely to file in the English language simply by examining descriptive statistics. Indeed, we find that of the 357 applications from French applicants, with a non-French inventor, filed directly at the EPO, 342 (almost 96 per cent) are filed in English.

3.46 The results also show that those applications for which a filing representative is employed are more likely to be filed at the EPO. However, the magnitude of the effect is very small: those that use a filing representative are just 0.4 per cent more likely to be filed at the EPO.

3.47 Finally, the results indicate that certain categories of applications, as defined by broad International Patent Classification class, are more likely to be filed at the EPO than are other classes. Compared to class A, human necessities, classes C, G and H are significantly more likely to file at the EPO, with the magnitude of effect ranging from 3.7 per cent for class H to 6.0 per cent for class G.

Analysis of the decision to enter the search phase.

3.48 This sub-section considers the issue of whether an applicant chooses to pay the search and filing fees, given that he has filed an application at the EPO. We understand that some applicants would wish to lodge an application at the EPO purely to receive a filing date which they would then use as a priority date in subsequent applications. We therefore wish to examine whether filing and search fees could have an impact on this practice. In particular, we investigate the question of whether or not an increase in the filing and search fees could lead reduce the likelihood of entering the search phase and hence increase in the practice of filing purely to obtain a filing date.

Identification of the dependent variable

3.49 In order for an application to proceed to the search phase the following requirements must be met:

(a) If the application is filed in a language other than English, German, or French, a translation into one of the official languages of the EPO must be filed within two months

(b) After the fulfilment of the requirements for accordance of the date of filing (normally this is the date of receipt of the application) applicants have one month to pay the filing fees, search fees and (if applicable) claims fee, in order to have a search conducted by the EPO.

3.50 Therefore, the number of applicants that enter the search phase has been identified by the simultaneous presence of an entry for the following variables (extracted from the 'Application Dataset'):

- Filing fee (FFEE) — indicates the date of payment for the filing fee from the Application Dataset
- Date of receipt of search fee (SFEE) — indicates the date of payment for the search fee.

3.51 In implementing our analysis, we have not included all EP filings for which we have data. The reason for this is that some of these applications will not yet have completed the application process and hence some applications that currently have not paid the filing and search fees may enter the search phase in the future. To overcome this problem, we have included in our analysis only those applications that have been declared 'dead' by the EPO. With this approach, we can be sure that those that have not paid the filing and search fees will never do so and hence that our results will be robust.

3.52 With this approach, we have found that of the 175,315 EP filings that have been declared dead by the EPO, only 174,456 have paid both the filing and search fees, meaning that, approximately 0.5 per cent do not even reach the search phase. Such applications are filed with the only purpose of establishing a filing date which, in subsequent applications claiming the priority of the first application will become the priority date.[27]

3.53 Despite being small, we consider such a number to be material, which justifies a formal analysis of the decision to enter the search phase.

Analysis

3.54 The table below model provide the estimation results for the Probit model. The pseudo R-squared of 0.086 indicates that 8.6 per cent of the decision to pay the search and filing fees are explained by the variables included in the regression.

[27] This practice is referred to as defensive publishing, see, e.g., Henkel and Jell, (2009), "Alternatives Motives to File for Patents,: Profiting from Pendency and Publication".

Table 3.2: Likelihood of entering search phase (only next stage fees matter)

	Pseudo R^2=0.086
Variable	**dy/dx**
Filing Fee	-8.9E-05**
Search Fee	-9.54E-07**
First Filing	0.000464
EPC application filed in language other than DE, EN or FR	-0.00155*
Non-EPC application filed in language other than DE, EN or FR	-0.00105
Extended Search Report	2.22E-05
Electronic Filing Indicator	-0.01112**
Number of Claims	-7.22E-06
Procedural Language EN	-0.00172**
Procedural Language FR	-0.0004
Use Filing Representative	0.090133**
Deliberate Decision to use Filing Representative	-0.01455**
French applicant	-0.00117
UK applicant	0.000965
Japanese applicant	-0.02214**
Korean applicant	-0.03834**
Other non-EPC applicant	-0.02901**
Other EPC applicant	-0.0005
US applicant	-0.02847**
IPC (B) - Performing operations	0.001093**
IPC(C) - Chemistry and Metallurgy	4.15E-05
IPC(D) - Textiles and Paper	0.000751
IPC(E) - Fixed constructions	8.98E-05
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	0.000664
IPC(G) – Physics	0.00058
IPC(H) – Electricity	0.001353**
Population	1.47E-09
Real GDP per capita	-1.47E-08
Consumption Share of Real Gross Domestic Product	3.11E-05
Government Share of Real Gross Domestic Product	-3E-05
Investment Share of Real Gross Domestic Product	0.000204**
Openness	1.18E-05
Growth Rate of Real GDP Chain per capita	-0.00016

Note: Year dummies were included in the regression but are not reported in the table

(*) significant at 5 per cent level

(**) significant at 1 per cent level

3.55 Several interesting observations can be made from the results presented in Table 3.2.

Fees

3.56 The coefficients of both the filing fee and search fee are negative and significantly different from zero. This indicates that an increase in either of these fees makes it less likely that an applicant would enter the search phase, given that they have obtained a filing date. However the magnitudes of the coefficients are extremely small.

Filing practices

3.57 The coefficient on first filings is insignificant, which indicates that there is no difference between applications that claim priority at the EPO and those that have previously been filed at a national patent office in terms of entering the search phase at the EPO.

3.58 While the use of a filing representative increases the chance of entering the search phase this chance decreases when the use of filing representative is a deliberate decision taken by EPC applicants. As we said earlier the deliberate use of a filing representative might be a proxy for firm size, (i.e. it indicates that a firm is small and does not have an internal patent division), in which case, the interpretation would be that the practice of defensive publishing is more common among large firms. It is also important to stress that the use of a filing representative is the variable that has the largest explanatory power, i.e. it is has the largest coefficient.

3.59 Finally, filing with the sole purpose of establishing a filing date is more likely when the procedural language of an application is English.

Geographical origin

3.60 The specific geographical origin within EPC countries adds no information to the model (all coefficients are insignificant), while applications originating in non-EPC states are more likely to file to the EPO with the only purpose of obtaining a filing date, as indicated by a negative coefficient on the variables.

Technological sectors

3.61 The only technological sectors that are significant in explaining the decision to enter the search phase are Performing Operations and Electricity; applications in these sectors are more likely to proceed to the search stage than are applications from the field of Human necessities.

Macroeconomic indicators

3.62 It is generally the case that macroeconomic variables have no impact on the decision of whether or not to enter the search phase. The one exception to this rule is the variable "Investment Share of Real Gross Domestic Product", the coefficient of which indicates that the greater the share of investment as a proportion of GDP the more likely it is that applications from the country will enter the search phase.

3.63 Results are similar when we assume that all future fees are relevant for the decision of whether or not to enter the search phase. These results are presented in Table 3.3 below.

Table 3.3: Likelihood of entering search phase (all future fees matter)

	Pseudo R^2=0.093
Variable	**dy/dx**
Filing Fee	-8.2E-05**
Search Fee	-8.83E-07**
Designation Fee	-2.2E-05**
Examination Fee	-2.04E-06**
Grant Fee	-0.00004*
First Filing	0.000153
EPC application filed in language other than DE, EN or FR	-0.00148*
Non-EPC application filed in language other than DE, EN or FR	-0.00076
Extended Search Report	0.000656
Electronic Filing Indicator	-0.01008**
Number of Claims	-7.21E-06
Procedural Language EN	-0.00154**
Procedural Language FR	-0.00039
Use Filing Representative	0.084043**
Deliberate Decision to use Filing Representative	-0.01342**
French applicant	-0.0011
UK applicant	0.000828
Japanese applicant	-0.02119**
Korean applicant	-0.03506**
Other non-EPC applicant	-0.02593**
Other EPC applicant	-0.00052
US applicant	-0.03162**
IPC (B) - Performing operations	0.001011**
IPC(C) - Chemistry and Metallurgy	4.59E-05
IPC(D) - Textiles and Paper	0.000675
IPC(E) - Fixed constructions	5.89E-05
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	0.000608
IPC(G) – Physics	0.000529
IPC(H) – Electricity	0.001247**
Population	1.97E-09
Real GDP per capita	2.35E-08
Consumption Share of Real Gross Domestic Product	4.34E-05
Government Share of Real Gross Domestic Product	-1.2E-05
Investment Share of Real Gross Domestic Product	0.000199**
Openness	1.17E-05*
Growth Rate of Real GDP Chain per capita	-0.00013

Note: Year dummies were included in the regression but are not reported in the table

(*) significant at 5 per cent level

(**) significant at 1 per cent level

3.64 The coefficients presented in the table above are almost exclusively of the same sign and very similar magnitude to those when we considered only the filing and search fees. Furthermore, the regression again explains less than 10 per cent of the variation in the data and hence some unobserved factors must be important determinants of applicants' decisions at this stage.

3.65 It is interesting to note, however, that both the designation and examination fees are significant in this regression and that they both act in the direction we would expect. In particular, the greater is the designation or examination fee, the less likely is the applicant to enter the search phase. This suggests that applicants are somewhat forward-looking when making decisions at the start of the application procedure.

Analysis of the decision to enter the examination phase

Identification of the dependent variable

3.66 The identification of the applications proceeding to the examination has been immensely facilitated by the presence of the variable *'Date of start of examination phase (dg2)'* in the 'Application Dataset'. It is our understanding that this variable alone is sufficient to identifying those application that proceed from search to examination. An alternative route — which we believe is more problematic — is to identify the applications that enter the examination phase by checking the presence of an entry for the following variables:

- *Examination request, date of filing* (EXAMFILING) — indicates the date in which the examination has been requested.
- *Examination request, date of receipt of examination payments* (EXAMPAY) — confirms the date of the receipt of the examination fee
- *Payment of designation fees, date* (DAPAYDST1) — indicates the date of payment if the designation fee. In order for an application to proceed to the examination stage at protection must be sought in at least one EPC country.

3.67 The three variables above could in principle confirm whether the three key requirements for proceeding to the examination phase are met. However, we believe that a potential complication is due to the fact that the payment of examination fees and the request for examination can be made before receiving the European search report (paragraphs 156 and157 of the EP Application Guideline). In this case, the Receiving Section invites the applicant to indicate (within six months of the date when the European Patent Bulletin mentions publication of the search report) whether he wishes to proceed further with the application. If there is no reply to this invitation, the application is deemed to be withdrawn and the examination fee is refunded in full. Therefore, by determining the applications that enter the examination phase through the variables listed above there is the risk of defining as proceeding to examination those applicants that have paid the relevant fees upfront but have withdrawn the application before the examination stage.

3.68 In implementing our analysis, we have not included all applications that entered the search phase and for which we have data. The reason for this is that some of these applications will not yet have completed the application process and hence some applications that currently have not yet entered the examination stage may do so in the future. To overcome this problem, we have included in our analysis only those applications that have been declared 'dead' by the EPO. With this approach, we can be

sure that those that have not entered the examination stage will never do so and hence that our results will be robust.

3.69 Using the variable *'Date of start of examination phase (dg2)'* as a filter we have found that of the 174,456 EP applications declared dead by the EPO that reached the search phase, 88,520 proceed to the examination phase, i.e. the probability that an average applicant enters the examination phase, given that they were previously in the search phase, is approximately 50.7 per cent. We present the analysis of the determinants behind this decision below.

Analysis

3.70 The table below model provide the estimation results for the Probit model.

Table 3.4: Likelihood of entering examination phase (only next stage fees matter)

	Pseudo R^2=0.320
Variable	**dy/dx**
Designation fee per country	0.002506**
Examination fee	-0.00169**
First Filing	0.062742**
EPC application filed in language other than DE, EN or FR	-0.0468**
Non-EPC application filed in language other than DE, EN or FR	-0.22928**
Extended Search Report	-0.38668**
Number of Y Documents	0.000719
Number of X Documents	-0.00265**
Number of Claims	0.001235**
Procedural Language EN	-0.08272**
Procedural Language FR	0.036863**
Use Filing Representative	0.050351
Deliberate Decision to use Filing Representative	-0.03816
Number of Designated States	-0.0124**
French applicant	0.042633**
UK applicant	0.058044**
Japanese applicant	0.034565
Korean applicant	-0.08114
Other non-EPC applicant	-0.00164
Other EPC applicant	-0.17721**
US applicant	0.173167**
IPC (B) - Performing operations	-0.01233**
IPC(C) - Chemistry and Metallurgy	0.025918**
IPC(D) - Textiles and Paper	0.038796**
IPC(E) - Fixed constructions	-0.01954**
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	-0.04036**
IPC(G) – Physics	-0.02217**
IPC(H) – Electricity	-0.03359**
Population	-2.56E-07**
Real GDP per capita	-1.3E-05**
Consumption Share of Real Gross Domestic Product	-0.00426**
Government Share of Real Gross Domestic Product	-0.00455**
Investment Share of Real Gross Domestic Product	0.00238**
Openness	-9.1E-05
Growth Rate of Real GDP Chain per capita	0.002713**

Note: Year dummies were included in the regression but are not reported in the table

(*) significant at 5 per cent level

(**) significant at 1 per cent level

3.71 Compared to the regression of Table 3.2, the regression of Table 3.4 has a much larger pseudo R-squared (0.320 compared to 0.087), meaning that the examination phase regression explains 32 per cent of the decisions made by the applicants about whether or not to progress the application. This is not surprising given that many applicants decide not to proceed to the examination phase and therefore there is much more variation in the data that can be explained.

Fees

3.72 The coefficient on the examination fee is negative and highly significant, indicating that the greater is the examination fee, the less likely is the application to progress to the examination phase. However, the coefficient on the designation fee per country is positive, which suggests that the greater is this fee the more likely is the applicant to enter the examination phase.

3.73 At first glance, this result may seem surprising since we would expect any fee increase to have a negative impact on the likelihood of entering the next phase of the patent application process. However, an intuitive explanation of the result can be given if it is noted that the major impact of an increase in the designation fee is likely to be on the number of designated states rather than on the choice of whether or not to progress the application. We attempted to control for this effect by including in the regression the number of designated states, which has a negative coefficient and hence indicates the lower the number of designated states the greater the likelihood of progressing to the examination phase (this result is discussed more in detail later on). It is possible, however, that our approach has not completely separated the impact of designation fees and the number of designated states and hence it might be the case that the coefficient on the designation fee is partially picking up the effect of the fee on the number of designated states, such that both variables indicate that the lower the number of designated states, the greater the likelihood of progression.

Filing practices

3.74 The coefficient on first filings indicates that applications that claim priority at the EPO are more likely to proceed to the examination phase. This result can be rationalised by noting that some first filings to the EPO may not result in a subsequent second filing and that, for these applications, the EPO represents the only route for patent protection in European markets.

3.75 Having filed the application in a language different from the three official languages of the EPO has a negative impact on the propensity to require an examination. Moreover, this negative effect is significantly larger if the application is not originated in an EPC state. The latter result can be explained by noting that EPC applicants that file in their national language (other than DE, EN, or FR) are eligible for a 20 percent discount on the examination fee, and that such a discount may provide an additional motive for requiring an examination.

3.76 As for the likelihood of requiring a search, the likelihood of requiring an examination is slightly lower among applications whose language of proceedings is English.

3.77 Finally, the results show that, generally, the use of a filing representative has no impact on the chance of entering the examination phase.

Breadth and geographical scope of protection

3.78 While the number of claims (a proxy for patent breadth) is associated with an increased chance of proceeding to the examination stage, a wider geographical scope of protection (i.e. the number of designated states) has a negative impact on the probability of proceeding further. While the former result is intuitive and confirmed by the findings of other studies that show a positive correlation between number of claims and patent/application quality, the latter result is more difficult rationalise. In fact, one would expect a broader geographical protection to be a positive signal on the perceived quality of the patent application. We suspect that the way in which the variable "Number of Designated States" is constructed is responsible for this unintuitive twist.

3.79 For applications that have entered the examination stage the "Number of Designated States" has been based on the payment of designation fees.[28] However, for applicants that have not entered the examination phase— and thus have not paid designation fees — the "Number of Designated States" (which in fact represents the number of States that *would have been* designated, had the applicant decided to require an examination) has been inferred by a variable which denotes the number of countries provisionally designated before the payment of designation fees. If the applicant, before the examination stage, does not provide an explicit indication about the scope of geographical protection, than all EPC countries are assumed to be provisionally designated. Therefore, the variable 'Number of Designated States' captures also the applicants' decision of being silent about the geographical scope of protection, a decision which might be more common among vague and unfocused applications.

Search outcome

3.80 The introduction of the Extended Search Report has the greatest explanatory power of any variable in the regression. Indeed, the coefficient of the dummy variable indicating whether or not an application was filed after the introduction of the extended search report is negative and highly significant. This result seems to be intuitively correct since it shows that where applications receive a more in-depth search report, applicants take more account of the contents of the report and are less likely to proceed to examination. In particular, the estimation result suggests that the introduction of the Extended Search Report has been responsible for a drop in the propensity of requiring an examination of the order of 39 per cent, i.e. the average applicant who has received the Extended

[28] More specifically, the 'Number of Designated States' has been set equal to the number of designation fees paid (each fee corresponds to the designation of one country) if less than seven fees have been paid, and to the total number of EPC contracting states (at the moment of the designation fee payment) otherwise.

Search Report, is 39 per cent less likely to proceed to the examination compared to an applicant who has received a standard search outcome.

3.81 The coefficient on the number of 'X' documents is negative whilst the coefficient on the number of 'Y' documents is not significant. These variables are used in the regression as proxies for the negativity of the search outcome since the greater the number of cited documents, the less 'unique' or 'innovative' is the subject of the patent application. Common sense would suggest that the more negative is the search outcome, the less likely is the applicant to enter the examination phase. The coefficients on these variables are consistent with such a hypothesis. Finally, we have previously stated that in patent attorney thinking, while the citation of many 'X' (possibly novelty destroying) documents may induce the withdrawal of the application, the citation of 'Y' documents (possibly no inventive step) might also be perceived as a good reason to fight for the grant of the patent. Our results show that the impact of 'Y' documents is unclear (because the coefficient is insignificant and confirm that 'X' documents are perceived as being a negative signal (because the coefficient is negative).

Geographical origin

3.82 The results indicate that applications originated in the US, in France and in the UK, are more likely to proceed to the examination than are applications originated in Germany, while those originated in other EPC countries (except Germany), are less likely to do so. Other geographical origins are statistically not significant.

Technological sectors

3.83 Technological sectors can be grouped according to the direction of their impacts on the likelihood of proceeding to the examination. While applications in the fields of chemistry and textiles are more likely to progress to the examination stage than are applications in the field of human necessities, applications in all other technological fields are less likely to do so. In terms of magnitude, the largest sector-specific impact is represented by the technological field of mechanical engineering, lighting, heating, weapons and blasting.

Macroeconomic indicators.

3.84 In contrast to the results of the search phase regression, macroeconomic variables appear to be significant determinants of the decision of whether or not to enter the examination phase.

3.85 Results are similar when we assume that the applicant takes all future fees into account when deciding whether or not to enter the examination phase. This is shown in the table below. The coefficients are almost exclusively of the same sign and very similar magnitude to those when we considered only the designation and examination fees and hence we do not repeat the discussion of results here.

Table 3.5: Likelihood of entering examination phase (all future fees are relevant)

	Pseudo R^2=0.336
Variable	**dy/dx**
Designation fee per country	0.00228**
Examination fee	-0.00153**
Grant fee	-0.00489**
First Filing	0.055004**
EPC application filed in language other than DE, EN or FR	-0.03376**
Non-EPC application filed in language other than DE, EN or FR	-0.20627**
Extended Search Report	-0.24448**
Number of Y Documents	0.000701
Number of X Documents	-0.00208**
Number of Claims	0.001018**
Procedural Language EN	-0.0703**
Procedural Language FR	0.037105**
Use Filing Representative	0.046262
Deliberate Decision to use Filing Representative	-0.03554
Number of Designated States	-0.01063**
French applicant	0.03674**
UK applicant	0.03804**
Japanese applicant	0.034235
Korean applicant	0.006668
Other non-EPC applicant	0.01583
Other EPC applicant	-0.16491**
US applicant	0.122227**
IPC (B) - Performing operations	-0.01056**
IPC(C) - Chemistry and Metallurgy	0.024665**
IPC(D) - Textiles and Paper	0.037555**
IPC(E) - Fixed constructions	-0.01887**
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	-0.03514**
IPC(G) – Physics	-0.02211**
IPC(H) – Electricity	-0.03333**
Population	-1.85E-07**
Real GDP per capita	-7.17E-06**
Consumption Share of Real Gross Domestic Product	-0.00248**
Government Share of Real Gross Domestic Product	-0.00181**
Investment Share of Real Gross Domestic Product	0.002369**
Openness	-0.00018**
Growth Rate of Real GDP Chain per capita	0.006727**

Note: Year dummies were included in the regression but are not reported in the table

(*) significant at 5 per cent level

(**) significant at 1 per cent level

Analysis of the decision to request further processing in the examination phase

Identification of the dependent variable

3.86 Once an application has entered the examination phase, there is the possibility for the applicant to request further processing by failing to comply with time limits laid down in the European Patent Convention or with time limits set by the examiner. For instance, the applicant may choose not to respond to a communication from the examiner within the set time limit. If he makes this choice, the applicant will receive a communication of loss of rights and may then rectify this situation by responding to the communication and paying the flat fee for further processing, currently €210. If the applicant fails to make a fee payment within the particular time limit, he will again receive a communication of loss of rights and can rectify this by making the original fee payment plus a further processing charge of 50 per cent of the relevant fee.

3.87 It has been thought that applicants might tactically decide not to comply with time limits. For instance, in the pharmaceutical or agrochemical field new products need a marketing authorisation granted by the responsible authorities only after years of testing. To get the patent grant before the marketing authorisation would considerably increase the costs for the applicant enterprise as pharmaceutical companies tend to validate their patents in all EPC contracting states and the sum of national renewal fees due would be much higher than the renewal fee for the pending European patent application.

3.88 To investigate this issue we first focus only on applications during the examination phase that are eventually granted. The rationale for restricting the analysis to patents that are eventually granted is that such a restriction controls for any unobservable differences between patents that are eventually granted and those which are not. It is quite possible that these unobservable differences would influence an applicant's decision of whether or not to seek further processing in the examination phase.

3.89 We also employ a second approach to the analysis that is based on applications that enter the examination phase and for which an IGRA is not dispatched and the application has been declared dead. This approach enables us to compare the propensity to request further processing in the examination phase by comparing applications that differ in 'quality' since one set are granted but the other is not.

3.90 Given the samples of applications to be used in this analysis, we have constructed a binary variable indicating whether or not a further processing charge has been. This variable was constructed from the fees dataset which also contains information on the date at which the further processing charge was paid. We have therefore checked whether the further processing charge was paid in the examination phase by comparing this date with the date of start of the examination phase (as reported in the 'Application Dataset') and the date of dispatch of intention to grant a patent (also reported in the 'Application Dataset').

3.91 The maximum number of requests for further processing observed in the dataset is three, including all procedural phases. We treat each decision as independent of other requests for further processing and hence separate regression results are presented below for the choices of whether or not to make second and third requests for further processing during the examination phase. Note that the first request may or may not also have been made in the examination phase.

3.92 We have identified that of the 175,315 EP applications declared dead by the EPO, 2,500 granted applications have paid the first further processing fee in the examination phase, 132 have paid the second further processing fee in the examination phase and 5 have paid the third further processing fee. Given that 88,520 applications declared dead by the EPO entered the examination phase, at least one examination stage further processing fee is received from 2.8 per cent of those that enter the examination phase.

Analysis

3.93 The results presented in Table 3.6 consider the choice facing applicants of whether or not to make their first request for further processing during the examination phase.

Table 3.6: Likelihood of making first request for further processing (grant fee received)

Pseudo R^2=0.396

Variable	dy/dx
Fee for further processing (non-fee time limit)	-0.0028**
First Filing	-0.00087
EPC application filed in language other than DE, EN or FR	-0.00663**
Non-EPC application filed in language other than DE, EN or FR	0.026866
Extended Search Report	0.001789
Number of Y Documents	0.000901**
Number of X Documents	0.00246**
Number of Claims	0.000593**
Procedural Language EN	0.017788**
Procedural Language FR	0.007428*
Use Filing Representative	-0.00588
Deliberate Decision to use Filing Representative	-0.00311
Number of Designated States	0.000154**
French applicant	0.012393**
UK applicant	0.061139**
Japanese applicant	0.000344
Korean applicant	-0.02119
Other non-EPC applicant	-0.0039
Other EPC applicant	0.007085*
US applicant	0.054835
IPC (B) - Performing operations	-0.00715**
IPC(C) - Chemistry and Metallurgy	-0.00562**
IPC(D) - Textiles and Paper	-0.01104**
IPC(E) - Fixed constructions	-0.00493
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	-0.00778**
IPC(G) - Physics	0.002719
IPC(H) - Electricity	-0.00026
Population	-1.61E-08*
Real GDP per capita	-1.07E-06**
Consumption Share of Real Gross Domestic Product	-0.00041
Government Share of Real Gross Domestic Product	0.000167
Investment Share of Real Gross Domestic Product	0.000116
Openness	3.75E-05
Growth Rate of Real GDP Chain per capita	-0.00033

Note: Year dummies were included in the regression but are not reported in the table

(*) significant at 5 per cent level

(**) significant at 1 per cent level

3.94 The first interesting conclusion that can be drawn from the table above is that the sign of many of the coefficients are the opposite of the sign when we analysed the choice of whether to request an examination. This indicates that, generally, the same factors that induce application withdrawals before entering the examination phase are those responsible for requesting further processing in the examination phase. This idea is discussed in more detail below.

Fees

3.95 The coefficient on the further processing fee variable is negative and highly significant, indicating that the greater the further processing fee, the less likely are applicants to request further processing of the application during the examination phase. Moreover, it should be noted that the magnitude of the coefficient is larger than that of any other fee considered so far (e.g. filing fee, search fee, and examination fee), and hence fees for further processing seem to be those with the greatest impact on applicants' behaviour. In particular, the coefficient implies that an increase in the fee for further processing of 100 euros would lead to a fall in the probability of a first request of further processing in the region of 28 per cent.

Filing practices

3.96 Compared to the regression outputs presented in the previous sections, fewer of the filing practices variables considered are significant in explaining the decisions to request further processing in the examination phase. For instance, the use (deliberate or not) of a filing representative does not explain any variation in the data. Recalling that we interpreted the deliberate use of a filing representative to be a proxy for firm size, the results suggest that decisions to request further processing are independent of firm size.

3.97 Interestingly, the variables that are significant have coefficients whose signs are opposite to those of the examination phase model. First, non-EPC applicants that have filed in their national language — who we know from Table 3.4 to be less likely to enter the examination stage — appear to be more inclined to request further processing in the examination phase. Similarly, applicants who have chosen English as the language of proceedings — who we also know from Table 3.4 to be less likely to enter the examination stage — are also more prone to request further processing.

Breadth and geographical scope of protection

3.98 As for the model of the decision to enter the examination stage, patent breadth — measured by the number of claims — has a positive impact on the probability of requesting further processing during the examination phase.

3.99 In contrast, the effect of the variable 'Number of Designated States' which is negative in Table 3.4, is positive in Table 3.6. We stress again that the interpretation of the last result is problematic given the imperfect way in which the variable 'Number of Designated States' is constructed.

Search outcome

3.100 The introduction of the Extended Search Report had no impact on the applicants' decision to request a further processing. In contrast, the coefficients on the number of 'X' and 'Y' documents are highly significant and positive, suggesting that the more negative is the

search outcome, the more likely it is that a request for further processing is made during the examination phase.

3.101 Such an outcome is not entirely surprising given that higher quality applications are more likely to proceed to each stage whilst lower quality applications are likely to extend the period of time before the examiner rejects the patent application. Furthermore, we understand from the EPO that first filings are less likely to request further processing, a thought confirmed by these results.

Geographical origin

3.102 Concerning the variables on geographical origin, the results of Table 3.6 are similar to those presented in Table 3.4. Applications originated in the UK and in France and in other to other EPC States are more likely to request further processing than are those originated in Germany. Among these, UK and French applications are more likely to enter the examination stage in the first place while other EPC applications are less likely to do so (see Table 3.4).

3.103 The US origin of application, which was highly significant in the examination phase model, is no longer significant here.

Technological sectors

3.104 Concerning technology specific effects, no sector is significantly more likely to request further processing than are applications in the field of human necessities. However, four sectors are significantly less likely to request further processing that are applications in the field of human necessities.

Macroeconomic indicators

3.105 In general, macroeconomic variables have no impact on the decision of whether to request further processing during the examination process.

3.106 Results are a little different when we consider applications that entered the examination phase but were not granted, an IGRA was issued and for which we can observe a date of death. This is shown in the table below.

Table 3.7: Likelihood of making first request for further processing (application for which IGRA not dispatched)

	Pseudo R^2=0.502
Variable	**dy/dx**
Fee for further processing (non-fee time limit)	-0.00241**
First Filing	-0.00152
EPC application filed in language other than DE, EN or FR	0.000172
Non-EPC application filed in language other than DE, EN or FR	-0.01159
Extended Search Report	-0.00083
Number of Y Documents	-1.3E-05
Number of X Documents	0.000796**
Number of Claims	0.000162**
Procedural Language EN	0.002858
Procedural Language FR	0.005004
Use Filing Representative	0.026756
Deliberate Decision to use Filing Representative	-0.16346
Number of Designated States	0.0001*
French applicant	-0.00365
UK applicant	0.006955
Japanese applicant	-0.08121
Korean applicant	-0.01518
Other non-EPC applicant	-0.01667
Other EPC applicant	-0.00264
US applicant	-0.07118
IPC (B) - Performing operations	-0.00483**
IPC(C) - Chemistry and Metallurgy	-0.00195
IPC(D) - Textiles and Paper	-0.0068*
IPC(E) - Fixed constructions	-0.00322
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	-0.00698**
IPC(G) – Physics	0.000622
IPC(H) – Electricity	-0.00232
Population	7.31E-09
Real GDP per capita	1.08E-07
Consumption Share of Real Gross Domestic Product	-0.00021
Government Share of Real Gross Domestic Product	0.000214
Investment Share of Real Gross Domestic Product	0.000533*
Openness	-1.1E-05
Growth Rate of Real GDP Chain per capita	-0.00066*

Note: Year dummies were included in the regression but are not reported in the table

(*) significant at 5 per cent level

(**) significant at 1 per cent level

3.107 The table above shows that far fewer variables are significant in this regression than was the case when we analysed requests for further processing by applications that were eventually granted.[29] However, two key similarities in the results are:

(a) the fee for further processing always has a significant negative coefficient and hence an increase in the fee makes it less likely that further processing will be requested;

(b) the coefficient on the number of X documents is always positive and significant, suggesting that the less favourable is the search outcome, the more likely it is that further processing is requested.

3.108 It should be noted that applications for which an IGRA is not issued appear to be marginally less sensitive to the magnitude of the further processing fee than are applications that are eventually granted. Indeed, the results suggest that a unit increase in the further processing fee would reduce the likelihood that the former group request further processing by 0.24 per cent whereas the reduction for the latter group is 0.28 per cent.

3.109 Some applicants pay their second or third further processing fees during the application process because they have missed a number of fee and/or non-fee time limits. Our analysis of EPO data has found that a maximum of three time limits are missed for a single application. We treat each decision to request further processing as independent and hence present below the results of a regression which considers the factors affecting the decision of whether or not to pay a second further processing fee during the examination phase.

[29] Technical note: A number of variables were dropped from this regression because a non-zero they perfectly predicted whether or not the application would request further processing for a second time.

Table 3.8: Likelihood of making second request for further processing (grant fee received)

Pseudo R^2=0.137

Variable	dy/dx
Fee for further processing (non-fee time limit)	-4.9E-05**
First Filing	-0.00039
EPC application filed in language other than DE, EN or FR	-0.00063
Non-EPC application filed in language other than DE, EN or FR	0.01953**
Extended Search Report	-0.00044
Number of Y Documents	0.000074*
Number of X Documents	0.000235**
Number of Claims	6.82E-05**
Procedural Language EN	0.001989**
Procedural Language FR	0.001249
Use Filing Representative	0.008205**
Deliberate Decision to use Filing Representative	-0.18847**
Number of Designated States	2.76E-05*
French applicant	-0.00016
UK applicant	0.005557**
Japanese applicant	-0.05159**
Korean applicant	-0.00293**
Other non-EPC applicant	-0.00295**
Other EPC applicant	-0.00109
US applicant	-0.01282
IPC (B) - Performing operations	-8E-05
IPC(C) - Chemistry and Metallurgy	0.000207
IPC(D) - Textiles and Paper	-0.00108
IPC(E) - Fixed constructions	0.000218
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	-0.00036
IPC(G) – Physics	0.000587
IPC(H) – Electricity	0.000793*
Population	-3.88E-09
Real GDP per capita	-2.36E-07**
Consumption Share of Real Gross Domestic Product	-8.2E-05
Government Share of Real Gross Domestic Product	-0.0001
Investment Share of Real Gross Domestic Product	6.55E-05
Openness	$1.08*10^{-05}$*
Growth Rate of Real GDP Chain per capita	-0.00013*

Note: Year dummies were included in the regression but are not reported in the table

(*) significant at 5 per cent level

(**) significant at 1 per cent level

3.110 The results presented in Table 3.8 are similar to those presented in Table 3.6 and hence we do not repeat the discussion particular coefficients here. However, it should be noted that the magnitude of the negative coefficient on the further processing fee is lower in this regression than it is in the regression which assesses the factors influencing the first request for further processing. This is somewhat unsurprising — applicants that have

already filed one request for further processing are unlikely to be influenced by the magnitude of the further processing fee when making a second request.

3.111 Results are slightly different when we consider applications that entered the examination phase but for which an IGRA was not issued and for which we can observe a date of death. The main differences between results based on granted and non-granted patents are broadly similar to those when we considered the first request for further processing and hence we do not repeat the discussion here. The results are shown in the table below.[30]

[30] Technical note: A number of variables were dropped from this regression because a non-zero they perfectly predicted whether or not the application would request further processing for a second time.

Table 3.9: Likelihood of making second request for further processing (application for which IGRA not dispatched)

	Pseudo R^2=0.154
Variable	**dy/dx**
Fee for further processing (non-fee time limit)	-2.5E-05**
EPC application filed in language other than DE, EN or FR	0.00031
Non-EPC application filed in language other than DE, EN or FR	-0.00023
Number of Y Documents	6.52E-06
Number of X Documents	2.48E-05
Number of Claims	1.29E-05*
Procedural Language EN	-1.06E-06
Procedural Language FR	0.000502
Use Filing Representative	0.002645**
Deliberate Decision to use Filing Representative	-0.0476**
Number of Designated States	1.15E-05
French applicant	-0.0005
UK applicant	0.000365
Japanese applicant	-0.01668**
Korean applicant	-0.00106**
Other non-EPC applicant	-0.00127**
Other EPC applicant	-0.00059
US applicant	-0.0165
IPC (B) - Performing operations	-0.00045
IPC(C) - Chemistry and Metallurgy	-0.00043
IPC(D) - Textiles and Paper	-0.00045
IPC(E) - Fixed constructions	-0.00017
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	-0.00063*
IPC(G) – Physics	-0.00023
IPC(H) – Electricity	-8.2E-05
Population	2.56E-09*
Real GDP per capita	2.42E-09
Consumption Share of Real Gross Domestic Product	5.96E-05
Government Share of Real Gross Domestic Product	2.95E-05
Investment Share of Real Gross Domestic Product	0.000152*
Openness	2.94E-06
Growth Rate of Real GDP Chain per capita	-0.00017**

Note: Year dummies were included in the regression but are not reported in the table

(*) significant at 5 per cent level

(**) significant at 1 per cent level

3.112 As noted above, we treat each decision to request further processing as independent and hence present below the results of a regression which considers the factors affecting the decision of whether or not to pay a third further processing fee.

Table 3.10: Likelihood of making third request for further processing (grant fee received)

Pseudo R^2=0.143

Variable	dy/dx
Fee for further processing (non-fee time limit)	-2.98E-06**
EPC application filed in language other than DE, EN or FR*	-8.9E-05
Non-EPC application filed in language other than DE, EN or FR*	0.001684
Extended Search Report*	0.000634
Number of Y Documents	6.41E-06
Number of X Documents	2.04E-05**
Number of Claims	5.07E-06**
Procedural Language EN*	0.000199
Procedural Language FR*	5.33E-05
Use Filing Representative*	0.000534**
Deliberate Decision to use Filing Representative*	-0.01343**
Number of Designated States	2.55E-06
French applicant*	-3.2E-05
UK applicant*	0.000172
Japanese applicant*	-0.00304**
Other non-EPC applicant*	-0.0002**
Other EPC applicant*	-0.00012
US applicant*	-0.00039
IPC (B) - Performing operations*	0.000344*
IPC(C) - Chemistry and Metallurgy*	0.000214
IPC(E) - Fixed constructions*	0.000455
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting*	0.000203
IPC(G) - Physics*	0.000123
IPC(H) - Electricity*	0.000247
Population	-4.01E-09
Real GDP per capita	-1.36E-08
Consumption Share of Real Gross Domestic Product per Capita	4.55E-06
Government Share of Real Gross Domestic Product per Capita	-6.80E-06
Investment Share of Real Gross Domestic Product per Capita	1.74E-05
Openness	-1.50E-06
Growth Rate of Real GDP Chain per capita	-7.43E-06

Note: Year dummies were included in the regression but are not reported in the table

(*) significant at 5 per cent level

(**) significant at 1 per cent level

3.113 The results presented in Table 3.10 are very similar to those presented in Table 3.6 and Table 3.8 and hence we do not repeat the discussion particular coefficients here. However, it should be noted that the magnitude of the negative coefficient on the further processing fee is lower in this regression than it is in the regressions which assess the factors influencing the first and second requests for further processing. This is somewhat unsurprising — applicants that have already filed two requests for further processing are unlikely to be influenced by the magnitude of the further processing fee when making a third request.

3.114 Results are slightly different when we consider applications that entered the examination phase but for which an IGRA was not issued and for which we can observe a date of death. The main differences between results based on granted and non-granted patents are broadly similar to those when we considered the first request for further processing and hence we do not repeat the discussion here. The results are shown in the table below.[31]

Table 3.11: Likelihood of making third request for further processing (application for which IGRA not dispatched)

	Pseudo R^2=0.358
Variable	**dy/dx**
Fee for further processing (non-fee time limit)	-1.11E-15**
EPC application filed in language other than DE, EN or FR*	8.51E-12
Number of Y Documents	2.33E-15
Number of X Documents	-5.38E-15
Number of Claims	1.00E-15
Procedural Language EN*	-5.94E-13
Procedural Language FR*	1.67E-14
Use Filing Representative*	1.49E-13**
Deliberate Decision to use Filing Representative*	-1.86E-10
Number of Designated States	-2.86E-17
French applicant*	0.026481
Other EPC applicant*	-1.37E-09
IPC (B) - Performing operations*	0.385839
IPC(G) - Physics*	-4.02E-15
IPC(H) - Electricity*	3.07E-14
Population	-7.50E-15
Real GDP per capita	1.73E-17
Consumption Share of Real Gross Domestic Product per Capita	3.73E-17
Government Share of Real Gross Domestic Product per Capita	8.00E-14
Investment Share of Real Gross Domestic Product per Capita	2.95E-14
Openness	-1.17E-14
Growth Rate of Real GDP Chain per capita	-2.77E-15

Note: Year dummies were included in the regression but are not reported in the table

(*) significant at 5 per cent level

(**) significant at 1 per cent level

[31] Technical note: A number of variables were dropped from this regression because a non-zero they perfectly predicted whether or not the application would request further processing for a third time.

Analysis of the decision to pay grant fee

3.115 An applicant only faces a choice of whether or not to pay the grant fee if the EPO examiner has issued an intention to grant the patent (an "IGRA"). Unless this document is dispatched, the applicant cannot pay the grant fee even if he would wish to do so. This step in the process is, therefore, quite different to those that precede it. In each stage prior to the decision of whether or not to pay the grant fee, all applications are eligible to pay the given fee and to continue in the process or to not pay the fee and withdraw the application.[32] For the present decision, examiners can refuse the patent application and thereby deny the applicant from facing a choice of whether or not to pay the grant fee. Only approved applications may face this choice and hence it is only reasonable to consider the decision for those applications for which an intention to grant has been dispatched.

Identification of the dependent variable

3.116 The dependent variable in this regression is identified using the EPASYS variable "IGRADPGRANT" which shows whether or not a grant fee has been received. Our interest is in explaining the impact of fees on the decision to pay the grant fee given that the applicant has the opportunity to make such a decision. Therefore, we restrict the regression to those applications where an IGRA has been issued.

3.117 In implementing our analysis, we have not included all applications that entered the search phase and for which we have data. The reason for this is that some of these applications will not yet have completed the application process and hence some applications that currently have not yet paid the grant fee may do so in the future. To overcome this problem, we have included in our analysis only those applications that have been declared 'dead' by the EPO. With this approach, we can be sure that those that have not paid the grant fee will never do so and hence that our results will be robust.

3.118 Examining our dataset, we have found that of the 175,315 EP applications declared dead by the EPO, an intention to grant the patent has been dispatched for 13,089 applications and a grant fee has been received for 1,994 applications.

[32] We are aware that some applications might be refused very early in the application process. However, we have been informed that the number of such applications is very small and hence, for convenience in explanation, state that applications are withdrawn from the process if they do not reach the examination stage.

Analysis

3.119 Table 3.12 below shows the results of a regression which analyses the factors driving the choice facing the applicant of whether or not to pay the grant fee, given that an intention to grant the application has been dispatched by the examiner.

Table 3.12: Likelihood of paying grant fee

	Pseudo R^2=0.224
Variable	**dy/dx**
Grant and Printing Fee	-0.00097**
First Filing	0.100945**
EPC application filed in language other than DE, EN or FR	-0.01039
Non-EPC application filed in language other than DE, EN or FR	0.237404
Extended Search Report	-0.06499**
Number of Y Documents	0.002974
Number of X Documents	0.005548**
Number of Claims	0.000526
Procedural Language EN	-0.07186**
Procedural Language FR	-0.08513**
Use Filing Representative	0.000299
Deliberate Decision to use Filing Representative	-0.02016
Number of Designated States	-0.00112**
French applicant	0.057399*
UK applicant	0.037619
Japanese applicant	-0.05064
Korean applicant	-0.09606
Other non-EPC applicant	-0.0244
Other EPC applicant	-0.01299
US applicant	0.133826
IPC (B) – Performing operations	-0.00278
IPC (C) – Chemistry and Metallurgy	0.046937**
IPC(D) – Textiles and Paper	0.06614**
IPC(E) – Fixed constructions	-0.02441
IPC(F) – Mechanical Engineering; Lighting; Heating; Weapons; Blasting	-0.00177
IPC(G) – Physics	-0.04389**
IPC(H) – Electricity	-0.04531**
Population	-1.73E-07**
Real GDP per capita	-6.71E-06**
Consumption Share of Real Gross Domestic Product	-0.00493**
Government Share of Real Gross Domestic Product	-0.00449
Investment Share of Real Gross Domestic Product	-0.00157
Openness	4.71E-05
Growth Rate of Real GDP Chain per capita	0.001607

Note: Year dummies were included in the regression but are not reported in the table

(*) significant at 5 per cent level

(**) significant at 1 per cent level

3.120 This regression explains a reasonable amount of the decision for applicants to pay the grant fee, given that an intention to grant has been dispatched, or whether to withdraw the application at this stage. Indeed, the pseudo r-squared value shows that less than 22.4 per cent of the decision is explained by the variables in the regression.

Fees

3.121 The coefficient on the grant and printing fee variable is negative and highly significant, indicating that the greater the grant and printing fee, the less likely are applicants to pay the necessary fees to get their application granted. In particular, the coefficient implies that an increase in the fee for grant and printing of 100 euros would lead to a fall in the probability of a paying the grant fee in the region of 9.7 per cent.

Filing practices

3.122 Compared to the regression outputs presented in the previous sections, fewer of the filing practices variables considered are significant in explaining the decisions of whether or not to pay the grant fee. For instance, the use (deliberate or not) of a filing representative does not explain any variation in the data. Recalling that we interpreted the deliberate use of a filing representative to be a proxy for firm size, the results suggest that propensity to pay the grant fee is independent of firm size.

3.123 Of those that are significant, first filings are more likely to pay the grant and printing fee whilst applications for which the language of proceedings is English or French are less likely to pay the grant and printing fee than are those that use German as the procedural language.

Breadth and geographical scope of protection

3.124 Patent breadth — measured by the number of claims — has a no impact on the probability of paying the grant and printing fee.

3.125 In contrast, the effect of the variable 'Number of Designated States' is negative and significant, suggesting that the greater the geographical scope, the less likely it is that the grant and printing fee will be paid. We stress again that the interpretation of this is problematic given the imperfect way in which the variable 'Number of Designated States' is constructed.

Search outcome

3.126 The introduction of the Extended Search Report appears to have had a negative impact on the likelihood of paying the grant and printing fee whilst the coefficient on the number of 'X' documents is highly significant and positive, suggesting that the more negative is the search outcome, the more likely it is that the grant fee will be paid.

Geographical origin

3.127 Geographical origin appears to play no part in the decision to pay the grant fee, other than that applications originated in France are slightly more likely to pay the grant and printing fee than are those originated in Germany.

Technological sectors

3.128 Concerning technology specific effects, applications in the fields of chemistry and textiles are significantly more likely to pay the grant fee than are applications in the field of human necessities. Applications in the field of physics and electricity are significantly less likely to request pay the grant fee than are applications in the field of human necessities.

Macroeconomic indicators

3.129 In general, macroeconomic variables have limited impact on the decision of whether to request further processing during the examination process. Few macroeconomic variables are significant and those that are significant are of very small magnitude.

Conclusions

3.130 A summary of the impact of fees on the applicants' decision (assuming that only next stage fees matter to the applicant) is presented in the table below. Note that the estimates for further processing fees are based on granted patents only.

Fee	Coefficient	€100 increase in fee causes…
Filing	-8.9E-05**	0.9 per cent reduction in likelihood of entering search phase
Search	-9.54E-07**	0.01 per cent reduction in likelihood of entering search phase
Examination	-0.00169**	17 per cent reduction in likelihood of entering examination phase
Further processing (1)	-0.0028**	28 per cent reduction in likelihood of paying first further processing fee in examination phase
Further processing (2)	-4.86E-05**	0.5 per cent reduction in likelihood of paying second further processing fee in examination phase
Further processing (3)	-2.98E-06**	0.03 per cent reduction in likelihood of paying second further processing fee in examination phase
Grant	0.00097**	9.7 per cent reduction in likelihood of paying grant and printing fee

3.131 Because €100 represents a larger proportional change in a smaller fee, and a smaller proportional change in a larger one, it may be helpful to express these findings in terms of responses to a 10 *per cent* increase in each fee, based on 2009 fee levels.

Fee	2009 fee	10% increase in fee causes…
Filing (online)	€100	0.09 per cent reduction in likelihood of entering search phase
Search	€1,050	0.01 per cent reduction in likelihood of entering search phase
Examination	€1,405	24 per cent reduction in likelihood of entering examination phase
Further processing (1)	€210	5.9 per cent reduction in likelihood of paying first further processing fee in examination phase
Further processing (2)	€210	0.1 per cent reduction in likelihood of paying second further processing fee in examination phase
Further processing (3)	€210	0.006 per cent reduction in likelihood of paying second further processing fee in examination phase
Grant	€790	7.6 per cent reduction in likelihood of paying grant and printing fee

3.132 The results above allow us to draw the following conclusions:

3.133 All fees examined have a statistically significant and negative impact on applicants' decisions to proceed to the next stage. However, the magnitude of these impacts is very different, which implies that not all fees would be equally effective if used as a sorting device. In particular:

(a) The impact of search and filing fee is negligible, which suggests that the overwhelming majority of applicants who file to the EPO do so having already anticipated the payment of these fees.

The relatively limited role that filing and search fee could play as a sorting device is also confirmed by the he analysis conducted on French patent applications which confirms the intuition that the main rationale for filing a first application directly to the EPO (and incurring in a higher search fee compared to the one that would have been paid had the application been sent to the INPI) is represented by the possibility of filing in the English language and, consequently, simplifying communication with non-French inventors

(b) Examination fees, in contrast, have a substantially larger impact on applicants' decisions to proceed to the further stage and could therefore be a much more effective sorting device.

(c) Finally, among the fees considered, fees for further processing are those having the largest impact on applicant's behaviour. More specifically, they have a significant discouraging effect on applicants' decision to request a first further processing, and such effect decreases with the number of further processing already requested. In other words, the same fee amount discourages applicants from requesting a first further processing more than it discourages applicants from requesting a second further processing. Similarly, the same fee amount discourages applicants from

requesting a second further processing more than it discourages applicants from requesting a third further processing.

On the basis of these results, the EPO might wish to consider whether a progressive further processing fee structure would be desirable, along the lines of the fees for the request of extensions of the time limits charged by the Hungarian Patent Office.

3.134 The quantitative analysis conducted allows us to draw the following conclusions which, even if not directly related to fees, are of some interest.

(a) Apart from fees, there are other factors that are important in influencing applicants' decisions. In particular:

- The decision to enter the examination phase is largely driven by the quality (i.e. the introduction of the Extended Search Report) and the content (especially the number of 'X' citations) of the search outcome.

- The decision to request further processing once the examination phase has been entered into is to a significant extent driven by the geographical origin of the applicants. For instance, applications originated in France and the UK are more likely to make at least one request for further processing during the examination phase when compared to applications generated in other geographical areas.

(b) Some of the factors that discourage applicants from entering their application into the examination phase are those that play a role in increasing the likelihood of applicants requesting further processing. These are summarised in the table below.

	Before the Examination Phase	During the Examination Phase
Number of 'X' and 'Y' documents cited	*Less likely* to request examination	*More likely* to request further processing
Application originated from an EPC country other than DE, FR, and the UK	*Less likely* to request examination	*More likely* to request further processing
EPC application filed in the national language different from DE, FR, and EN	*Less likely* to request examination	*More likely* to request further processing

4 RELATIONSHIP BETWEEN RENEWAL FEES AND PATENT LIFE ACROSS EUROPE

Introduction

4.1 This document sets out the analysis we have conducted concerning the relationship between renewal fees and patent life across Europe. It is composed of the following sub-sections:

(a) Brief description of renewal fees in Europe

(b) General methodology

(c) Patent life across Europe and its main determinants

(d) The effect of progressive fee structure on patent life

(e) The effect of absolute fee levels on patent life

(f) Conclusions

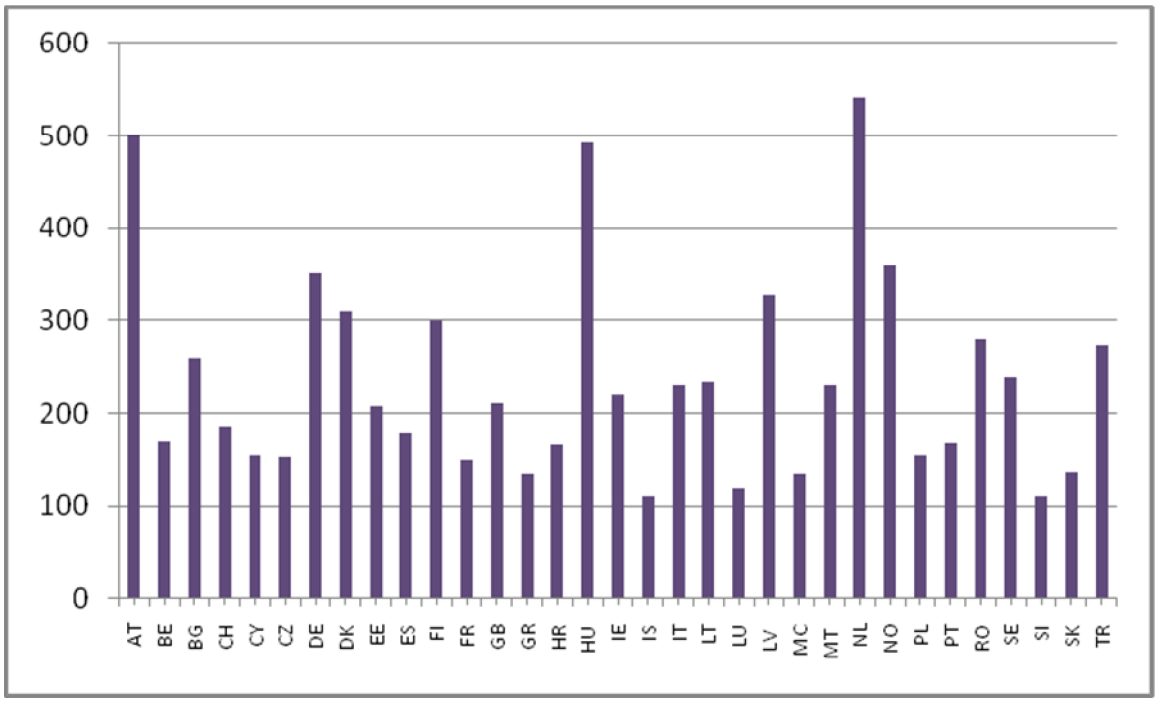
Brief description of renewal fees in Europe

4.2 In Section 2 of this report, we found that National Patent Offices typically adopt, to some varying degrees the traditional fee policy approach: low procedural fees to make the system widely accessible and renewal fees that not only induce patent holders to give up their monopoly rights but also cross-subsidise entry fees.

4.3 With the exception of the Swiss Federal Institute of Intellectual Property, renewal fees are progressively increasing, such that the fee for, say, year ten is greater than the fee for year nine. However, differences across patent offices exist in relation to both the degree of progressiveness of renewal fees, and the amount of procedural fees relative to that of renewal fees. Differences in the progressiveness of the renewal fee structure could have a significant impact on the behaviour of rights holders in making renewal decisions and investigating the impact of such differences will be an important component of our empirical analysis.

4.4 Differences between patent offices can also be observed in the absolute level of renewal fees for given years. This is illustrated in Figure 4.1 below, which considers the renewal fees charged for year ten in EPO countries during 2008. The range of charges is rather wide, from just more than €100 in Iceland to more than €500 in the Netherlands. The picture is similar for other renewal years and hence the total cost of maintaining a patent alive for a given number of years varies greatly between countries.

Figure 4.1: Year 10 renewal fees in € (2008)



General methodology

The key questions

4.5 Economists have devoted significant attention to understand the factors that determine patent life. Patents that live longer are typically associated with a higher economic value. Other factors that have been identified as being important include: the geographical scope of protection (i.e. patents that are validated in more countries are also likely to live longer), the number of claims (patents with wider breadth are likely to be renewed for more years), the technological sector (e.g. patents within sectors characterised by rapid technological changes are likely to become obsolete faster).

4.6 Renewal fees are another important factor. Economists argue that a renewal fee structure should be designed with the primary goal of ensuring that patents with little economic value are not maintained alive. Whilst the EPO receives 50 per cent of the renewal fee income generated by patents that are renewed nationally, renewal fees are set at national level and are thus not under the control of the EPO. Therefore the renewal fee policy in the European Patent System is not harmonized since each jurisdiction has complete control over the setting of renewal fee structures. In particular, national renewal fee structures differ according to the two following dimensions.

(a) *The fee amounts to be paid* — for instance, according to the current renewal fee structure, the cost of maintaining a patent alive for its entire statutory life in the Netherlands is approximately € 11,000, while in the UK it is approximately € 3,500.

(b) *The progressiveness of the fee structure* — renewal fees are typically progressive in nature, i.e., the fee that is charged to renew a patent for, say, the third year is higher than the fee for renewing the patent for the second year. However, the extent of progressiveness of the fee structure can vary considerably across jurisdictions.

4.7 In line with the observations above, the main questions explored in this document are the following:

(a) What are the main determinants of patent life across Europe?

(b) Do higher renewal fees reduce patent life?

(c) Do more progressive renewal fees reduce patent life?

Data sources

4.8 The analysis has been based on four different sources:

(a) The first dataset (hereafter the 'Patent Holder Dataset'), provided by the EPO, contains information on the characteristics of each patent granted in 1989, 1990, 1994, 1998 and 2002 and validated in EPC member states, and for which renewal decisions were made in the period 1989-2009.

(b) The second dataset (hereafter the 'Renewal Fee Dataset'), also provided by the EPO, contains information on the renewal decisions as well as the renewal fee amounts paid by each patent holder contained in the 'Patent holder Dataset'.

(c) The third dataset (hereafter the 'Lapses' dataset) was also provided by the EPO and contains information on the lapse dates of patents included in the previous two datasets.

(d) We have constructed a fourth dataset (the 'Macroeconomic Dataset') which contains general macroeconomic indicators of all the EPC countries in which patents have been renewed.[33]

4.9 We have merged the four datasets in order to obtain a dataset (hereafter the "Dataset") which allows us to analyse the effect of renewal fees and other patent and macroeconomic characteristics on decisions to maintain a patent alive.

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[33] The macroeconomic database was constructed using Penn World tables and the Oanda exchange rate website. The internet links for these websites are http://pwt.econ.upenn.edu/ and http://www.oanda.com/ respectively.

Description of the variables

4.10 We provide here a brief description of the variables used to specify the models. They can be grouped into the following seven categories:

(a) ***Patent characteristics*** — these variables are derived from the 'Patent holder Dataset' and describe patent-specific features. Variables of this type include:

- *Number of claims at grant.*
- *Protection in multiple jurisdictions.* This is a dummy variable that indicates whether, at each point in time, a patent is kept alive in more than one EPC country.
- *Number of designated states at grant.*
- *Protection in the home market.* This variable indicates whether the geographical origin of the patent holder coincides with the jurisdiction in which protection is sought.
- *Length of the patent pending period.* This indicates the number of years that a patent spent in the application procedure, i.e. the time between filing and grant. The inclusion of this variable is justified because the alleged effect of long patent pending periods on patent quality is controversial. On the one hand, long pending periods allow inventors to improve their applications, and possibly the quality of the invention granted protection. On the other hand, long pending periods might result from strategic patenting practices aimed at gaming the system and responsible for patents of, allegedly, little economic value.
- *Opposition.* After a patent has been granted, it may be opposed by any member of the public, based on grounds mentioned in Article 100 of the European Patent Convention. This variable takes the value 1 if the patent was opposed and zero otherwise. Opposition may be interpreted as an indication of the value of a patent, since a patent would not be opposed if it has little value.
- *Application route.* Dummy variables are included in the regression to control for any unobservable differences between patents that followed different application routes. The routes included are: E-PCT, EP non-divisional and EP-divisional.

(b) ***Technological sectors*** — the international patent classification contained in the 'Patent holder Dataset' (which reflects a very refined classification consisting of several different technological areas) has been aggregated into eight broad technological areas:

- *IPC (A) - Human necessities*
- *IPC (B) - Performing operations*

- *IPC(C) - Chemistry and Metallurgy*
- *IPC(D) - Textiles and Paper*
- *IPC(E) - Fixed constructions*
- *IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting*
- *IPC(G) - Physics*
- *IPC(H) - Electricity*

(c) ***Geographical origin*** — is determined by the country code of the patent holder, as reported in the 'Patent holder Dataset'. We have distinguished the three largest European markets (DE, FR, UK), the three non-European countries responsible for the largest number of EP filings (USA, Japan, and South Korea), and the other countries. The list of geographical areas considered is therefore:

- *France*
- *Germany*
- *The UK*
- *Other non-EPC countries*
- *The USA*
- *Japan*
- *South Korea*
- *Other non-EPC countries*

(d) ***Macroeconomic indicators*** — these are economic indicators for all the countries from which patent filings are generated:

- *Population*
- *GDP*

(e) ***Renewal Fees*** — this set of variables includes both appropriate dummy variables that indicate a structural change in the renewal fee for a particular country and an index of the progressiveness of the fee structure of each country.

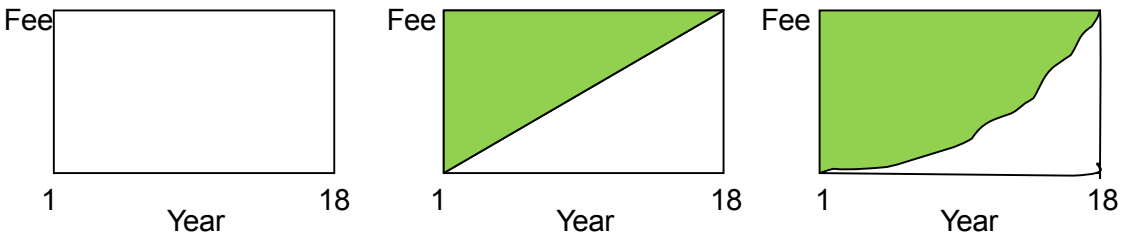
Dummy variables have been used to report changes in the absolute levels of the renewal fees (e.g. an increase in amount due for renewing a patent for a given renewal year) or changes in the progressiveness of a country's entire renewal fee

structure. These variables are included in regressions for which the dataset consists of only one country (e.g. Switzerland).

The index of progressiveness is used in a duration model which includes data on renewal fees payments in France, Germany, the Netherlands, Switzerland and the UK. The index is constructed from data on official renewal fees in each of these countries from 1980 until 2010 and may take any value between zero and one. For each month in this time period, the index is calculated as one minus the sum of all renewal fees for years 3 to 20 inclusive (1 to 18 inclusive in the case of the Netherlands) divided by eighteen times the final year's renewal fee. Algebraically, for countries other than the Netherlands:

$$\text{Index} = 1 - \frac{\Sigma\, fee_i}{18 * fee_{20}}$$

This index can also be represented as calculating the area within a box. Indeed, in the boxes below, the height is defined as the renewal fee for the final year and the width is 18 years (i.e. the number of years for which renewal fees must be paid).



The area shaded green (the area of the box minus the sum of all renewal fees) divided by the area of the box (the final renewal fee multiplied by 18) gives the index of progressiveness. To see this, consider the diagram on the left. In this case, the fee is the same in all years - a flat fee structure - and hence the non-shaded area equals the full area of the box and the index of progressiveness is 0. In the middle diagram, renewal fees increase by the same amount each year, from zero in year 1. The shaded area is thus 50 per cent of the area of the box and hence the index of progressiveness is 0.5. The diagram on the right shows a more progressive fee structure and it is clear that *the more progressive is the fee structure the greater is the index of progressiveness*.

Model specification

4.11 The econometric analysis has been conducted primarily through the use of duration models (also known as survival analysis models). The aim of duration models is to analyse the determinants behind the duration of a certain event. In the context of this study the event of interest is the patent lifetime, and duration analysis allows us to identify the factors that affect how long a patent is maintained alive.

4.12 In statistical terms, duration models estimate the so called *hazard function*, i.e. the probability of observing a patent dying (i.e. not being renewed) at time *t*, given that the patent was still alive in period *t-1*.

4.13 We have employed two different methods in our empirical analysis of patent life:

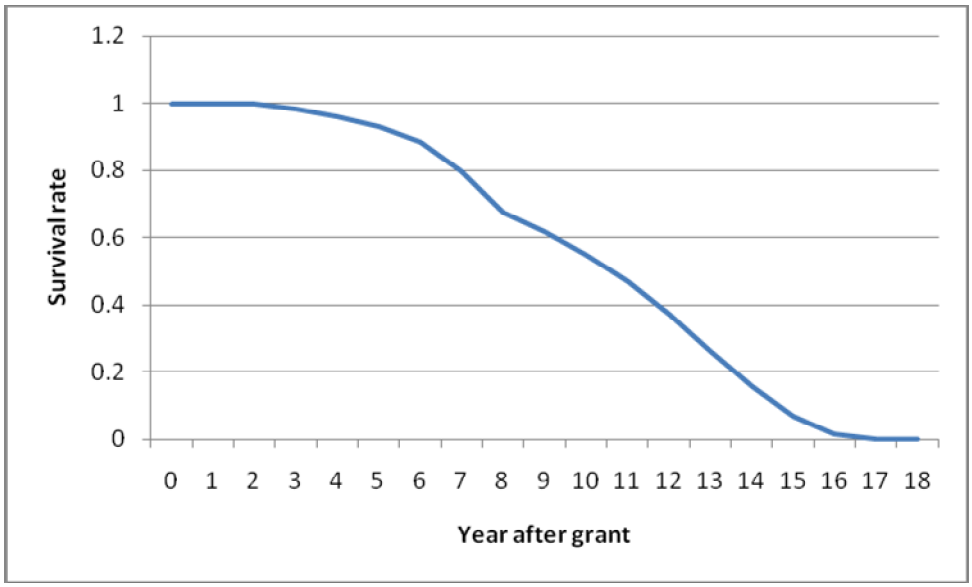
(a) Non-parametric: this methodology provides a descriptive analysis of how patent life varies across different EPC member states and across technological sectors.

(b) Parametric: this approach uses models to explain the factors that determine patent life and to determine the quantitative impact of different factors on patent life.

Non-parametric analysis

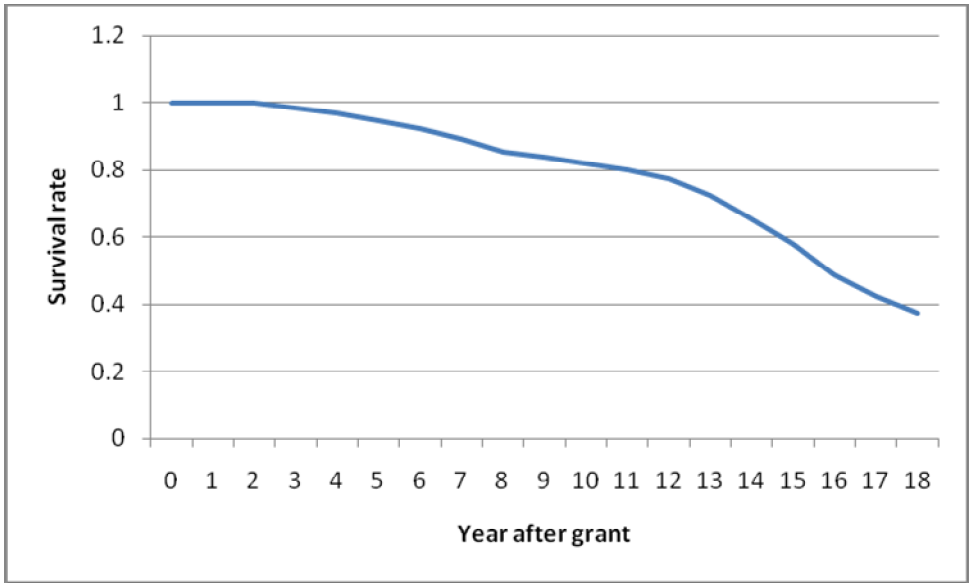
4.14 The most familiar statistic that is used to describe populations is their survival rate over time. Figure 4.2 shows the standard survival rate for all EPO patents.

Figure 4.2: Standard survival rate (excluding 'lost' patents)



4.15 The problem with this statistic is that it combines the effects of two quite different reasons for the decline in the reported number of surviving patents over time – their deaths, and their loss from the statistical records. In the jargon, the lost patents are said to be "(right) censored". Our principal interest here is why patents die, not why they are lost track of. We need, then, a statistic that continuously adjusts the survival function to take account of the number of patents that are lost. The statistic that achieves this is the hazard function suggested by Kaplan and Meier (1958); it is widely used, for example, in medical research, to compare patients' survival rates after treatments.

Figure 4.3: KM estimates



4.16 The primary difference between the standard survival rate and the Kaplan–Meier curve concerns the definition of the 'population' (in this case the number of patents) in each time period. In a standard survival function, the population is always the number of patents that were initially granted whereas the 'population' in KM estimates is reduced through time to take account of those patents that are lost ("censored"). If data is not censored, the standard survival rate and the KM estimate are identical.

4.17 Algebraically, the KM formula is as follows:

$$S(t) = (1 - \frac{d_1}{n_1}) * (1 - \frac{d_2}{n_2}) * \ldots * (1 - \frac{d_j}{n_j}) = \prod_{i=1}^{j} (1 - \frac{d_i}{n_i})$$

4.18 This formula states that the survival rate at time t is the multiple of the proportion of patents that survived at each period prior to t.

4.19 The proportion of patents that die in each period is given by dividing the number of deaths at period i (d_i) by the population at risk at this period (n_i). The population at risk in period i is calculated by subtracting both the number of patents that were observed to die and the number of patents that were censored (i.e. lost from the data) in period i -1 from the population that was at risk in period i -1. Algebraically, this can be written as follows:

$$n_i = n_{i-1} - d_{i-1} - c_{i-1}$$

4.20 It is important to note that the population at risk includes only those that were alive at the start of the period and hence the population at risk decreases through time, assuming that there are some deaths.

4.21 The KM survival rate estimate for time t is given by multiplying together the proportion of patents that have survived in each period for all periods from period 1 to period j (where time t is at the end of period j).

4.22 To illustrate, suppose that 100 patents were originally granted (and hence were alive in the first year after grant) and that we are considering the survival rate of patents in the third year after grant. Assume also that 5 patents died in the second year and the third year after grant and also that 5 patents records were lost (censored) in each of these years.

4.23 The standard survival rate in year three would be calculated by dividing the number of patents alive in year three by the original number of grants, i.e. the survival rate = (80/100) = 0.8 = 80%.

4.24 The KM estimated survival rate in year three would be calculated by multiplying the proportion that survived in year one (100 per cent) by the proportion that survived in years two and three, i.e. the survival rate = (1-(0/100))*(1-(5/(100-0-0))*(1-(5/(100-5-5)) = 89.7%.

4.25 This example explains why the KM estimates in the figure above are greater than or equal to the standard survival rate. Indeed, whenever the standard survival rate was below 100 per cent in the previous period, KM estimates will be greater than the standard survival rate. This can be further illustrated by comparing the graphs below, for individual countries.

4.26 It is interesting to note from the standard survival rate figure that the survival rates of all countries are very similar, although the Switzerland has a noticeably greater survival rate for between year eight and year 16 after grant. The KM estimates figure also shows that there are limited differences between countries.

Figure 4.4: Standard survival rate estimates

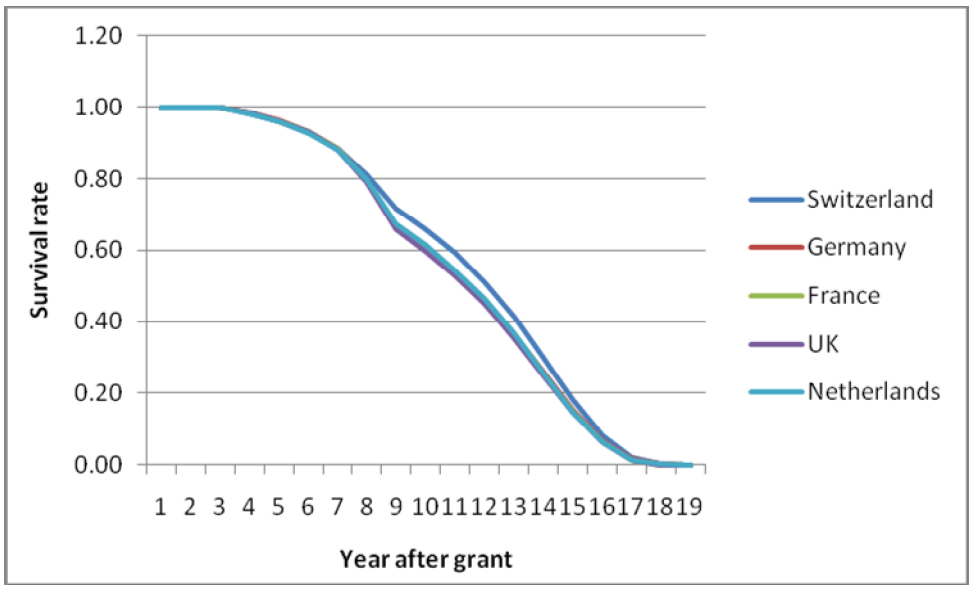
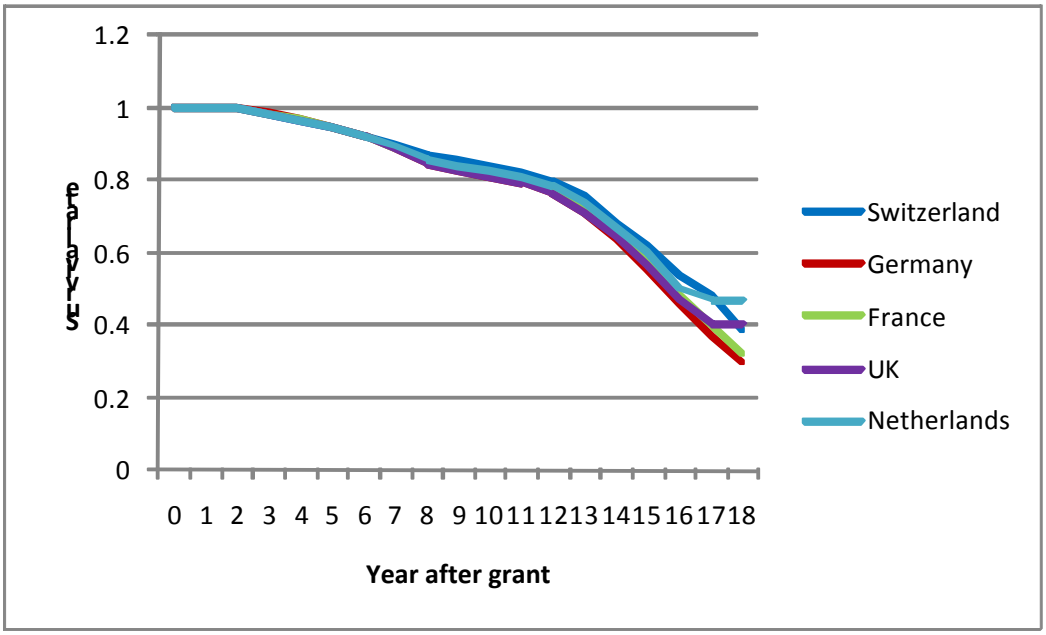


Figure 4.5: KM survival rate estimates



Parametric analysis

4.27 Parametric estimates of the hazard function are more sophisticated than the non-parametric KM estimates and have the advantage of allowing us to quantify the magnitude of the effect of each variable on patent life.

4.28 The most widely used hazard function is the *Proportional Hazard (PH) Model.* In this type of model the hazard function $H(t, Xs)$ depends on a series of explanatory factors (Xs) according to the following formula:

$$H(t) = H_0(t)\exp(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_n X_n)$$

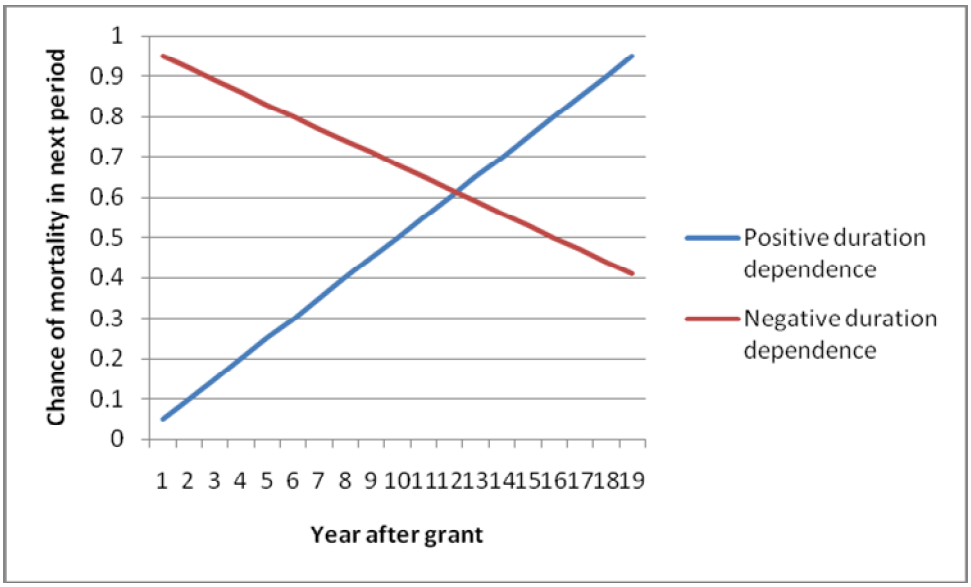
where, *t* represents time, $H_0(t)$ is the so called baseline hazard function (which depends on time), $X_1 \ldots X_n$ are the explanatory variables, and $\beta_1 \ldots \beta_n$ are the parameters to be estimated.

4.29 In other words, a *PH* model defines the probability of a patent dying as being dependent on a number of explanatory factors (e.g. the number of claims, the number of other countries in which the same patent is still alive, etc.) as well as on the number years in which a patent as already been alive (this is captured by the baseline hazard function).

4.30 We have chosen to employ the proportional hazard model proposed by Prentice and Gloeckler (1978) because of its flexibility. It allows the relationship between age and survival to vary over a patent's life, in contrast to the popular model proposed by Cox (1973) that would assume – unrealistically in our view – that the likelihood of a patent dying in a given year is independent of its age.

4.31 Where the likelihood of patents surviving until the next period varies with the age of the patent, it is said that there is *duration dependence* in patent life and this may take one of two possible forms. On the one hand, one could argue that patents that have already been renewed for many years are of high economic value and, thus, *ceteris paribus*, are less likely to die in the immediate future (*negative duration dependence*). On the other hand, one could argue that as time goes by all patents become obsolete and therefore, *ceteris paribus*, the likelihood of them dying increases with their age (*positive duration dependence*). This is illustrated in the graph below.

Figure 4.6: Duration dependence



4.32 Finally, in situations where a duration model did not allow us to reach definite conclusions, we have specified a discrete choice probit model of the same type utilised in Work Package Three. In such a model, the dependent variable is a binary variable that takes the value 1 if the patent has died in a particular period and zero otherwise.

Interpreting regression results

4.33 To interpret the regression results presented in the tables below, a little background knowledge of econometrics and statistics is required. In this section, we seek to provide the necessary knowledge to understand the discussion that follows.

4.34 First, it should be noticed that the dependent variable in a duration model is represented by the hazard function, i.e. by the probability of a patent dying in period *t* given that it was alive in period *t-1*. For completeness, the tables below will present results of duration models in terms of both the coefficient and the hazard ratio. The definitions of these terms are discussed in greater detail below.

Dummy variables

4.35 Some of the variables included in the regression are 'dummy variables', which take a value of either zero or one. For example, the '*Protection in multiple jurisdictions*' dummy would take a value of one for all those patents which are renewed in more than one country, and zero for those patents that are renewed in only one country. Dummy variables are indicated by an asterisk in the results tables below.

4.36 Interpreting the coefficients on dummy variables is slightly more complex than is the interpretation of the coefficients on standard numeric variables. In the context of the duration analysis carried out here, the coefficient on a dummy variable indicates the change in the probability of a patent dying, given a change in the value of the dummy variable from zero to one. For example, a negative coefficient on the '*Protection in multiple jurisdictions*' should be interpreted as follows:

4.37 Patents renewed in more jurisdictions are less likely to die when compared to patents are that are renewed in only one country.

4.38 An added complication arises where dummy variables are used to indicate whether or not a patent has a particular characteristic, from several alternatives. In this case it is always necessary, for technical reasons, to omit one option from the regression and hence the coefficients on the other dummies are interpreted relative to the omitted option. For example, the application procedure route can be E-PCT, EP non-divisional or EP divisional. The regressions below include dummy variables for E-PCT and EP non-divisional but omit EP divisional. Therefore, a positive coefficient on the E-PCT dummy should be interpreted as the effect of the E-PCT route on whether a patent is more likely to die *relative to patents for which the application route was EP divisional.*

4.39 A similar interpretation is required for variables which indicate the broad International Patent Classification class and the nationality of the patent holder.

Understanding the results tables

4.40 The tables below consist of the following three columns:

Variable	Coefficient	Hazard Ratio

4.41 The "Variable" column contains the explanatory variables of the regression model. Explanatory variables are those factors which we believe might have an impact on patent life.

4.42 The "Coefficient" column shows the effect of the explanatory variable on the probability of a patent dying. A positive value for the coefficient shows that an increase in the value of the variable increases the probability of a patent dying whilst a negative coefficient means that an increase in the value of the variable makes the death of a patent less likely. The greater the magnitude of the coefficient (either positive or negative), the greater the impact on the likelihood of dying. It is difficult to interpret these coefficients in quantitative

terms, however, because of the specification of the duration model. Therefore, where a quantitative interpretation of the impact of the variable on the hazard rate is required (rather than simply an analysis of the direction of impact) we make use of the hazard ratio.

4.43 The "hazard ratio" is defined as the ratio of hazard rates, where the hazard rate is the risk of a patent with certain characteristics dying in a particular period. If the hazard ratio is greater than one, the variable increases the hazard rate (risk of mortality in the next period) whereas the reverse applies for a hazard ratio of less than one.

Analysis of patent life across Europe

4.44 This section analyses patent lifetime across Europe, employing two different methodologies. First, we provide the KM estimates according to the following dimensions:

(a) National market.

(b) Technological sector.

4.45 Second, we have specified Prentice-Gloeckler models in order to be able to quantify explicitly the impact that a wide of variables has on patent life across Europe.

4.46 Concerning the choice of the countries, we needed to restrict our analysis to a limited number of jurisdictions, namely: Germany, France, the UK, the Netherlands and Switzerland. This choice was dictated mainly by the size and structure of the dataset used: the inclusion of each additional country would increase exponentially the size of the dataset making any econometric analysis nearly unmanageable even for a modern and relatively powerful computer work station. We decided to include Germany, France and the UK because these are the largest markets in Europe. The inclusion of the Netherlands is justified on the grounds that it represents a wealthy country of relatively small size. Finally Switzerland has been included because, during the period covered by the data, it witnessed unique changes in the renewal fee policy.

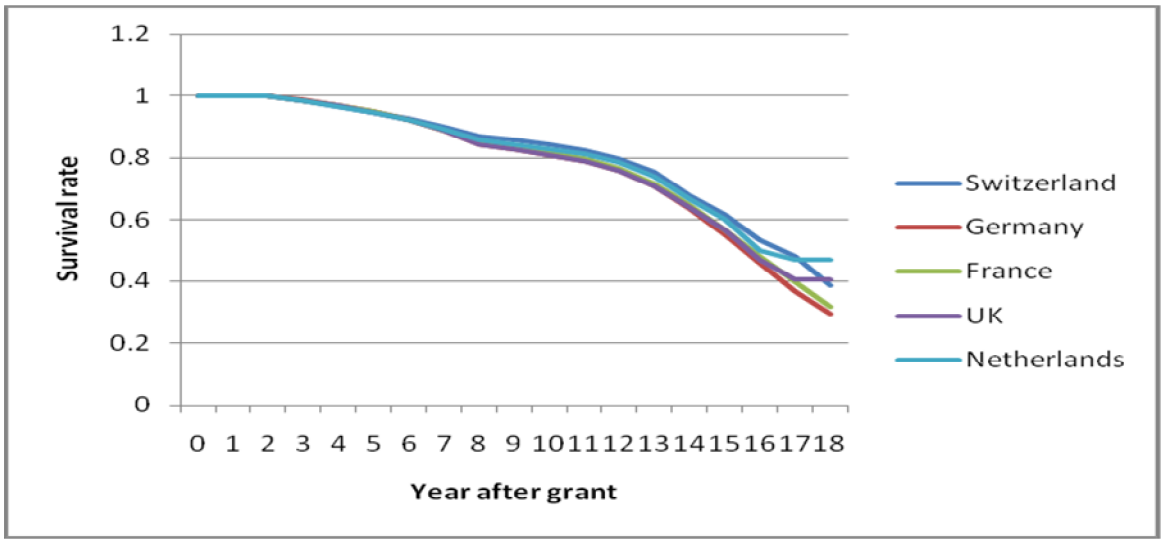
Kaplan-Meier estimates

4.47 The results of the KM estimates are reported in the graphs below. It should be noted that we have defined applications that paid renewal fees in ordinal year 20 as alive at all points in time. This is because there is a behavioural difference between patents which lapsed because of a deliberate decision not to pay a renewal fee for the next year and patents which lapsed because they were no longer permitted to be renewed. We did not wish to confuse the analysis by grouping these two types of patents and hence defined those that pay a renewal fee in ordinal year 20 as always alive. This explains why the KM estimates are quite different to zero even in the eighteenth year after grant.

Average KM survival rate

4.48 Figure 4.7 shows the KM estimates for the five countries considered in our empirical analysis, averaged across industrial sectors. As already explained, KM estimates can be significantly greater than standard survival rates.

Figure 4.7: Kaplan-Meier Estimates for Selected Countries

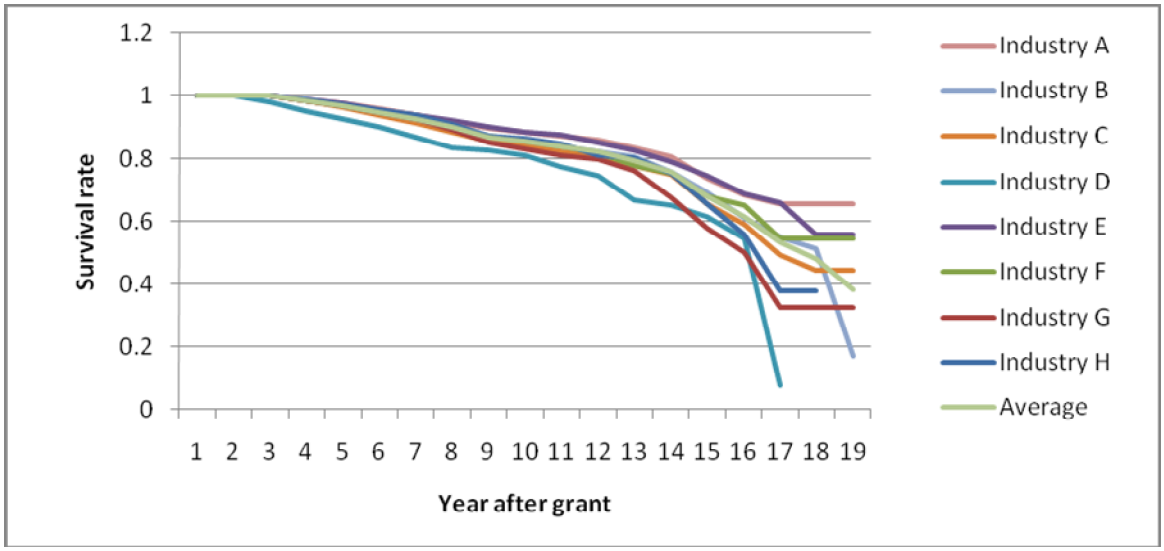


4.49 The KM estimates presented above show that the survival rates are very similar in the countries considered, especially in the early years after grant. A slightly more dispersed picture is observed in the later years, with Switzerland having the greatest survival rate between years eight and 17.

4.50 Switzerland is overtaken by both the Netherlands and the UK in year 18, a feature which is most likely explained by the fact that very few patents pay 17 or 18 renewal fees and hence the withdrawal of just one patent in year 18 can have a significant impact on the survival rate. Looking at the graph, it appears that all patents that were alive in year 17 in the Netherlands and the UK also paid the renewal fee for year 18, whereas at least one patent that was alive in Switzerland in year 17 chose not to pay the renewal fee for year 18.

Switzerland

Figure 4.8: Kaplan-Meier Estimates for Switzerland

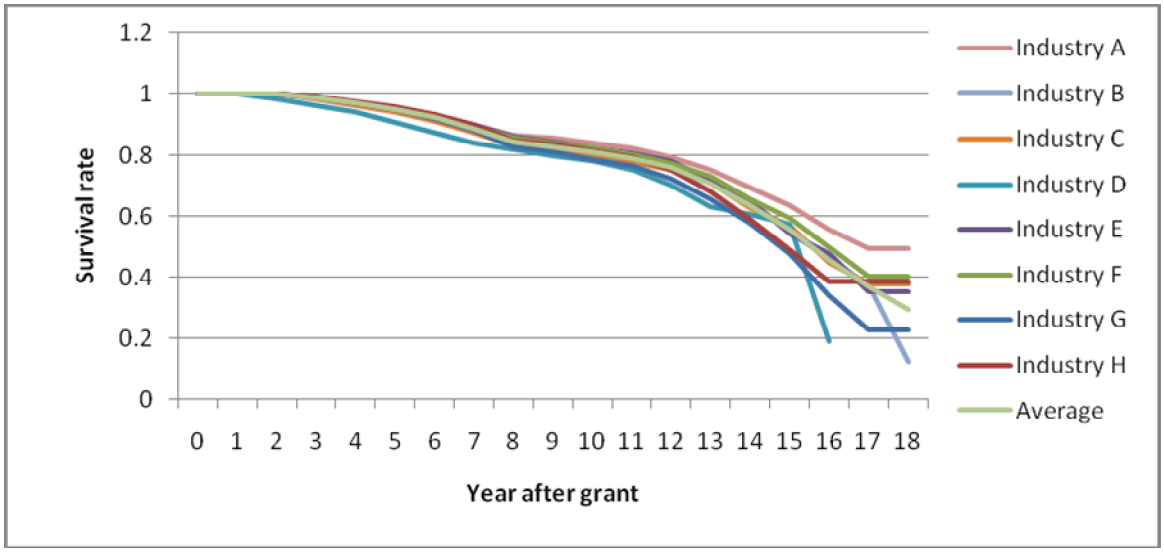


4.51 The graph above shows that the Swiss survival rate differs little between technological sectors for the first eight years after grant, with the notable exception of technological sector D (textiles and paper). Indeed, patents in the textiles and paper industry generally have the lowest survival rate at all years' post-grant.

4.52 There are greater differences in patent survival rates from renewal year ten onwards. These differences most likely reflect perceived difference in the value of the patent to the patent holder within each of the technological sectors. This hypothesis suggests that patents continue to hold their value in the field of human necessities (technological sector A) whereas the value of patents in the field of physics (technological sector G) diminishes relatively quickly after ten years of renewal.

Germany

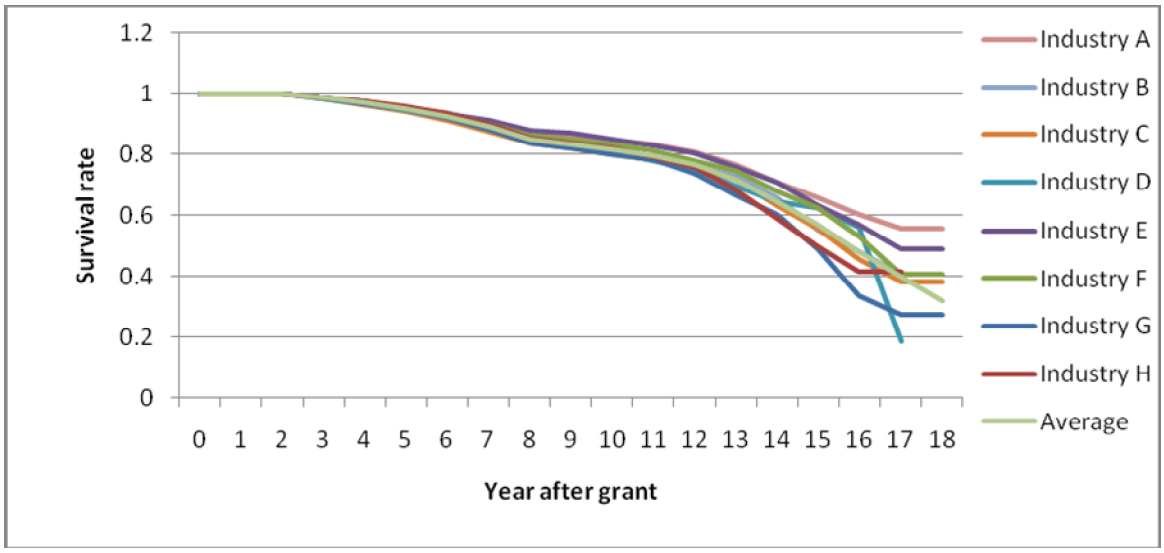
Figure 4.9: Kaplan-Meier Estimates for Germany



4.53 Compared to the results presented above for Switzerland, German survival rates differ less between technological sectors, even in the later years. It is interesting to note, however, that physics patents appear to be of greater value in Germany than in Switzerland, whilst human necessities patents once again appear to be of the greatest value to the patent holder. The average survival rate is generally lower in Germany than in Switzerland for all years post-grant.

France

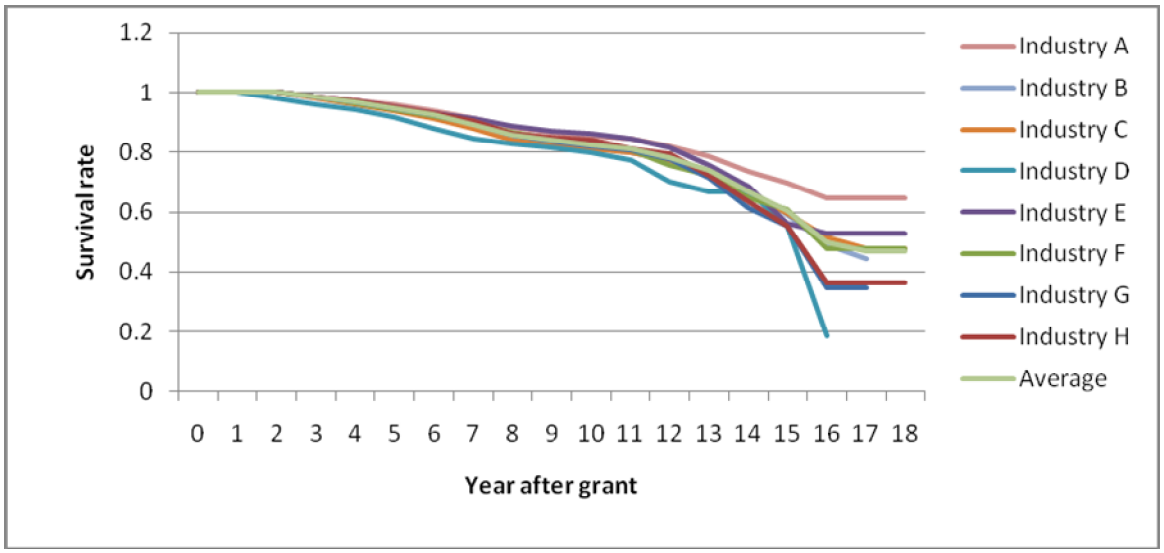
Figure 4.10: Kaplan-Meier Estimates for France



4.54 The average survival rate of patents in France follows an almost identical trajectory to that of Germany. Other aspects of graphs are also similar, including the fact that human necessities patents appear to be greatly valued whereas those in paper and textiles appear to have lesser value to the holder in later renewal years.

Netherlands

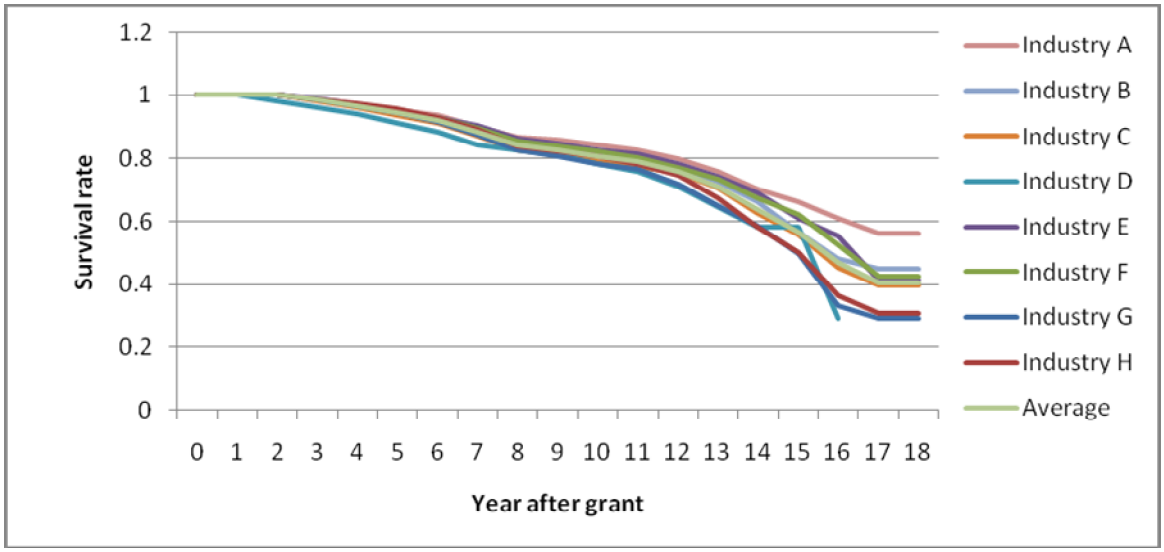
Figure 4.11: Kaplan-Meier Estimates for the Netherlands



4.55 The average survival rate in Netherlands is the higher than those of Switzerland, Germany and France and there is greater dispersion between technological sectors in the Netherlands than in France or Germany. As with all countries presented above, the greatest survival rate is in human necessities and the lowest is in paper and textiles.

UK

Figure 4.12: Kaplan-Meier Estimates for the UK



4.56 The dispersion of survival rates in the UK is lower than in any of the other countries for which Kaplan-Meier estimates have been presented. Other characteristics of UK survival rates are similar to those of other countries, including the fact that human necessities patents have the greatest survival rate whilst those of physics a paper and textiles are relatively low.

Analysis of the effect of renewal fees on patent life

Treatment of renewal fees in the parametric analysis

4.57 Renewal fees have not been directly included in the Prentice-Gloeckler and binary regression models presented below. In principle it would have been possible to include the level of renewal fees directly because the '*Renewal fees*' variable could be easily constructed by setting its value to be equal to the national renewal fee amounts that have been paid (for patents that have been renewed) and the amount that that would have been paid (for patents that have not been renewed). Therefore, the reason for excluding renewal fees from the regression is not due to a lack of data, but because of a methodological issue.

4.58 The aim of a duration model is to assess how the explanatory variables influence patent life (i.e. the dependent variable to be explained). If we included the 'Renewal fee' variable, we would be assuming that its coefficient would measure a *causal link running from renewal fees to patent life*. However, it is obvious that progressive renewal fee structures provide another causal link which works powerfully in exactly the opposite direction, i.e. *from patent life to renewal fees*. In other words, if we included renewal fees in the model we would have the illusion of explaining how fees influence patent life but we would in fact partly capture the opposite effect, i.e. the fact that the lifetime of patents

largely determines their renewal fees. In econometrics this problem is called *endogeneity*. There are a number of methods that can be used to address endogeneity problems, and we have deployed two of them.

4.59 The first consists in replacing the explanatory variable of interest (renewal fees in our context) with an index of progressiveness which is directly derived from renewal fees but which (unlike renewal fees) is not affected by patents' lifetime. We have therefore included such index of progressiveness in the regression of patent life across Europe. The results of this regression are presented in the following section, in Table 4.1 below.

4.60 The second approach consists in testing the causal hypothesis of interest by comparing an experimental *group* to a control *group*. The experimental and control groups must be identical in respect to all characteristics except the causal variable of interest, which should be present only in the experimental group. In our context, since the goal is, for example, to test whether more progressive renewal fees shorten patent life, we would need a sub-set of patents for which renewal decisions were based on a progressive renewal fee structure (the experimental group) and a sub-set of identical (or extremely similar) patents for which renewal decisions were based on a flat renewal fee structure (this would be the control group). Similarly, if the goal is to test whether higher renewal fees shorten patent life, the experimental group should contain patents for which renewal decisions were based on high renewal fees, and the control group should contain identical patents for which renewal decisions were based on low renewal fees. The viability of this approach depends of course on the availability of an appropriate control group.

4.61 We happen to be in the fortunate situation of being able to identify such a control group of patents. The results of this analysis are shown in Tables 4.2 to 4.9.

Econometric analysis of the impact of the progressiveness of renewal fees on patent life, using the progressiveness index

4.62 We present below the estimation results of the Prentice-Gloeckler duration model based on EPO patents granted in Switzerland, Germany, France, the Netherlands and the United Kingdom for which renewal decisions were made in the period 1989-2009. The dependent variable in this regression is the likelihood of patent mortality in the next period and hence a negative coefficient implies that the variable lowers the risk of patent mortality and hence prolongs survival.

Table 4.1: The Determinants of the likelihood of patent mortality across Europe

Variable	Coefficient	Hazard Ratio
Index of progressiveness	1.009**	2.742
Log(renewal year)	1.270**	3.562
Claims at grant	-0.008**	0.992
Valid in >1 country	-0.885**	0.413
Designated states at grant	-0.021**	0.979
Valid in home country	0.018	1.018
Procedural phase duration	0.034**	1.035
Opposition indicator	-0.235**	0.791
E-PCT	0.330**	1.391
EP, non divisional	0.354**	1.425
IPC (B) – Performing operations	0.160**	1.174
IPC(C) – Chemistry and Metallurgy	0.256**	1.292
IPC(D) – Textiles and Paper	0.241**	1.273
IPC(E) – Fixed constructions	0.033	1.034
IPC(F) – Mechanical Engineering; Lighting; Heating; Weapons; Blasting	0.083**	1.087
IPC(G) – Physics	0.144**	1.154
IPC(H) – Electricity	0.025	1.025
French patent holder	0.057**	1.058
UK patent holder	0.091**	1.095
Japanese patent holder	-0.173**	0.841
Korean patent holder	-0.581	0.560
Other non-EPC patent holder	0.208**	1.232
Other EPC patent holder	0.047**	1.048
US patent holder	0.037*	1.038
Germany	-4.453**	0.012
France	-3.408**	0.033
Netherlands	-3.348**	0.035
UK	-0.633**	0.531
GDP	-1.75E-09**	1.000
Population	9.63E-05**	1.000
Constant	-4.919**	N/A

(*) significant at 5 per cent level

(**) significant at 1 per cent level

4.63 These results indicate that the progressiveness of the renewal fee structure has a significant impact on patent life. The coefficient is positive, which implies that the greater the value of the progressiveness index (i.e. the more progressive the fee structure) the greater is the risk of dying in the next period. In other words, the flatter is the fee structure, the longer is patent life. More specifically, the hazard ratio indicates that a unit

increase in the index of progressiveness would mean that the likelihood of mortality in the next period would be approximately 2.7 times greater.

4.64 Given that the index is constrained to lie between zero and one, a unit increase is the largest possible increment in the index. We observe a decrease in the index of 0.62 in Switzerland in 1997. In this case, the hazard ratio shows that, if all else remained unchanged, the likelihood of any given patent dying in the next period would be 1.7 per cent lower (i.e. 2.7*-0.62) in 1997 than it was in 1996.

4.65 The coefficient on the log(renewal year) variable indicates that there is positive duration dependence in patent survival, by which we mean that the longer a patent has lived thus far, the greater the likelihood that it will not be renewed in the next period. As this is a logarithmic variable, the hazard ratio shows that a unit increase in the value of the logarithm of the renewal year approximately increases the risk of dying in the next period by 256 per cent (i.e. ((3.56-1)/1)*100). A unit increase in the value of the logarithm of the renewal year would be achieved if the value of renewal year changed from one to 10, and hence the hazard ratio indicates that patents for which the tenth year of renewal fees have been paid are more than 3.56 times more likely to die in the next period than are those for which the first year of renewal fees have been paid.

4.66 The results further indicate that the greater the number of claims and designated states at grant, the lower is the likelihood that a patent will die and hence the longer it will pay renewal fees. In addition, the greater the number of countries in which the patent remains valid, the more likely it is that renewal fees will be paid in the country under consideration.

4.67 Longer patent pending periods (represented by the variable '*Procedural phase duration*') are associated with a shorter (granted) patent life. For each year post-grant, patents that had a longer procedural phase must pay a greater fee than must those that had a shorter procedural phase in countries with a progressive renewal fee structure. Hence, the total cost of renewing a patent for 5 years post-grant can be significantly greater for patents that had a longer procedural phase. The variable attempts to capture this effect. The results show that the longer the procedural phase, the greater the risk of mortality in each period. From the results presented above, it is not clear whether or not this is simply because of higher fees or whether there is some impact of patent quality (e.g. if poorer quality patents are likely to spend longer in the application process). We attempt to separate these effects in the analysis of 'young' and 'old' Swiss patents presented below.

4.68 The dummy variables that identify technological sectors show that compared to sector A (human necessities) patents in all sectors other than fixed constructions and electricity are more likely to die. This goes some way to support the hypothesis we formed on the basis of the Kaplan-Meier results that human necessities patents are of the greatest value to the patent holder.

4.69 Whilst the macroeconomic variables of GDP and population are significant, their coefficients are very close to zero which shows that they have no appreciable impact on patent life.

Econometric analysis of the effect of the progressiveness of renewal fees on patent mortality, using a control group

4.70 Amongst the EPC countries for which we have data, Switzerland has witnessed the most remarkable structural change in renewal fee policy. Prior to 1997 the renewal fee structure in Switzerland was progressive, but in 1997 a flat fee structure was introduced. This structural break is illustrated in Figure 4.13, which compares the renewal fee structures in 1996 and 1997.

Figure 4.13: Renewal fee structures in Switzerland (1996 and 1997)

4.71 We have tested a Prentice-Gloeckler duration model based on all patents granted in 1989, 1990, 1994, 1998 and 2002 and validated in Switzerland, and for which renewal decisions were made in the period 1989-2009. In order to estimate whether the progressiveness of renewal structure had an impact on patent life we have included a structural break dummy which takes value one for renewal decisions made after 1997 (the experimental group), and value zero for renewal decisions made prior to 1997 (the control group).

4.72 It is important to stress that, for the analysis above to be valid, it is necessary that the control and experimental groups are very similar (if not identical) in all relevant characteristics except in respect to the nature (progressive or flat) of the fee structure. Indeed, the fact that the model is specified on a cohort of patents renewed in the same jurisdiction ensures that this condition is respected. In contrast, had we defined the control and experiment groups on a geographical basis, (i.e. by comparing renewal decisions made in countries with a relatively flat renewal fee structure to renewal decisions made in countries with a relatively progressive renewal fee structures), it would have been much more difficult to argue that differences in fee structures were the only

differentiating factors. A number of country-specific factors (i.e. the extent of IP legal enforcement, the effectiveness of the litigation system, the size and profitability of the domestic market etc.) are also likely to influence renewal decisions and we would not have been able to control for them.

4.73 The estimation results of the model are provided in the table below.

Table 4.2: The effect of the 1997 change in the progressiveness of the Swiss renewal fee structure on the likelihood of patent mortality

	Coefficient	Hazard Ratio
Flat fee structure*log(renewal year)	-0.429**	0.651
Log(renewal year)	1.470**	4.350
Claims at grant	-0.009**	0.991
Valid in >1 country	-1.263**	0.283
Designated states at grant	-0.016**	0.984
Valid in home country	0.023	1.023
Procedural phase duration	0.036**	1.037
Opposition indicator	-0.138**	0.871
E-PCT	0.317**	1.374
EP, non divisional	0.333**	1.395
IPC (B) - Performing operations	0.172**	1.187
IPC(C) - Chemistry and Metallurgy	0.290**	1.337
IPC(D) - Textiles and Paper	0.420**	1.523
IPC(E) - Fixed constructions	-0.025	0.976
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	0.171**	1.186
IPC(G) – Physics	0.168**	1.183
IPC(H) – Electricity	0.035	1.035
French patent holder	0.088*	1.092
UK patent holder	0.015	1.015
Japanese patent holder	0.006	1.006
Korean patent holder	-15.430	0.000
Other non-EPC patent holder	0.259**	1.296
Other EPC patent holder	0.011	1.011
US patent holder	-0.015	0.985
Constant	-3.817**	N/A

(*) significant at 5 per cent level

(**) significant at 1 per cent level

4.74 The log (renewal year) variable has a positive and significant coefficient, which indicates that there is duration dependence in patent life: the longer a patent has been alive, the more likely it is to die in the next period. The hazard ratio indicates that a unit increase in the value of this variable would increase the likelihood of dying in the next period fourfold.

Bearing in mind that when the renewal year increases by ten, this variable increases by one unit (because the logarithm of 10 to the base 10 is one). Thus the hazard ratio shows that, for example, a patent in renewal year 15 is 4.35 times more likely to die in the next year than is a patent in renewal year 5.

4.75 The variable flat fee structure*log(renewal year) has been created by multiplying a dummy variable indicating if a fee payment was made after the introduction of the flat fee structure by the log(renewal year) duration dependence variable. It therefore identifies the impact that the introduction of the flat fee structure has had upon duration dependence. The fact that the coefficient on the variable is negative suggests that, whilst all patents are more likely to die as they age, the magnitude of this effect is less when a flat fee structure is in place. More specifically, the hazard ratio shows that when a flat fee structure was in place in Switzerland, the impact of duration dependence is approximately 35 per cent lower (i.e. 1 minus 0.65) than it was when a progressive fee structure was in place. This indicates that the less progressive is the fee structure, the greater is patent life.

4.76 The results also indicate that patents that were opposed have longer patent lives than those that were not opposed. This suggests opposition might be a positive indicator of the value of a patent — if a patent is expected to have little impact upon the patent holder's competitors, there would be no opposition. The patent will only be opposed if a competitor believes that it will have a detrimental impact on their business. Therefore, holders of patents which were opposed are likely to renew the patent for more years than holders of unopposed patents, all else being equal.

4.77 The coefficients on the number of claims, number of designated states and dummy variable indicating whether or not the patent is valid in another country all have the same effect on patent life as in the multi-country regression described above and hence we do not repeat the discussion here.

4.78 There is, however, one last obstacle that prevents us from asserting just yet, with absolute confidence, that the sudden switch from a progressive to a flat fee structure resulted in longer patent lives. The problem is that everything else did *not* remain equal when the flat fee structure was introduced: the absolute fee level was progressively reduced. For instance, the flat renewal fee was decreased from CHF 530 to CHF 430 in year 2000, and from CHF 430 to 310 in year 2005[34]. This implies that, from the above results alone, we cannot disentangle the extent to which the increase in patent life can be attributed to the

[34] Other changes occurred also in 1998, 2007, and 2008.

change in the fee structure (from progressive to flat) or to the gradual reduction in fee levels.

4.79 Nonetheless, the results presented above for Switzerland are an additional piece of evidence that confirm results based on the progressiveness index.

Age of patents

4.80 Having concluded that there exists evidence to support the idea that the more progressive the fee structure the shorter is patent life, we are interested to investigate whether such an effect is uniform across all patents. This question seems relevant because there is anecdotal evidence suggesting that renewal decisions are more sensitive to fee changes in the earlier renewal years (i.e. when the economic value of a patent is still relatively uncertain) than in the later years (because long lived patents are typically of higher economic value, hence less sensitive to fee changes).

4.81 We therefore replicated the Swiss results using on two separate samples. The first sample contains only short-lived patents, i.e. patents that had paid fewer than ten renewal fees; the second sample contains only patents that have paid at least ten renewal fees.

4.82 The estimation results based on the two samples are reported below:

Table 4.3: The effect of the progressiveness of the Swiss renewal fee structure on patent mortality for short-lived patents (change in year 1997)

	Coefficient	Hazard Ratio
Flat fee structure*log(renewal year)	-0.384**	0.681
Log(renewal year)	1.576**	4.835
Claims at grant	-0.008**	0.992
Valid in >1 country	-1.212**	0.298
Designated states at grant	-0.015**	0.985
Valid in home country	0.023	1.023
Procedural phase duration	0.010	1.010
Opposition indicator	-0.108*	0.897
E-PCT	0.251*	1.285
EP, non divisional	0.302**	1.353
IPC (B) - Performing operations	0.145**	1.157
IPC(C) - Chemistry and Metallurgy	0.273**	1.314
IPC(D) - Textiles and Paper	0.351**	1.421
IPC(E) - Fixed constructions	-0.063	0.939
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	0.125*	1.133
IPC(G) – Physics	0.105*	1.111
IPC(H) – Electricity	-0.036	0.965
French patent holder	0.143**	1.153
UK patent holder	0.051	1.052
Japanese patent holder	0.021	1.021
Korean patent holder	-15.429	0.000
Other non-EPC patent holder	0.284**	1.328
Other EPC patent holder	0.041	1.042
US patent holder	0.043	1.043
Constant	-3.887**	N/A

(*) significant at 5 per cent level

(**) significant at 1 per cent level

4.83 We noted above (Table 4.2) that where all renewal decisions were included in the regression, irrespective of number of renewal fees that had already been paid, the change to a flat fee structure appeared to increase patent life.

4.84 Splitting the analysis by patent age, the results presented in the table above show that there is an effect on patent life for young patents. The coefficient on the flat fee structure*log(renewal year) variable, which shows the impact of the change to a flat fee structure on duration dependence, has a negative and significant coefficient. This suggests that whilst duration dependence exists for all patents considered in the regression, the magnitude of effect is lower when a flat fee structure is in place. More specifically, the hazard ratio shows that where a flat fee structure is in place, the impact of

duration dependence is approximately 32 per cent lower (i.e. 1 minus 0.68) than where a progressive fee structure is in place for short-lived patents. This provides even further evidence that the more progressive the fee structure, the shorter is patent life.

4.85 The table below shows that the change to a flat fee structure had no impact on the patent life for older patents, as the coefficient on the flat fee structure*log(renewal year) variable is insignificant.

Table 4.4: The Effect of the progressiveness of the Swiss renewal fee structure on patent mortality for long-lived patents (change in year 1997)

	Coefficient	Hazard Ratio
Flat fee structure*log(renewal year)	5.566	261.425
Log(renewal year)	-3.489	0.031
Claims at grant	-0.013**	0.987
Designated states at grant	-0.051**	0.951
Valid in home country	0.008	1.008
Procedural phase duration	0.161**	1.175
Opposition indicator	-0.283**	0.754
E-PCT	0.478	1.613
EP, non divisional	0.437	1.548
IPC (B) - Performing operations	0.292**	1.339
IPC(C) - Chemistry and Metallurgy	0.374**	1.453
IPC(D) - Textiles and Paper	0.788**	2.199
IPC(E) - Fixed constructions	0.190	1.210
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	0.405**	1.499
IPC(G) – Physics	0.480**	1.615
IPC(H) – Electricity	0.302*	1.353
French patent holder	-0.137	0.872
UK patent holder	-0.130	0.878
Japanese patent holder	-0.124	0.883
Korean patent holder	0.173	1.189
Other non-EPC patent holder	-0.123	0.884
Other EPC patent holder	-0.259**	0.772
Constant	-8.2021**	N/A

(*) significant at 5 per cent level

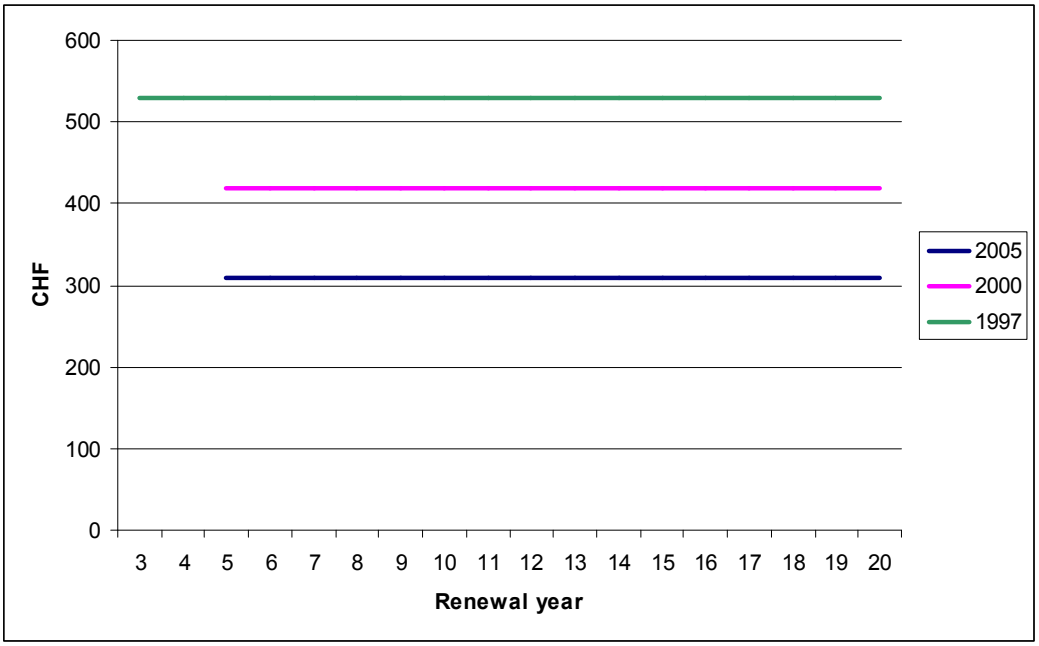
(**) significant at 1 per cent level

Econometric analysis of the effect of higher of renewal fees levels on patent mortality, using a control group

4.86 For the purpose of this analysis, Switzerland is our preferred choice because, as we noted above, following the introduction of a flat renewal fee structure the absolute fee

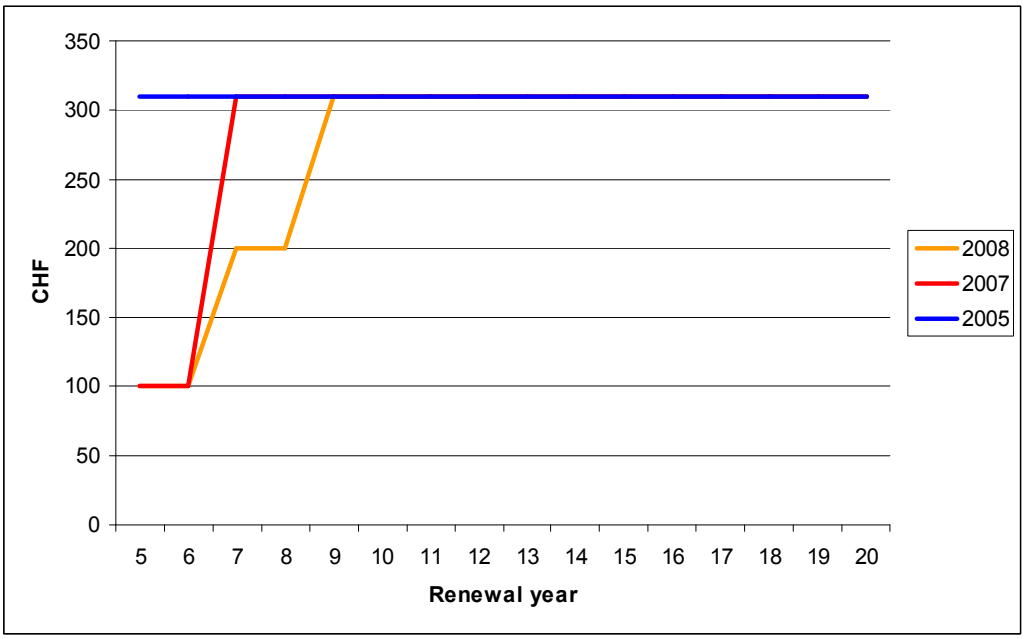
level has gradually decreased. More precisely, the most significant fee changes occurred in 2000 and 2005 as indicated in the figure below.

Figure 4.14 Renewal fee structure in Switzerland (1997, 2000, 2005)



4.87 Other fee changes occurred also after 2005, which partially reintroduced some form of progressiveness in the fee structure for the earlier renewal years. In particular, in 2007 the flat fee of CHF 310 was replaced by a fee of CHF 100 for the fifth and sixth renewal years, and in 2008 the flat fee of CHF 310 was replaced by a fee of CHF 200 for year seventh and eighth renewal years. Such fee changes are displayed in the figure below, where the renewal fees for year 2005, 2007, and 2008 are compared.

Figure 4.15: Renewal fee structure in Switzerland (2005, 2007, 2008)



4.88 To analyse the impact of changes in the level of renewal fees on patent life, we ran the Prentice-Gloeckler duration model twice;

(a) firstly, for all Swiss patents for which renewal decisions were made in the period 1997-2005, with a structural break dummy to estimate the impact of the reduction in the renewal fee from CHF 530 to CHF 420 that occurred in 2000;

(b) and secondly, for all Swiss patents for which renewal decisions were made in the period 2000-2006, with a structural break dummy to estimate the impact of the reduction in the renewal fee from CHF 420 to CHF 310 that took place in 2005.

4.89 Years after 2006 have not been included because the fee changes that took place in those years (i.e. 2007 and 2008) affected the progressiveness of the fee structure rather than its absolute fee level.

4.90 A significant coefficient for the structural break dummy in either model would imply that changes in absolute fee levels have an effect on patent life, and the sign of the coefficient would indicate the direction of this effect.

Table 4.5: The Effect of the Absolute Renewal Fee Level (change in year 2000) on patent mortality of Swiss patents

	Coefficient	Hazard Ratio
High flat fee*log(renewal year)	-0.033	0.967
Log(renewal year)	0.375**	1.454
Claims at grant	-0.007**	0.993
Valid in >1 country	-1.095**	0.334
Designated states at grant	-0.028**	0.973
Valid in home country	0.007	1.007
Procedural phase duration	0.026	1.026
Opposition indicator	-0.123*	0.884
E-PCT	-0.072	0.931
EP, non divisional	0.018	1.018
IPC (B) – Performing operations	0.229**	1.257
IPC(C) – Chemistry and Metallurgy	0.290**	1.337
IPC(D) – Textiles and Paper	0.419**	1.521
IPC(E) – Fixed constructions	0.036	1.037
IPC(F) – Mechanical Engineering; Lighting; Heating; Weapons; Blasting	0.293**	1.340
IPC(G) – Physics	0.252**	1.286
IPC(H) – Electricity	0.139	1.149
French patent holder	-0.046	0.955
UK patent holder	-0.223**	0.800
Japanese patent holder	-0.001	0.999
Korean patent holder	-15.041	0.000
Other non-EPC patent holder	0.016	1.016
Other EPC patent holder	-0.121*	0.886
US patent holder	-0.188**	0.829
Constant	-2.038**	N/A

(*) significant at 5 per cent level

(**) significant at 1 per cent level

4.91 The coefficient of the variable *'high flat fee*log(renewal year)'* is insignificant and hence suggests that the reduction in the level of renewal fees in 2000 had no impact upon duration dependence and thus no impact on patent life. However, before drawing any conclusions, we have run the second model to test the effect of the change in fee level that occurred in 2005. The results are reported in the table below.

Table 4.6: The Effect of the Absolute Renewal Fee Level (change in year 2005) on patent mortality of Swiss patents

	Coefficient	Hazard Ratio
Mid flat fee*log(renewal year)	0.075*	1.078
Log(renewal year)	0.963**	2.619
Claims at grant	-0.012**	0.988
Valid in >1 country	-0.808*	0.446
Designated states at grant	-0.029**	0.971
Valid in home country	0.077	1.080
Procedural phase duration	0.071**	1.074
Opposition indicator	-0.106	0.899
E-PCT	0.178	1.194
EP, non divisional	0.286	1.331
IPC (B) – Performing operations	0.252**	1.286
IPC(C) – Chemistry and Metallurgy	0.336**	1.399
IPC(D) – Textiles and Paper	0.314	1.369
IPC(E) – Fixed constructions	0.195	1.215
IPC(F) – Mechanical Engineering; Lighting; Heating; Weapons; Blasting	0.488**	1.629
IPC(G) – Physics	0.387**	1.473
IPC(H) – Electricity	0.414**	1.513
French patent holder	-0.089	0.915
UK patent holder	-0.125	0.882
Japanese patent holder	-0.115	0.891
Korean patent holder	-14.209	0.000
Other non-EPC patent holder	0.206	1.229
Other EPC patent holder	-0.147*	0.863
US patent holder	-0.154*	0.857
Constant	-4.355**	N/A

(*) significant at 5 per cent level

(**) significant at 1 per cent level

4.92 The results presented in the table above show that, in contrast to 2000, the 2005 reduction in renewal fees had an impact on patent life. The mid flat fee*log(renewal year) variable has been created by multiplying a dummy variable indicating if a fee payment was made before the second reduction of the flat fee structure by the log(renewal year) duration dependence variable. It therefore identifies the impact that the second reduction in the flat fee structure had upon duration dependence. The positive coefficient suggests that whilst duration dependence exists for all patents considered in the regression (i.e. their mortality rate increases with age), the magnitude of this effect is greater when renewal fees are higher. More specifically, the results indicate that the impact of duration dependence before the fee reduction was approximately 7.8 per cent greater than it was

after the fee reduction (i.e. the hazard ratio was 1.078). This indicates that the lower are renewal fees, the longer is patent life.

Do renewal fees have the same effects on patent life, irrespective of patent age?

4.93 Having concluded that there exists some evidence to support the idea that higher renewal fees shorten patent life, we are interested to investigate whether such an effect is uniform across all patents. There is anecdotal evidence suggesting that renewal decisions are more sensitive to fee changes in the earlier renewal years (i.e. when the economic value of a patent is still relatively uncertain) than in the later years (because long lived patents are typically of higher economic value, hence less sensitive to fee changes).

4.94 We therefore estimated the Prentice-Gloeckler model based on renewal decisions between1997-2005 and a structural break dummy in 2000, on two separate samples. The first sample contains only short-lived patents, i.e. patents that had paid fewer than ten renewal fees in the time period considered (i.e. between 1997 and 2005); the second sample contains only patents that have paid at least ten renewal fees in the time period considered.

4.95 The estimation results based on the two samples are reported below:

Table 4.7: The effect of renewal fees on patent mortality of Swiss short-lived patents (change in year 2000)

	Coefficient	Hazard Ratio
High flat fee*log(renewal year)	0.052*	1.053
Log(renewal year)	0.114	1.121
Claims at grant	-0.003	0.997
Valid in >1 country	-1.129**	0.323
Designated states at grant	-0.017*	0.983
Valid in home country	0.005	1.005
Procedural phase duration	-0.007	0.993
Opposition indicator	-0.039	0.962
E-PCT	-0.317	0.728
EP, non divisional	-0.187	0.829
IPC (B) - Performing operations	0.244**	1.276
IPC(C) - Chemistry and Metallurgy	0.281**	1.325
IPC(D) - Textiles and Paper	0.386**	1.470
IPC(E) - Fixed constructions	-0.016	0.984
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	0.250**	1.285
IPC(G) – Physics	0.214**	1.239
IPC(H) – Electricity	0.105	1.111
French patent holder	-0.024	0.977
UK patent holder	-0.299**	0.741
Japanese patent holder	0.050	1.051
Korean patent holder	-14.906	0.000
Other non-EPC patent holder	-0.064	0.938
Other EPC patent holder	-0.118	0.889
US patent holder	-0.188**	0.829
Constant	-1.445**	N/A

(*) significant at 5 per cent level

(**) significant at 1 per cent level

4.96 We noted above (Table 4.5) that where all renewal decisions made between 1997 and 2004 were included in the regression, irrespective of number of renewal fees that had already been paid, the reduction in the level of renewal fees in 2000 appeared to have no impact on patent life.

4.97 The results presented in Table 4.7 show that there is, in fact, an effect on patent life for young patents and that this effect was masked in the full regression. The coefficient on the high flat fee*log(renewal year) variable shows that the 2000 reduction in renewal fees had a positive and statistically significant effect on duration dependence. This suggests that whilst duration dependence exists for all patents considered in the regression, the magnitude of effect is greater when renewal fees are higher. More specifically, the results

indicate that the impact of duration dependence before the fee reduction was approximately 5.3 per cent greater than it was after the fee reduction. This indicates that the lower are renewal fees, the greater is patent life.

4.98 The table below shows that the change in fee level that occurred in 2000 had no impact on the patent life for older patents, as the coefficient on the high flat fee*log(renewal year) variable is insignificant.

Table 4.8: The effect of renewal fees on patent mortality of long-lived patents (change in year 2000)

	Coefficient	Hazard Ratio
High flat fee*log(renewal year)	1.92E-02	1.019
Log(renewal year)	2.693**	14.770
Claims at grant	-0.016**	0.984
Designated states at grant	-0.060**	0.942
Valid in home country	0.025	1.025
Procedural phase duration	0.149**	1.161
Opposition indicator	-0.303**	0.739
E-PCT	0.459	1.582
EP, non divisional	0.412	1.509
IPC (B) - Performing operations	0.225*	1.252
IPC(C) - Chemistry and Metallurgy	0.349**	1.418
IPC(D) - Textiles and Paper	0.646**	1.907
IPC(E) - Fixed constructions	0.187	1.206
IPC(F) - Mechanical Engineering; Lighting; Heating; Weapons; Blasting	0.424**	1.528
IPC(G) – Physics	0.394**	1.483
IPC(H) – Electricity	0.223	1.250
French patent holder	-0.075	0.928
UK patent holder	-0.144	0.866
Japanese patent holder	-0.157	0.854
Korean patent holder	0.159	1.173
Other non-EPC patent holder	-0.145	0.865
Other EPC patent holder	-0.208*	0.812
Constant	-9.474**	N/A

(*) significant at 5 per cent level

(**) significant at 1 per cent level

Conclusions

4.99 This analysis of the impact of renewal fees on patent life allows us to draw the following conclusions.

(a) Renewal fees play an important role in shaping patent life. In particular:

- Higher renewal fees tend to reduce patent life. Short-lived patents appear to be more sensitive to renewal fees than long-lived patents;

- More progressive renewal fee structures have a negative effect on patent life.

(b) Patent mortality displays positive duration dependence: as patents grow older they are more likely to die. This applies both to short-lived and to long-lived patents. Moreover, positive duration dependence has been confirmed also in settings where renewal fees are flat, which confirms that such dependence is an intrinsic characteristic of patent life and it is not simply driven by the progressive structure of renewal payments.

(c) Besides renewal fees, the following factors play a significant role in influencing patent life:

- *Scope of protection:* patents with a wider breadth (i.e. more claims) are likely to live longer.

- *Geographical scope:* a higher number of designated states at grant is associated with a longer patent life.

- *Opposition*: patents that have been opposed are likely to live longer. This suggests to us that patents that have a potentially high economic value are more likely to be opposed.

- *Patent pending period:* longer patent pending periods are associated with shorter-lived (granted) patents.

- *Technological sectors*: patents that provide cover in the human necessities sector tend to live longer than patents in other technological sectors.

- *Geographical origin*: compared to patents generated by EPC applicants, patents generated by Japanese and Korean applicants tend to live longer. The same is not true for patents generated by US applicants, which tend to live relatively shorter.

5 CONCLUSIONS

5.1 This section sets out the general welfare conclusions that can be drawn from this report.

Is there a need for a 'new fee policy'?

5.2 The traditional patent fee policy is characterised by low procedural fees to make the system widely accessible and progressively increasing renewal fees to induce patent holders to give up monopoly rights while subsidising examination activities on unsuccessful applications.

5.3 The rationale for such a policy can be found in a vast and well-established economic literature. In fact, there seems to be a general consensus among economists on the welfare-enhancing role of progressively increasing renewal fees. However, while economists provide clear welfare indications with regard to renewal fee policy, there is a lack of welfare indications concerning the setting of procedural fees.

5.4 The reason for this 'gap' in the literature is the underlying assumption of a perfectly functioning patent system. The traditional literature is concerned primarily with the problem of inducing optimal renewal decisions, while the application process by which patent rights come to exist is viewed as instantaneous and perfect. In other words it is assumed that patenting authorities make instantaneous and perfect grant decisions, and that patentees file applications with the genuine intent of obtaining protection for their invention. However, there is growing economic evidence that applicants may enjoy significant financial benefits simply by remaining in the system. This contributes to increasing patent backlogs and market uncertainty, with the ultimate consequence of making patent rights less predictable.

5.5 Therefore, even if economists have not yet provided clear welfare implications concerning the setting of procedural fees, we believe that there are several economic rationales that call for welfare-enhancing use of procedural fees. In particular, these include:

(a) *Paying for private benefits.* — Just as patent holders pay renewal fees in exchange for the financial benefits they enjoy from IP rights, applicants should be charged in exchange for the economic befits they derive from the patent pending status.

(b) *Paying for externalities*. — By 'gaming' the application system, applicants impose various negative externalities on society, e.g.:

- they increase patent offices' overload by effectively absorbing resources that could be used to process applications from inventors who apply with the genuine purpose of obtaining a grant;

- they contribute to patent backlogs, thus creating uncertainty as to whether and when certain IP rights would be granted;

- they fuel and sustain a cycle of perverse incentives because the fact that some firms 'game' the system makes it optimal for other firms to do the same.

Consequently procedural fees could be increased to include a 'tax' on the externality imposed on society.

5.6 These two rationales are based purely on economic welfare arguments. A third rationale (which can be justified on budgetary grounds) is that applicants should pay for the service they receive. Moreover, since costs associated with the delivery of a service (e.g. examination) may vary across applicants, the pricing should also reflect differences in the resources absorbed. If applicants that 'game' the system utilise more of the EPO's time/resources, they should pay accordingly.

Are fee policies adopted in Europe optimal?

5.7 Having concluded that recent trends in patenting activity call for a 'new fee policy' in which procedural fees should play a more prominent role, we asked the question whether patenting authorities do recognise such a need.

5.8 At first sight, the answer seems to be no. NPOs still rely on the traditional fee policy approach: low procedural fees to make the system widely accessible and progressively increasing renewal fees to induce patent holders to give up their monopoly rights and to cross-subsidise unsuccessful applications. Also, it seems highly unlikely (if not impossible) that NPOs will move away from the traditional fee policy in the near future.

5.9 First, charging high procedural fees is considered politically unacceptable. Second, the possibility of a change in fee policy is further limited by the financial agreement that exists between NPOs and the EPO.

5.10 NPO revenues are largely driven by renewal fees on patents that have been granted by the EPO; thus there is no direct link between fee income and patent processing work. Consequently NPOs are unlikely to feel the need to adopt radical changes in fee policies, because the pressure associated with backlogs and the increasing strategic use of the patent application system (which would call for such changes) is experienced mainly by the EPO.

5.11 The discussion above seems to indicate that there is a material risk that patent fee policies in Europe are sub-optimal from a welfare perspective. This risk is further aggravated by the following considerations.

5.12 First, the self-financing status of some NPOs may constitute an additional obstacle to the setting of optimal fees. Among the NPOs we reviewed, those that are self-financed indicated that social welfare considerations are not taken into account when setting renewal fees. Also, comparing the renewal fees charged by self-financed offices with those charged by publicly financed offices, we cannot exclude the possibility that the presence of budgetary constraints leads to the setting of renewal fee schedules that are

'flatter' than socially optimal, because flatter fees are a more effective income-steering device.

5.13 Second, the reality of the European patent system is extremely complex because of the multitude of institutional players involved, and the possibility of misalignment of incentives associated with it. For instance, the renewal fees set by national patent offices might be optimal at the national level, but not for the European area as a whole.

5.14 The overall picture is however not entirely negative. Even if NPOs seem reluctant to abandon the traditional fee policy approach, there is also evidence that they recognise the potentially important role procedural fees can play in steering applicants' behaviour. This is proved by the fact that several offices charge fees, such as excess claims/pages fees, fees for amendments, or fees for requesting extensions to time limits, which have the potential of steering applicants' behaviour.

5.15 The Hungarian Patent Office, in particular, has a rather sophisticated tariff system, the most interesting feature of which is probably the progressive structures of the fees for amendments and for requesting extensions to time limits. These fee amounts are lower for the first amendment/request, but progressively increase up to the third amendment/request. The rationale for having progressively increasing fees for amendments and extension requests could be very similar to that for having progressive renewal fees, i.e. the so-called 'revelation principle'. With each additional request for extension, applicants reveal that they benefit from prolonging the procedural phase, and consequently they are charged more for doing so.

5.16 In order to verify the validity of such an interpretation, and accordingly to conclude whether such a fee policy can be considered a 'success story', further investigation is required.

What changes in fee policy are desirable from a welfare perspective?

5.17 Our analysis of patent renewal decisions suggests that, in general, national renewal fees fulfil their traditional welfare-enhancing role. Therefore changes in fee policy appear to be needed mainly at the procedural level.

5.18 In order to provide concrete indications of the potential role played by procedural fees in enhancing welfare it was necessary to gather empirical evidence. Ideally, such evidence should:

(a) show that procedural fees are indeed an effective steering device;

(b) make it possible to identify which procedural fees are most effective in steering applicants' behaviour.

5.19 The analysis we have conducted on EP applications leads us to conclude that all fees examined have a statistically significant and negative impact on applicants' decisions to

proceed to the next stage. However, the magnitude of their impact varies greatly, which implies that not all fees would be equally effective if used as a sorting device. In particular:

(a) The impact of search and filing fees is negligible (see Section 3), which suggests that the overwhelming majority of applicants who file with the EPO do so having already anticipated the payment of these fees.

    The relatively limited role that filing and search fees could play as a sorting device is also confirmed by the analysis conducted on French patent applications (see Section 3). This analysis indicates that the main rationale for filing a first application directly with the EPO (and incurring a higher search fee than would have been payable if the application had been sent to INPI) is to file in the English language and consequently simplify communications with non-French inventors.

(b) Examination fees, in contrast, have a substantially larger impact on applicants' propensity to proceed to the next stage (see Section 3) and could therefore be a much more effective sorting device, and a means of managing the level of applications. However, our analysis also suggests that factors such as the quality and outcome of the search are more important than fees in influencing an applicant's decision to request examination. One implication of this is that factors other than fees, and in particular examiners' activities, could be more effective sorting tools at this stage of the application process.

(c) Among the fees considered, fees for further processing are those that have the largest impact on applicants' behaviour. More specifically, they have a significant discouraging effect on applicants' decisions to request further processing once, and that effect decreases with the number of further-processing requests already made. In other words, the same fee amount discourages applicants from requesting further processing once more than it discourages them from requesting further processing a second time. Similarly, the same fee amount discourages applicants from requesting further processing a second time more than it discourages them from requesting further processing a third time. On the basis of this result, the progressive nature of the fees charged by the Hungarian Patent Office for requesting extensions to time limits seems perfectly justifiable.

5.20 Overall, the analysis indicates that fees for further processing are most in need of reform, for two reasons. First, the evidence suggests that applicants are highly responsive to this type of fee. Second, the examination phase is particularly expensive in terms of the Office's resources. Shortening the examination phase is clearly justifiable from an economic welfare perspective. In particular:

- If the request for further processing is a genuine request, i.e. not driven by the wish to delay the examination process, the fee payments can be justified on the ground that such requests contribute to backlogs, and thus impose an externality on the system as a whole.

- If the request is made with the intention of delaying the examination process, the fee would act as a tool to discourage such strategic behaviour.

5.21 Finally, with regard to the redesign of fees for further processing, the recommendations are as follows:

(a) *Higher fee level*: Charging a higher fee level for the *first* request for further processing is the most effective sorting solution: applicants are more responsive to these fees if they have not yet made the first request for further processing.

(b) *Progressive structure*: The EPO might wish to consider whether a progressive further-processing fee structure would be desirable, given that applicants' sensitivity to these fees decreases with the number of further-processing requests already made. In other words, with each additional request for extension, applicants reveal that they benefit from prolonging the procedural phase, and consequently they should be charged more for doing so. An example of a progressive structure of this kind is the fee charged by the Hungarian Patent Office for requesting extensions to time limits.

Further research

5.22 Some recent academic papers have addressed the impact of aggregate procedural fees (from filing to grant) on patent filings. However, there is apparently no study which adopts a step-by-step analysis of the effect of individual procedural fees on applicants' decisions to proceed within the application process. Therefore one of the main merits of the current report is the novelty of the research question that it has addressed.

5.23 Nevertheless, the insights that the report is able to provide into economic aspects of fee policy in the European patent system are, of course, incomplete. More specifically, the following areas appear to be potentially relevant and in need of further research.

(a) *The impact of other procedural fees.* — There are other procedural fees that might be investigated. For instance, internal renewal fees may have an impact on applicants' propensity to stay within the application process for a prolonged period.

(b) *The linkages between procedural and renewal fees.* — Clearly there is a dynamic relationship between procedural fees and renewal fees, and a better understanding of this linkage would provide additional insights into the economic dimension of patent fee policies. In the context of this study, it would have been useful to investigate the relationship between EPO-internal renewal fees and national renewal fees. What is the conjoint impact of these fees on patent life (if the birth of a patent is defined as the moment of filling)?

(c) *The multi-jurisdiction nature of the European patent system.* — The development of a theoretical framework that investigates the functioning of this type of system should be a key priority on the agenda of patent economists. The establishment of a framework in which for example it is assumed for simplicity that national fees are set

by a centralised 'benevolent dictator' seems to be the prerequisite for obtaining a more comprehensive view of what the optimal European fee policy should look like.

(d) *The limitations of fee policies.* — The current report is concerned mainly with patent fee policy. Consequently it investigates how welfare could be enhanced through the setting of appropriate fees, while assuming that the legal and institutional frameworks are external givens. The focus on fees is justifiable on the ground that fee policies have the advantage of being immediately effective and relatively easy to implement. However, policy-makers have at their disposal a variety of tools, of which patent fees are only one example. It should therefore be acknowledged that some of the welfare concerns discussed in this report could also be addressed through changes in the legal and/or institutional framework. To this end, impact assessment studies that highlight the costs and benefits of alternative policy interventions might also be desirable.