Filing strategies and the increasing duration of patent applications

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JEL Classifications: O31; O34; O50

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Abstract
It has long been implicitly assumed that the roaring backlogs experienced by most patent offices around the world – and harshly criticized by many patentees – are a mere mechanical consequence of surging numbers of patent filings. However, different voices suggest that the patent system may sometimes be gamed by an applicant in order precisely to delay the time when a decision will be taken as to the patentability of his application. By empirically showing the impact of several procedural options chosen by patentees in filing their applications at the EPO, this paper clearly demonstrates that this possibility is real, and probably not anecdotal. Deliberate or not, the main consequence of several procedural options is clearly to delay the grant decision. Why and how firms could win any benefit from such strategies can only be guessed, but whether such behaviours are legitimate or not, socially desirable or not, remains an open question.

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1. Introduction

One of the most direct consequences of the hyperinflation in patent quantity ([1] [2] [3] [4]) is the well-known surge in patent backlogs and processing times at patent offices around the world. Although most of them have struggled for years already to cope with this quantity challenge and actually managed to restrain this evolution, there still remains a huge amount of applications awaiting for a decision on whether to grant them or not, and a scaling up in patent office staff is probably no magic bullet, especially in the long run.

That long pendency times could easily result in situations in which the legal uncertainty surrounding pending applications is exploited by some large (cash-rich) firms to threaten, discourage and ultimately exclude smaller players on a given market (or extract rents from non patentable inventions) has surprisingly not been extensively discussed in the economic literature. It is therefore less surprising that little research has been dedicated to understanding the various factors that may drive processing times up as well. There is indeed a natural inclination for many stakeholders to consider that backlogs and processing times should only be considered an organisational issue for patent offices to solve on their own.

This line of reasoning is probably simplistic and hides the potential interest applicants may have under particular circumstances to endure longer pendency times. To convince oneself, it should be sufficient to look at the major success of the PCT procedure. PCT filings not only ease the extension of a filing across the world, it has – as a major effect – the advantage of providing 18 additional months for the applicant to make up his mind on whether to incur the cost of extending his application worldwide or not. It is widely acknowledged that this particular benefit from the PCT option has largely contributed to its success (see [5] [6] [7] [8]). If applicants sometimes need more time in the patenting process before incurring important costs, then there clearly is a case for considering the possibility that some patentees would sometimes use all possible procedural option available to them to postpone the grant decision regarding their case.

This is precisely the question addressed in this paper: what determines the length of patent applications? It has often been argued in the economic literature that longer post-grant patent rights are indicative of more valuable inventions ([9] [10] [11]). This paper simply extends the empirical assessment of this question to the entire life of patent applications (i.e. from filing to withdrawal, refusal, revocation or lapse and not only from grant to lapse), by testing the effect of different factors on the length of examination procedures, renewals, and both periods.

The results from this exercise show that most filing strategies implemented by patentees in filing and managing their applications to the EPO clearly result in longer processing times, as suggested by [8], possibly to the benefit of some patentees, but surely at the expense of growing legal uncertainty in the patent system. Why and how firms could win any benefit from such strategies can only be guessed, but whether such behaviours are legitimate or not, socially desirable or not, remains an open question.

The paper first presents (in section 2) the evolution of patent length at the EPO and comments on major pitfalls in analysing it empirically. Section 3 introduces different factors that may contribute to explaining the observed lengths, processing times and renewal periods. Section 4 presents the main result from the econometric analysis, and section 5 concludes.

2. The increasing life expectancy of patent applications

When speaking of patent length, the economic literature has usually focused on the post-grant destiny of patents that is on their legal challenges and renewals. Most this strand of the literature has then used renewals and legal challenges to build indicators of economic importance, on the grounds that the necessary costs to challenge, enforce and renew patents would only be incurred by rational patent owners when they think their patent of sufficient value to justify them.
By so doing, the economic literature has largely ignored the potential economic (and scientific) importance of non-granted patent applications, as well as the fact the destiny of a patent is now increasingly made of pendency. If one considers the theoretical possibility to enforce pending patent applications by virtue of Article 67 of the European Patent Convention (EPC), non-granted patent applications and inflating processing times might matter more than the economic literature has acknowledged so far.

In this paper, the focus is not on post-grant renewals but encompasses the entire life of all patent applications, from their filing to their fall into the public domain. The objective here is to analyse the determinants of patent length at different stages in their lifetime. The latter can be broken down into two main stages (pre-grant (i.e. examination) and post-grant (i.e. renewal)) and one decision in between.

The main issue one has to face when analysing these dimensions is their censoring. Indeed, only patents older than 20 years in age can be observed over their entire life with certainty. More recent filings have a non-zero probability (in fact a growing probability as the year of filing approaches the time of observation) of being either pending or in force. This means that for recent patents, only a portion of their lifetime can be observed and the maximum one can say about them is how long they have been pending or in force so far. In addition, for a recent filing to be fully determined nowadays it has to be in the public domain already, which means that the only fully determined recent observations are the ones that exited the system the earliest. Therefore simple averages of pendency or renewal periods, as exhibited in Figure 1, are severely biased by these selection issues.

![Figure 1](image.png)

Since patents can live for up to 20 years, since applications pending for more than 10 years have been exceptional until the end of the nineties, and since our data was extracted in January 2006, the horizon of observation of patent length (before the effect of censoring appears) is 1987 from maintenance periods (or entire length) and 1996 for processing times and grant rates. From Figure 1, all that can be concluded is therefore that maintenance (renewal) periods have dropped by over one year from 1980 to 1987 whereas processing times have increased from about 3 years in 1980 to close to 5 years in the mid-nineties and grant rates have fallen from 70% in the early eighties to about 60% in 1996. The evolution of these figures beyond their respective horizons can be guessed but is hard to show. [11] have shown that European patents live overall longer nowadays than before but that they tend to be validated and maintained in a smaller set of large countries. In [12], a statistical test accounting for the censored nature of the data has confirmed that
both processing times and renewal periods have significantly increased over time between the mid eighties and the early 2000’s.

Precise averages are unfortunately impossible to compute, but statistical evidence clearly suggests that patent rights (pending or in force) tend to be maintained longer in recent years than before. For as far as post-grant maintenance is concerned, this evolution could be interpreted as a sign that patents are increasingly valuable, a very expected result of the emergence of the knowledge-based economy. Nonetheless, although the economic literature has long assumed longer renewals to be indicative of more valuable patents ([9]; [10]; [11]), little research efforts had been put to date into the empirical validation of this presumption. This is one complementary objective pursued in this paper.

However, the inflating pendency of patent applications, combined with an observed decline in average grant rates, is more appealing. It means that it takes longer to process patent applications whereas a smaller share of them actually turn into valid patent rights being granted.

Figure 2 shows that these two trends are somehow interrelated. It depicts an estimate of the survival function of patent applications from their filing to the grant decision according to the decision taken: deem withdrawal (i.e. withdrawal observed but not notified by the applicant to the Office), (explicit) withdrawal, refusal, or grant. The parallelism between these 4 different curves shows that the average time needed to reach a decision depends on the decision and the distance between each pair of curves represents the average difference in processing time between the two corresponding decisions. This reveals that it takes about one more year on average to grant a patent than to withdraw it, and about 6 more months to refuse an application than to grant a patent.²

\[Figure 2 – Survival function of patent applications up to their grant decision – by decision\]


\[Source: van Zeebroeck (2007b).\]

² Note that a very small fraction of applications are refused by the Office, in the order of 4 percent. However [22] suggest that many withdrawals are actually induced by the examiner.
More importantly, whether these observed trends can only be imputed to patent office backlogs needs to be empirically investigated. Different potential factors are therefore introduced in the next section.

3. What may expand the life expectancy of patents?

To the best of our knowledge, the only attempts to analyse the determinants of patent renewals can be found in [13] and [14], which both rely on small samples of patents and account for a limited number of potential factors. More effort has been put into the investigation of the determinants of grant rates ([5] [6]) and examination lags ([15] [16] [17] [18]). These papers essentially concluded on the importance of backlogs and on the optimality of a system which would grant more important patents faster.

In this paper, we focus on various procedural options chosen by firms in drafting, filing and managing their applications, which make up the filing strategy of each applicant with each of its filings. These strategies have been typified by [8], suggesting that some of them might be inspired by a deliberate will to win some extra time in the process. The main options considered here (detailed in [7] [19] [20]) include the route and procedure chosen to reach the EPO (PCT or Euro-Direct, requests for accelerated processing), the size (in claims) of the drafted application as compared to the contemporaneous industry average, the number of priorities and equivalents listed (indicating the type of construction adopted as coined by [21]), and the use of divisional filings in the course of the examination to split an application into smaller parts while keeping the same priority date.

The common denominator of these different strategies is their growing popularity over the past two decades. From virtually inexisten in the early eighties, most of them have become quite common practice in the late nineties and even more so since then. Our assumption in this paper is that such strategies are not neutral in terms of processing time and should expectedly result into longer pendency periods. Our main argument here is that there may be very sound reasons for firms to wish for longer processing times under certain circumstances, in particular when they are facing significant business or technological uncertainty.

The emergence of such strategies is indeed probably not innocent. The strategic importance of patents in the conduct of businesses is growing and obtaining the most appropriate scope of protection is of paramount importance for many companies. In an economic environment increasingly based on the exchange of knowledge and skills, any instrument aimed at appropriating technical knowledge – such as patents – is by definition critical. This largely explains the booming interest (or race) for patents observed throughout the world over the past decades.

At the same time, competitive processes and technological change have evolved and considerably accelerated, resulting in higher business and technological uncertainty, especially when competition becomes global. In many industries, the setting of industrial standards shapes markets and competition. But standard settings consortia work on fierce negotiations and in many industries (such as telecoms or information technologies) standards take several years to be finalized and constitute moving targets. If one player’s patent claims do not read perfectly on the standard that will ultimately be adopted, the losses could be considerable and the player’s position in the industry severely compromised. However on the one hand a patent application must be filed as soon as possible (to avoid the risk of being deprived by a competitor), whereas on the other hand patent claims can no longer be amended by the applicant once the patent is granted. It is therefore only a natural inclination for a firm acting in an industry dominated by standards to file patent applications as soon as any invention comes out of their R&D labs and to maintain them pending in the pipeline by any means to adapt the wording (and scope) of their claims until the standard gets defined.

3 Note that similar developments have been observed in the US by [23].
In other industries (e.g. chemicals, pharmaceuticals, biotechnologies), research processes can lead to the discovery of a set of compounds among which one could be potentially highly valuable. But identifying, among large sets of compounds, which one would be most valuable and marketable can take time, sometimes up to several years. Then what should a firm in such a situation do? Wait for the important compound to be identified before filing a patent application and pray that nobody would have filed a broader patent application covering it in the meantime? Or occupy the field in advance by drafting (mechanically) a very broad application including all potential compounds in bulk, maintaining the application pending as long as possible until the valuable one has been identified, and then extracting it from the original application into a divisional filing that gets quickly to grant?

These examples suggest that there may be very legitimate reasons for patentees to delay grant decisions on their patent applications to a certain point when placed in particular business or technological conditions. In such conditions, one may expect inventors to either file very broad applications (i.e. containing an abnormally large number of claims) or to use delaying mechanisms allowed for by patenting procedures, or both. The main objective of this paper is to investigate to what extent such procedures can be used as strategic devices to influence the length of (provisional) patent rights. Filing strategies will be identified using procedural data on each patent application, whereas market or industry conditions will be roughly expressed by the technological field of each filing (based on IPC classes).

4. Results and discussion

To test this assumption empirically, a proper econometric model dealing with the censoring of the data observed in section 2 was needed. Survival time models have been designed precisely for this purpose. They allowed us to estimate the effect of each factor considered on the hazard rate of patents, defined as the probability for a patent or application to fall into the public domain at each time over its life expectancy (the hazard function is the inverse of the survival function depicted in Figure 2). The selected model and detailed econometric results are presented in [12] [24]).

The explanatory variables integrated in the model include: the different strategies evoked here above, along with 6 groups of additional (control) factors: patent value (measured with forward citations and family sizes4), technological complexity (measured with the number of inventors listed, the number of IPC classes5, and the number of backward patent and non patent citations), ownership structure (co-application, cross-border ownership, size of patent portfolios), industrial sectors (14 joint clusters defined by the EPO), countries of origin (i.e. the country of residence of the applicant), and time (or years of filing).

The econometric results can be summarized as follows: first, the trends in processing times, grant rates and renewal periods announced in section 2 are confirmed by the coefficients associated with time dummies: patents do live longer on average, processing times are statistically increasing, and grant rates are declining.

Second, the long accepted idea that more important patents tend to be renewed for longer periods finds some solid empirical support here as both value indicators are associated with very significant positive coefficients in the four models. More important patents are not only enforced longer, but they take longer to be examined and are more likely to be granted. On the contrary, complex inventions take more time to be processed, but are associated with lower grant and renewal rates (especially for non patent citations and IPC classes).

Third, the most striking result is that most filing strategies accounted for in the model have a very strong impact on grant rates and patent length. Their most significant effect, however, is clearly to expand or delay

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4 More specifically triadic patent families: a binary variable indicates for each EPO application whether it belongs to a triadic family, which means whether it has also been filed in Japan and the US or not ([25] [26] [27]).

5 At four digits, IPC4.
the granting process whilst they are usually associated with lower grant rates, which suggests that their quality is actually lower.

In particular, applications with more claims than average or with equivalent filings at the EPO are associated with longer decision lags but also with lower grant rates. This results is illustrated in Figure 3 for claims. This figure depicts an estimation of the survival function according to the size of applications: applications with 30 claims or less (the left curve) v. top 5% largest filings, with over 30 claims (the right curve). It clearly shows that the largest applications require much more time – about two additional years – to be processed. Given the substantial increase in claims observed at the EPO over the past 3 decades ([3] [7] [19]), this result suggests that patents take increasingly long to be processed by the Office, not only because of the surging number of applications filed, but also as a consequence of the concurrent inflation in size (in claims and pages). [22] explain the additional processing time due to multiple claims by their inducing more communications between applicant and examiner, as each round of communication can take one year to complete.

**Figure 3 – Survival function of patent applications up to their grant decision – Average v. Largest filings in claims**


PCT filings present a strange case: they are also associated with longer pendency periods, but their likelihood to be granted is much higher, whereas once granted they tend to live significantly shorter than average. The strongest effect is however to be found with divisional filings, which are characterised by the longest pendency periods, by far. Interestingly, the root filing in a set of divisionals is also associated with some of the largest grant and renewal rates when the end leaves (divisional themselves) score only slightly above average on these dimensions.

Figure 4 illustrates the very striking results obtained for the divisional indicator. It exhibits an estimation of the survival function according to the type of application: normal application (the left curve) v. divisional filing (the right curve). The distance between the two curves represents approximately 5 years, suggesting
that divisional filings take on average 5 more years to be processed than a regular application. These results are consistent with the typology of filing strategies proposed by [8].

Overall, these results suggest that such procedural options could technically be used to delay the grant decision. The motivations of patentees in so doing are however more complex to observe. Nonetheless, the coefficients associated with industry dummies reveal some interesting patterns. High tech industries (biotechnologies, IT, telecommunications) are characterised by the longest pendency periods and the lowest grant rates by far, whereas the longest renewals can be observed in more traditional sectors: audio and video, vehicles, and human necessities. There is therefore little doubt that delaying strategies are mainly used for this purpose in industries with intense technological rivalry and possibly shorter product lifecycles. Interestingly, two of these sectors are also the more standards intense (computers and telecommunications).

Figure 4 – Survival function of patent applications up to their grant decision – Divisionals v. Other


5. Concluding remarks
Since many agree that growing patent backlogs and increased pendency periods are a critical issue for the patent system, highlighting some of the factors that may contribute to these undesirable effects of the inflation in quantity is no less important. Assuming that the emergence of huge backlogs in different major patent offices is no more than the mechanical result of the number of applications entering into the process would be far too simplistic.

First, the increase in patent office workload is not only a matter of patent quantity. It is also a matter of patent size and complexity. The results reported in this paper show that the inflation in patent size (in claims and pages) observed at the EPO ([3] [7] [4]) and the growing complexity of patent filings (science linkage,
size of the teams of inventors, number of IPC classes) has undoubtedly contributed to the average processing time of patent applications.\(^6\)

Second, the fact that more important patents take more time to be processed is probably indicative of a more intense negotiation between applicant and examiner. One is more reluctant to give up his application when he deems it more valuable. [15] observe indeed that applicants are less willing to abandon applications relating to inventions which are potentially valuable compared to other applications.

Third, the various procedural options left to the choice of the applicant in filing or managing his applications (construction, route, size, requests for accelerated processing, divisional filings) are associated with very substantial delays in the examination process. This does not constitute evidence that this effect is anticipated by the applicants using such strategies, but it is sufficient to prove that they could technically be implemented for this very purpose of obtaining more time in the process.

Why firms, in certain situations, could be willing to obtain more time before they get their patent granted can easily be guessed. First, because once granted, a patent exposes its owner to considerable translation, validation and renewal costs and to potential legal disputes (opposition, nullity actions, etc.) Second, because once granted, the legal scope of a patent – as defined within the claims – is frozen. It could be subject to different interpretations (depending on the existence and applicability of a doctrine of equivalents), but its wording can no longer be amended. In a sense, in certain industries, a patent application is like a bullet, and getting it granted is like shooting the only bullet you have. As long as it is pending, procedures allowed for by the EPC make it possible to adapt the wording here and there so that the claims would read on a particular case. Third, if one knows his invention is not patentable, he is better off with a pending application – that is, with the perspective of getting a valid patent – than with a refused or withdrawn application – that is, with nothing. Hence, in such situations where obtaining a patent could make a huge difference in terms of obtaining license revenues or access to a third-party technology through cross-licenses, it could be tempting to use any possible legal mean to maintain a patent application alive as long as possible rather than to see it refused.

Therefore, one could easily foresee situations in which such strategies could be leveraged in arguably less legitimate ways. Given the considerable costs and risks associated with patent litigation, a pending patent whose validity has not yet been confirmed by the Office, could easily be used by a cash-rich entity as a dissuasive weapon against smaller (or less cash-rich) competitors to exclude them from a market, obtain potentially undue licenses, or force them to concede cross-licenses.

The technical plausibility of such behaviours highlighted in this paper makes it important enough to be considered. However, drawing a red line between legitimate and abusive behaviours, between acceptable and unacceptable strategies, or between socially desirable and socially detrimental exploitations of the procedural possibilities offered by the patent system would be an all but easy task for policy makers, properly informed by economists. This may however be a necessary exercise to ensure the sustainability of the patent system.

\(^6\) One should keep in mind that the EPO practice recommends that the search process be performed at the claim level; hence more claims mechanically induce more work for the examiner.
References


