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Delays in International Patent Application Outcomes

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## **Abstract**

One component of the duration of pending patents – why applicants choose to delay the examination process – is modelled. We use a matched sample of 9,597 patent applications. Controlling for differences between patent offices, we find evidence of strategic behaviour by applicants.

*Keywords:* Patent examinations; Patent pendency; Strategic behavior

*JEL Classification:* O31, O34

## 1. Introduction

The patent system exists to stimulate inventive activity and mitigate the market failure associated with the expropriation of innovation profits. However, designing the rules of the patent examination process is complex and opportunities often arise for patent applicants to engage in rent-seeking behaviour and thus a loss of social welfare. An example is the rule currently in force in many patent offices which allows applicants to request examination of their application at some point after it has been initially filed.<sup>1</sup> Such a rule is typically justified on the grounds that it allows applicants time to claim the earliest possible priority date while permitting them some additional time to develop their invention. However, such extensions to the pendency period may come at some social cost since it introduces uncertainty in the status of property rights, thereby distorting rival firms' investment decisions (see Zeebroeck 2007). We examine why applicants may chose to delay their examination in this paper.

In order to examine how a *given* applicant behaves with respect to a *given* underlying invention but under different administrative rules, we use a matched sample of 9,597 sets of non-PCT applications that have been submitted to the USPTO, the EPO, the JPO and the APO and have a single, common priority application.<sup>2</sup> We then analyze the length of the examination request lag using a fixed-effects model to determine whether lags are determined by the quality of the underlying invention after controlling for office protocols and rules and applicant behaviour. Other studies such as Popp et al. (2004), Harhoff and Wagner (2005) and Regibeau and Rockett (2007) have modelled examination duration at one patent office, but this is the first study of its kind to consider applicant effects across different patent offices. Moreover, these other studies do not account for the fact that the total patent pending period is a function of both delays in applicants' formal examination requests (or decision not to request examination) and the

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<sup>1</sup> At the European Patent Office (EPO), the Japanese Patent Office (JPO) and the Australian Patent Office (APO), patent applicants file an initial application and then request examination some time in the future (which may be up to 5 years after filing date). Only the United States Patent and Trademark Office (USPTO) commences examination of the application without a request to do so (although applicants can pay a fee to defer examination).

<sup>2</sup> The priority date is the year in which the first patent application of a 'family' was first lodged with a patent office. This application is subsequently referred to as the priority application.

duration of the examination itself. In this paper, we focus on the former issue – the “examination request lag” – although we note that applicants may also behave strategically once the examination has commenced.

Our results indicate that the lag in examination request has a clear strategic component since the applicant-specific behaviour variables and the quality of the application have a significant effect on the length of the request lag.

## **2. Background**

A pending patent creates uncertainty for all parties in a market. Of particular concern is that patent pendency may distort rival firms’ investment decisions since it sends a signal to rival firms that a specific technology space maybe already owned. Of course, the strength of this signal may depend on the likelihood that the invention will eventually be patented, but this is private applicant information. From a welfare perspective, the optimal pending period represents a trade-off between speed and accuracy: faster examinations are desirable since they reduce business uncertainty, however thorough examinations (including searches for prior art) take time to conduct and there is a strong rationale for excluding obvious and non-novel inventions.<sup>3</sup> Since it is (almost) axiomatic that business uncertainty leads to a loss of welfare, there is nothing to be gained from allowing a longer pendency period (including the examination request lag) than is necessary.

Despite this, applicants are given some discretion over when their application is examined at most patent offices. Once an application is filed, applicants can request examination immediately or wait for the maximum allowable time period. Since information regarding the probability of the application being granted a patent is private, this delay in examination request allows applicants to engage in strategies that maximise their private advantage regardless of the effect on social welfare. In Europe, for example, the private value of patent pending status is increased by the fact that pending applications are theoretically enforceable. That is, compensating damages can be claimed from alleged infringers of a patent whose application is still pending (see Zeebroeck

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<sup>3</sup> Although this is an important issue, we do not analyse it in any detail here.

2007). In the event that the application is eventually refused by the patent office, such power would seem unwarranted.

In summary, when a patent application has a high probability of success, the applicant may want a fast decision since this gives them certainty over their rights sooner. However, if the applicant believes the application has a low probability of success, there may be some private benefit in delaying examination. Private gains for the applicant in choosing when to have the application examined are based on the following: First, a delay in requesting examination results in a gain of the time value of the examination fee (or avoidance of accelerated examination fee) and increased uncertainty for competitors. These private gains are not welfare-enhancing. Secondly, a fast examination may result in gains due to more certainty for the applicant's investment decisions (including decisions to license, joint venture or re-assign) and (if granted) better protection from infringement compared with pending status. These private gains do contribute to social welfare.

The maximum period the applicant is permitted before an examination request must be made varies by office. There is no allowable period at the USPTO (although applicants can pay a fee to defer examination) and accordingly we assume that the US request lag is uniformly zero. At the EPO, the applicant may request a substantive examination at any time so long as it is no later than six months after the European Patent Bulletin mentions publication of the prior art search report. In normal circumstances, this maximum will be 2 years. At the JPO during the 1990 to 1995 period, applicants were allowed 7 years after filing to request an examination.<sup>4</sup> The rules at the APO are less prescriptive. Generally, the office directs applicants to request an examination if they have not already done so 1-2 years after filing. The applicant then has 6 months to decide whether to proceed with examination or withdraw. For the purposes of our study, what is most relevant is that in each office applicants can request an examination at any time. Office procedures merely impose a maximum time limit on this request.

The considerable variation in the length of the actual delay in requesting an examination of ending proceedings suggests that there may be substantial advantages to the applicant from sometimes opting to take full advantage of the maximum period offered by the office. We argue that applicants use their private knowledge on the quality

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<sup>4</sup> In 2001, the allowable period was changed to 3 years at the JPO.

of their inventions to strategically delay the outcome when the application has a lower probability of grant.

### 3. Data and descriptive statistics

Our dataset – consisting of 9,597 sets of non-PCT<sup>5</sup> patent applications – was compiled from:

- (1) the OECD Triadic Patent Family Database;
- (2) the EPO’s public access online database (*esp@cenet*);
- (3) the JPO’s public access online Industrial Property Digital Library (IPDL) databases (Patent & Utility Model Concordance);
- (4) the NBER Patent-Citations Data File (Hall et al. 2002); and
- (5) the IP Australia PatAdmin database.

In order to minimise the amount of truncation with regard to the application outcome, we only used data on applications with priority years from 1990-1995 inclusive.<sup>6</sup> To ensure we have matched the same invention, we only included patent families with a single priority application since the content of multiple priority applications may vary across offices.<sup>7</sup> Since the USPTO did not publish patent applications prior to 2001, we consider application outcomes at the EPO, JPO and APO conditional on them being granted by the USPTO. Thus, our dataset relates to non-PCT complete patent applications with a single patent application filed at the EPO, a single patent application filed at the JPO, a single patent application filed at the APO and a single patent application which has been granted by the USPTO.<sup>8</sup>

Table 1 below shows the distribution of request lags at the EPO, JPO and APO. It shows that the JPO had both the longest median lag and the greatest variation of lags. It

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<sup>5</sup> PCT is an acronym for Patent Cooperation Treaty, which was signed in 1970, and provides for the filing of a single patent application in designated PCT member countries, either by filing an application with the national patent office of the Contracting State (and designating it a PCT application), or filing an application directly with the World Intellectual Property Office in Geneva.

<sup>6</sup> Prior to 1988, the JPO required an application per claim and accordingly their applications were not consistent with the EPO and USPTO.

<sup>7</sup> For similar reasons, we also excluded patent families involving continuation and divisional patent applications at the USPTO.

<sup>8</sup> For more details on the construction of this dataset and consideration of possible selection bias effects, see Webster et al. (2007).

suggests that when applicants have considerable scope in when they are subject to examination, they take full advantage of it. There is a wide diversity of *ex ante* desires for pendency periods and few opt for the minimum period (with maximum certainty) when given a choice.

Table 1

Distribution of examination request lags at the EPO, JPO and APO (in months), matched sample of applications filed 1990 to 1995

Quartiles	APO	EPO	JPO
1 <sup>st</sup> quartile	11.8	8.4	42.0
Median	14.6	12.0	84.3
3 <sup>rd</sup> quartile	20.8	15.9	88.2
Maximum	44.2	151.4	125.8
Sample size	9595	9618	8168

#### 4. Modelling delays in the examination request lag

Our dependent variable – the *ex post* examination request lag – is defined as the number of months between filing the application in each office and either i) the time taken by the applicant to request an examination or to withdraw the application,<sup>9</sup> or ii) the time taken by the applicant to request an examination.

To investigate the determinants of the *ex post* request lag decision, we model the lag as a function of: First, private knowledge about the probable success of an application. We assume that this knowledge is only revealed after many years. Fortunately, we have hindsight and we measure private knowledge as the proportion of eventual grants across all patent offices.<sup>10</sup> Secondly, particular market knowledge. We expect local applicants will want earlier certainty in their own (first) market. This effect is proxied by whether or not any of the inventors are local to the office. Thirdly, unobservable applicant-specific behaviours. This effect is captured by modelling the applicant as a fixed effect in the panel estimation. Fourthly, office rules, protocols and workload which affect the

<sup>9</sup> By this, we mean that the application is either ‘withdrawn’ by the applicant or is ‘deemed withdrawn’ by the office (at the APO this is referred to as the ‘lapsed date’).

<sup>10</sup> The proportion of patents granted across offices is calculated at the end of 2004, and excludes the small number of applications that are still pending at that time.



maximum examination request lag at each office in each year. We model this factor as a series of office/year dummy variables. Finally, public knowledge about the probable success of the application. We model this as the number of prior grants by other patent offices for that particular invention that were known 12 months after filing in each office.

Accordingly:

$$\text{Request lag}_{io} = f(\text{Proportion of grants as at } 2004_i, \text{Local inventor}_{io}, \text{D}_{oy}, \text{Number of grants before 12 months}_i, \alpha), \quad (1)$$

$$\forall i=1, \dots, 9597; o=1, 2, 3; y=1990, \dots, 1996; \alpha=1, \dots, 2140.$$

Where  $i$  denotes a given invention,  $o$  denotes the patent office and  $y$  is the year of filing and  $\alpha$  is the fixed effect for each applicant.

If the length of the request lag is purely administrative, then after accounting for the office/year effects, the lag will be random and all other variables should not be significant. If the lag is strategic however, we expect that the applicant-specific behaviour variables and the private knowledge variables will be significant. Table 2 presents the results of our fixed-effects estimation for both definitions of a request lag using a linear specification of equation (1). The results suggest that the applicant-specific effects are in fact significant, which supports the conjecture that applicants behave strategically in the timing of their decision to request patent examinations. In the first estimation, a rise in the ‘Proportion of grants as at 2004’ from 0 to 0.5 will shorten the request lag by 5 months. Applications with a local inventor tend to be requested 7 months earlier than otherwise.

Table 2

## Determinants of examination request lag

	Time to request exam or withdraw	Time to request exam
Proportion of grants as at 2004	-10.793*** (-18.95)	-1.483** (-2.40)
Local inventor	-7.321*** (-22.53)	-5.809*** (-17.38)
Average office/year dummies (average of all years)		
APO	-3.026***	-42.069***
EPO	-2.681***	-41.627***
JPO	12.730***	-0.978***
Number of grants before 12 months	-0.154 (-0.51)	-0.567 (-1.80)
Constant	27.007*** (33.90)	58.510*** (65.62)
Rho	0.271	0.285
R <sup>2</sup> – Within	0.67	0.55
R <sup>2</sup> – Between	0.31	0.30
R <sup>2</sup> – Overall	0.62	0.48
Number of obs.	29,059	25,500
Number of groups	2,140	2,116

\*\*\* significant at the 1% level.

## 5. Policy implications and concluding comments

Previous empirical research has paid little attention to the fact that patent applicants have strong incentives to behave strategically in delaying examination of their patent applications. We address this lacuna in this paper and find strong evidence of such rent-seeking behaviour by applicants. We posit that when given the opportunity, applicants use their private knowledge of the quality of the patent application to choose whether to hasten or delay their request of an examination. The social cost of delaying examination is that patent pendency distorts rivals' investment decisions. In other words, private incentives are not perfectly aligned with optimal social incentives. Rather than seeing their mission as a client-serving organisation, patent offices should consider the implications for the broad community as their ultimate objective and should thus undertake to remove opportunities for applicants to behave in such a strategic manner.

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