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Firm reputation and incentives to "milk" pending patents

Johannes Koenen [a], Martin Peitz [b,c,d,e,f,g,*,1]

[a] Ifo Institute Leibniz Institute for Economic Research at the University of Munich, Poschingerstr. 5, 81679 Munich, Germany
[b] Department of Economics, University of Mannheim, 68131 Mannheim, Germany
[c] CEPR, United Kingdom
[d] CERRE, Belgium
[e] CESifo, Germany
[f] MaCCI, Germany
[g] ZEW, Germany

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ABSTRACT

In this paper we develop a theory of patenting in which a firm preserves its reputation by only applying for a patent whenever a truly patentable idea has been generated. Firms have a short-run incentive to deviate and receive additional rents from unworthy pending patents, as well as potential rents from PTO mistakes in granting patents. We provide conditions for reputation to be preserved in equilibrium and analyze which market environments are favorable for such an equilibrium to exist. In particular, we analyze the merits of different patent systems.

1. Introduction

When your competitors see the words "Patent pending" at a trade show, on your new product, on your web site, or in your sales literature, they will naturally wonder about the scope of your patent application. […] Your patent application will not be discoverable for at least eighteen months or more, and even then, prosecution could impact what ultimately may issue. So your competitor's fear of the unknown may provide you a temporary but substantial advantage in the marketplace. Use it well.[2]

A pending patent application is a curious thing: On the one hand, there is little to nothing that a firm's competitors can do about it. In fact, legislation in the US even allows the details of the application to be held secret for at least 18 months, a time limit introduced only in 1999 by the American Inventors Protection Act.[3] On the other hand, there are a number of channels through which even the sheer evidence of a patent application may confer economic value to its holder: As in the introductory quote, competitors may change their behavior in desirable ways, such as competing less aggressively in the market or in an innovation race. Other companies may be willing to pay to purchase or license pending patents for a number of reasons: Either in order to obtain information during the period it is held secret, or later on, if for example complementary know-how of the patenting firm or institution is required for profitable use.[4] Any investment that a competitor undertakes will be in the shadow of a holdup-situation arising if and when the patent is granted.[5]

In addition to reactions by competitors, a firm may benefit for other reasons. Consumers' willingness to pay could increase if they perceive a

* Corresponding author at: Department of Economics, University of Mannheim, 68131 Mannheim, Germany.
E-mail addresses: koenen@ifo.de (J. Koenen), martin.peitz@gmail.com (M. Peitz).

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[2] Patent agents Robert Gunderman and John Hammond in an advice column titled "The Limited Monopoly" in the May 2007 issue of The Rochester Engineer, see www.patenteducation.dom/images/200705_Limited_monopoly_-_Patent_Pending.pdf.

[3] See Chapter 37 Section 1.211 of the Code of Federal Regulations and Gallini (2002) for a brief discussion of the implications.

[4] Typical examples in this context are agreements with technology transfer offices of universities or government institutions. For example, the National Cancer Institute at Frederick provides "Licensing Contact Information for Patents and Patents Pending" at www-immb.ncifcrf.gov/ toms/contacts.html.

[5] See, e.g., Koenen and Peitz (2012), who also provide a broad discussion of other issues related to pending patents.

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pending patent as a signal of quality. Häussler et al. (2009) and Cockburn and MacGarvie (2009) find that a firm's pending patents improve its access to venture capital and external financing.[6] Pending patents, therefore, are valuable to firms, even if they are not granted, later on. These short-term benefits during the pending phase add to firms' temptation to apply for patents with bogus ideas. This is a serious issue, which potentially contributes to the widely documented application inflation at the Patent and Trademark Office (PTO), and the associated problems with regard to patent quality, set out, e.g., in Cook (2007) and Bessen and Meurer (2008).

This paper explores to which extent a firm's reputation may act as a countervailing force to this tendency and how patent policy can best make use of reputation mechanisms to uphold patent quality. Whether it is competitors' willingness to enter into pre-grant licensing agreements or their fear of later holdup; each source of value for pending patents requires that others believe the firm's application to be legitimate, i.e., that it will result in a patent being granted with sufficiently high probability. Intuitively, if a firm's application is rejected, its reputation will suffer so that its ability to generate rents with future pending applications diminishes or disappears.

We model this in an infinite horizon setting in the spirit of Klein and Leffler (1981) and Choi (1998): Each period, with a certain probability strictly smaller than 1, a firm generates an objectively patentable idea. Even when it does not, though, it can submit a patent application to the PTO. After some periods of inspection, the PTO grants patents to good ideas with certainty, while due to first-order mistakes it also grants patents to bad applications with a positive probability. If a patent has been granted, the firm holds it for the remainder of the patent lifetime. During the pending phase, a firm generates income from each pending patent, depending on the publicly held belief regarding patent quality, which is based on the observable history of the game. As our model focuses on inspection and PTO policy, we assume that publicly available information is limited mainly to the results of the PTO's examinations of patent applications.[7] For each granted patent in the firm's portfolio, the firm receives a (belief-dependent) income for each period of the patent lifetime.

We study under which conditions reputational consequences, via the channel of publicly held beliefs, can induce desired behavior of firms, i.e., applying for patents only when an objectively patentable idea has been generated. This allows us to compare the effects of different approaches to patent inspection: the "US" policy of fast inspection (small γ) with a relatively high rate of first order mistakes vs. the "European" method of more careful scrutiny at the cost of relatively slow inspection.[8] Further, we provide a rationale for differences between values of patent applications of "young" vs. more established firms.

1.1. Related literature

To our knowledge, this is the first theoretical economic study focusing on the revenues to firms from pending patents and the ensuing incentives to apply for bogus patents. A handful of empirical studies have focussed on pending patents in an often descriptive setting, with the added difficulty that it is difficult to obtain information on unsuccessful patent applications, as Hall et al. (2005) note.

More closely related to our interest of strategic implications of pending patents, van Zeebroeck (2007) finds evidence that firms adapt their patenting strategies to benefit from the pending period of patents, using two decades worth of European application data. Firms appear to extend the pending phase, in particular by filing divisional applications which are processed more slowly, but the firm can also influence the duration of patent inspection through different ways of drafting and pursuing claims (longer specifications, number and complexity of claims, choice of route through the European Patent Office or Patent Cooperation Treaty) and by requesting (or refraining from requesting) an accelerated process. As the duration of the inspection process increases (and thereby the duration of protection through the actual patent shrinks), it becomes less likely that the firm will choose to activate the patent, once it is granted. A possible inference from this is that the pending phase may actually be *more* effective than an actual patent to protect a firm's interests in many cases. In a similar study using US data, Popp et al. (2004) consider grant lags for US patent applications. They find that more valuable claims tend to be examined for longer periods of time by the PTO.[9]

The effects of pending patents on the performance of (mainly) young firms are studied by Häussler et al. (2009) and Cockburn and MacGarvie (2009). Both find that pending patents lead to a higher probability of obtaining venture capital financing. According to the estimates obtained by Cockburn and MacGarvie (2009), this effect is actually stronger for pending than for granted patents.

Methodologically, our approach is related to the literature on umbrella branding, in particular Choi (1998) and Wernerfelt (1988).[10] More broadly, our paper contributes to the literature on the firm as a bearer of reputation, which is surveyed in Bar-Isaac and Tadelis (2008). To model reputation, we follow the approach proposed by Klein and Leffler (1981) that is also used in Choi (1998).

Wernerfelt (1988) proposes a signaling model in which a firm successively produces experience goods in two periods. Even when consumers have bought the first good, they are not completely certain regarding its quality. The central result is that equilibrium beliefs exist, such that a subsequent discovery of bad quality in the second good leads to a downward re-evaluation of the quality perception of the first good, which results in revenue losses for the monopolist firm. This mechanism can lead the firm to abstain from misrepresenting the quality of its later product. As opposed to this, in Choi (1998), the quality of experience goods is revealed to consumers perfectly after purchase. The effect of a discovery of bad quality here is that consumers adjust their quality beliefs for products introduced in the future; due to this forward-looking effect it can be efficient for the firm to refrain from extending its brand to low-quality products.

We suggest that patent applications and experience goods have a lot in common. The quality of a patent application can only be judged by competitors and the public in general after it has become accessible; for simplicity, we assume that this happens only when the PTO publishes its verdict on the application. Similar to Wernerfelt (1988), after the PTO's decision, not all uncertainty is resolved: different kinds of patent litigation such as challenges and infringement suits bear witness to the fact that even the quality of granted patents is not entirely certain. While in Choi (1998) consumers correctly assess the quality of the purchased product immediately, we introduce a delay between filing and examination as well as potential examination errors. This adds additional tradeoffs: The lower detection probability by the PTO gives firms a direct incentive to game the system; but, as in Wernerfelt (1988) there is also an indirect force at play. If the PTO makes mistakes, there is residual uncertainty regarding the quality of patents even after their approval. As long as the firm has the reputation of submitting only good applications, this does not play a role, but once a firm is caught with a bad application being rejected, the beliefs regarding the existing

[6] Kortum and Lerner (2000) find that venture capital, in turn, may spark more innovative investment; they estimate that about 8% of innovation expenditures are linked to venture capital influx.

[7] In particular, we abstract from the information contained in potential post-grant lawsuits.

[8] The average time from application to decision is around two years for the US, but almost twice as long in Germany, see Hall and Harhoff (2004) who also provide empirical evidence for the difference in grant rates across the systems.

[9] This is, however, at least partially driven by the fact that patents from different areas of technology consistently differ in their inspection duration.

[10] In the context of umbrella branding the firm is concerned about the reputation it enjoys with consumers, while in our model the firm is concerned about its reputation vis-a-vis its potential competitors.