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The cost of patent protection: Renewal propensity☆

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ABSTRACT

Using a newly collected time-series country panel of renewal fees, this paper finds a small, but significant patentee sensitivity to patent renewal fees, which likely indicates renewal fees are low compared to the exclusionary value confer within a jurisdiction. The low sensitivity may be explained by a decline in fees relative to GDP over the last 30 years. We also find that patent family effects drive much of the renewal behavior at the jurisdictional level, and that estimates of patentee behavior at the jurisdictional level are likely to be biased or incomplete without accounting for the family owner's global strategy.

1. Introduction

1.1. Motivation

It is interesting to see how much analysis is devoted to consumer and business behavior related to price sensitivity, but so little analytical attention is devoted to the fees and incentives of government fees in general, and the those of the intellectual property system in particular. When it came to setting Switzerland's maintenance fee structure some 2 years ago, management had little but good business intuition and past experience to make, what in effect was a multi-million franc decision. It is fair to say that said decision rested primarily on administrative, legal, and revenue implications rather than considerations of inter-temporal social welfare or the strategic incentives of the applicants and patentees. Switzerland's patent office's own experience is very similar to those of other national offices. Specifically, the European patent office has wrestled with the question at a large multi-lateral scale, and until very recently the UK patent office took only revenue considerations into account. Large questions remain about EPO revenue, the political economy of national patent office funding, industry's demands for low fees, and multilateral integration. Beyond the European patent system, we have seen Ecuador drastically increase renewal fees to the highest in the world raising questions about whether fees can be used negate the patent right. At the other extreme Italy removed renewal fees entirely for a brief spell creating a tangle of active patents. Such divergent views on fee policy raise obvious questions about optimal renewal fee policy.

It is within this policy context, this paper looks at one specific aspect of fee-setting that has been empirically neglected, namely that of the renewal or maintenance fees. These are fees which are typically paid annually by patentees to patent offices in order to preserve their exclusionary right within a jurisdiction. Whereas the literature has dealt with the issue of patent application fees and costs fairly thoroughly, the topic of renewal fees, which is the primary source of income for patent offices, and potentially a key but neglected policy lever, has received comparatively little quantitative scrutiny.

Aside from the policy implications, renewal fees are worth investigating in their own right because they diachronically lay bare the intricacies of patent strategy, international commerce and trade, and provide information about the underlying value of both the technology and exclusionary right. In this sense, patentee renewal behavior reveals economic information that is distinct from patent application data alone.

1.2. Literature review and contribution

The majority of the work on fees has centered around application propensity. The first econometric work, known to us, is Adams [1], who addresses demand forecasts for patent applications. He finds that a 1% increase fees leads to a one-off decline of about 0.12% in applications, which wears off, leading to an increase in applications in subsequent periods. The positive and negative coefficients essentially offset one another with the net effect being about zero

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(pg. 514). De Rassenfosse [2] looks at the role of costs of the national office in the context of the European patent system; de Rassenfosse [3] extends the investigation into patenting by looking at the propensity to patent within the inventive population conditional on governmental policies. In a similar vein, using advanced time-series panel techniques, Van Pottelsberghe de la Potterie [4] demonstrates that fees play a role in the international demand for patent protection. De Rassenfosse [5] provides the most recent and thorough treatment of patent fees by providing a survey of the literature theretofore. Beyond the academic literature, there have been a couple of *ad hoc* measurements of elasticity [6] [7]. In terms of theory, Gans [8] builds on some of the earlier theoretical work in the field done by Ariel Pakes, and highlights the tension between funding the work of the patent office and socially optimal fee policy where high fees encourage quality and low fees encourage patentees to file and disclose information to competitors.

Table 1 provides a convenient overview work related to patent price elasticity (η) along with the methods and data employed.

Table 1 reveals that while the estimates of fee sensitivity in various contexts are very heterogenous, there nevertheless emerges a clear common pattern that all are less than unity and negative.

This paper sheds more light on the role of renewal fees and their structure on applicant behavior. In particular, it contributes to the renewal fee-setting discussion currently going on at the European patent office. The closest work done on this particular question comes from a report for the Internal Market and Services Directorate General on the common patent [11]. The authors use aggregated time series cross-section data to estimate the elasticity by way of the fraction of patents maintained. Their estimates have several short-comings in that: they use a single year (2006) for GDP, opt for an inappropriate linear model for a fractional response variable, take the fees and GDP in levels rather than logs, and do not cluster their estimates by country and/or time which likely understates their standard errors substantially. It is not entirely clear what inference can reasonably be drawn from their estimate.

In contrast, the USPTO [6] takes a micro-approach, and deploys a more concise and appropriate probit model of an applicant's decision of whether to renew conditional on the fees, but it is unclear how generalizable the US fee structure is to other countries: US patentees make three maintenance payments instead of paying annual renewal fees, which means patentees are paying for several years with a single payment. Since fees exhibit tight ranges in those studies it is also harder to generalize the estimates to new situations or jurisdictions. On a more practical level, better elasticity estimates should help patent offices optimize fee structures to generate revenue, better incentivize patentees, and/or provide better guidance on implementing policies to either encourage innovation or improve patent quality. It goes beyond the state of the art by showing how large fee changes might alter behavior by estimating the hyper-elasticity of the fee response in an international cross-section.

The second contribution is methodological. Aside from the USPTO's investigation [6], the general strategy heretofore has been to estimate aggregate statistics while neglecting the basic attributes of the individual patents. The methodology employed here incorporates cross-country effects, essential for understanding a global patent strategy and patentee and patent attributes, and lays a foundation for how these might best be modeled in an extensible econometric framework using the public information from PATSTAT. Moreover, the patent-level approach advanced here should yield more accurate estimates than the methods used heretofore in the literature. It also allows for an exploration of what a heterogenous fee structure may have on particular groups of interest to policy-makers, such as small business or individual inventors. By disentangling the market effects from the patent attributes, we add to the literature surrounding multinational patent strategy and valuation.

The structure of the paper is as follows: the next section presents a simple renewal model of patentee behavior, then we will look at the data behind the estimation, explore the results, and finally derive certain policy implications.

2. Model

In this section we present a simplified model of patentee behavior largely based on the work of Pakes [14] and Bessen [15] that will motivate and clarify the empirical strategy. In Pake's model, he essentially treats renewals as a type of rolling call option on the exclusionary right, where patentees receive updated information as to its value. The simplified model here is that the invention's value is static from its inception, and that value drives the underlying motivation for the observed renewal behavior.

The value of the would-be patentee's invention ($E\{V_{inv}[\bullet]\}$) is the sum of the discounted profits under both a granted scenario with probability γ less invention and application expenses and an ungranted/unprotected scenario $(1-\gamma)$. The application process is very long and is pitted with strategic decisions. Many patents do not survive the grant procedure, and patentees often withdraw or abandon the application before the first fees come due. The *ab initio* value of the patent is the sum of future profits discounted. The discount rate (δ) can be interpreted as comprising both the technological rate of obsolescence and the financial opportunity costs: $\delta = \text{interest}_j + \text{obsolescence}_{IPC}$. The interest rate will largely

Table 1
Overview of patent fee elasticity estimates.

Study	DV	Methods & data	η [lo, hi]
Adams [1]	Filings	Univariate ARIMA & multivariate ARDL US applications	[−0.12, +0.13]
Archontopoulos [9]	Claims	One-off 2004 US claim fee change	[−0.1,−0.2][a]
De Rassenfosse [2]	Filings	First diff rOLS ts-panel for 29 EPC countries in 2003	[−0.45, −0.56]
Harhoff [10]	“Validations”	Cross-section MLR for 1995, 1999, 2003 EP cohorts	[−0.30,−0.34]
De Rassenfosse [3]	Filings	Cross-country rOLS of 34 EPC countries	[−0.5, −0.3]
Van Pottelsberghe de la Potterie [11]	Maintenance rate	OLS 15 EPC members, JP, US	[−0.084]
Van Pottelsberghe de la Potterie [4]	Filings	IFGLS, LSDV, GMM & ECM ts-panel for US, JP, EP	[−0.06,−0.12]
Swiss PO internal	Renewal	Event analysis of 2014 fee change for each renewal cohort	[0_{Y20}, -0.34_{Y5}]
De Rassenfosse [12]	Quality	Block testing for 1982 US fee change	[+0.01,+0.12]
USPTO [6]	Renewal	Probit model of renewal propensity	[−0.056,−0.338]
WIPO [7]	Filing choice	Probit model of PCT or Paris route filing	[−0.014,−0.028]
This study	Renewal	Logit, Poisson, Cox-PH, MMLR ts-panel 46 countries 1980–2013	[0,−0.25]

[a] Archontopoulos points out the discontinuity, this author calculates the point elasticity at −0.10 based on patents with more than 20 claims and two 11 month windows before and after December 2004. Based on the same data Van Pottelsberghe de la Potterie computes −0.20.
Adapted and extended from Table 5 [13].