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Patent life cycle: New evidence

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ABSTRACT

Patents and their renewals are critical because they protect inventions and reinforce information reported to investors about the utility and the quality of inventions. Thus, they signal the appropriate use of financial resources being invested, notably in research and development departments, and future revenues for their owner. Based on a sample of about 22,700 European patents, our research contributes to existing literature on patent renewal by two relevant outcomes. The first contribution proposes a possible definition of a European patent life cycle: abandonment of procedure, natural abandonment, and late withdrawal. The second contribution shows two main factors that influence the renewal of a European patent by examining delivery time and the cumulative number of citations.

Our results show that the procedure is the key issue of structuring the patent's life. In addition, patents' viability is likely to happen given that a part in a series of patents is increasing, which means that valuable patents are often cited by later ones. The relationship stems from the rational behavior of market operators who will try to minimize essential ownership.

1. Introduction

Investors and academics agree that intellectual assets are strategic factors in creating added value for companies [1,2]. However, due to difficulties of considering these intangible assets in financial and accounting statements, they are rarely presented on corporate balance sheets [3].

In this context, patents and their renewal are important ways for the company to claim a portion of its value in terms of intangible assets by giving them legal status and possibly a book value [4,5].

The patent filing confirms the achievement of targets such as a proof of concepts or performance, and is a way to report the appropriate use of financial resources invested in research and development. Patent renewal is critical since it reinforces information reported to investors about utility and quality of inventions.

Therefore, the probability measurement indicator of keeping a patent alive during its life cycle shows the patent's value at each step until its maturity, and the possibility to generate future revenues [6]. Several studies try to analyze how a number of different factors influence the decision to renew a patent, but no consensus has been reached yet [7,8].

The aim of our study is to identify factors fostering the renewal or the abandonment of a patent (Fig. 1). In the first section, we give a brief overview regarding the theoretical framework of our study based on previous work. In the second part, we present the methodology used and the sample exploited in our empirical study. The third part will be devoted to the analysis of the database and a discussion of results. We finally conclude our study with the main contributions and limitations of models and we eventually hint at some suggestive extensions regarding our work.

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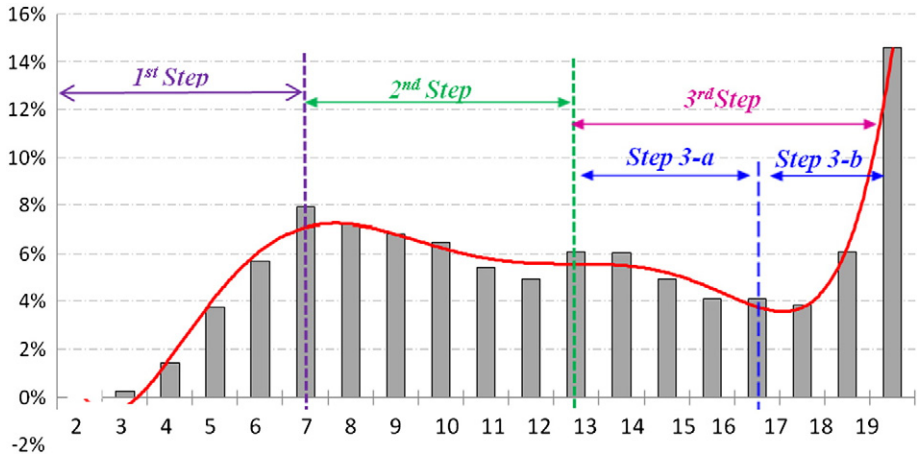

Fig. 1. Distribution of the patents abandoned according to their age.

2. Literature review

In this section, we present an overview of the previous researches on patent renewal and relating to criteria such as patent's age, patent's scope, industry effect and patent's strength.

2.1. Application and maintenance fees

The legal protection of an invention deriving from patent filing is limited in time. That is why companies should pay an annual fee (for European patents) to renew its protection against competitors. On every patent's anniversary, companies face a choice whether or not to renew its patents. This choice is made carefully since the abandonment of a patent is not retroactive. As a result, the holder can no longer enjoy the benefits of its patents once abandoned. The decision can be made by an intercession of the investment's profitability under the assumption of rational investors [4]. In fact, investors will opt for the renewal of their patents only if the expected cash flows are significant enough to justify such an investment [9]. The patent renewal factor should be carefully analyzed given the bias that it may include. According to Moore [10], the abandonment of 50% of patents is related to the inability of their owners to pay costs of maintenance or legal defense. This result was confirmed by Lemley [11] who reveals that 66% of patents are abandoned for the same reasons.

Ignoring the implementation and maintenance costs of an investment project generates valuation bias. Equating patents' granting to an investment project leads us to hypothesize that costs may affect patent renewal's decision. Despite the fact that patent renewal fees are used to finance patent offices in practice and to induce them, there is no reason to believe that the existing pattern of de facto patent lives improves welfare. Econometric studies have confirmed that renewal fees influence the decision on patents and that more valuable patents are held longer [12–15].

Empirical studies show that cost consideration seems to be large for deciding to forego patenting[2] [16–19]. A quantitative assessment of the relationship between fees (costs) and the validation behavior of applicants is analyzed at the microeconomic and macroeconomic levels by Harhoff et al. [20] and Harhoff et al. [21], respectively. Harhoff et al. [21] give us a first insight to the impact of renewal fees: an increase in the validation fees by 1% leads to a decrease in the validation probability of 5.3%, whereas a 1% increase in early renewal fees[3] leads to a decrease in the validation probability of 13.7%. Within this context, Schankerman and Pakes [13] and Danguy and Van Pottelsberghe [22] have been investigating the impact of renewal fees on renewal rates. According to their research, 1% increase in renewal fees decreases the proportion renewed by about 0.02%.

Empirical work of Baudry and Dumont [23] asserts that low-quality patents are characterized by low costs including filing, maintenance and renewal fees. However, valuable patents present high costs during their life cycle, given the direct revelation mechanism of the patent renewal system [24].

2.2. Patents' age

Following the rationality assumption, investors maintain their patents as long as possible due to their high expected value. Thus, the most valuable patents that will be maintained till their legal maturity seek an added value.

According to empirical studies of Pakes [12], patent holders amass profits issued from their investments with a temporal gap of four years after the patent application feeling. Furthermore, only a few seven-year-old patents will be able to generate profits. In the case of French patents, Baudry and Dumont [23] deconstructed these results. Their

[2] These finding should be taken with reserve since it is normal for firms to complain of the level of fees.

[3] Fees up to the 6th year according to Harhoff et al. [20].