



Private value of patent right and patent infringement: An empirical study based on patent renewal data of China[☆]

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ABSTRACT

It is common to see patentees coexist with infringers in developing countries, which leads to a split of patent value between patentees and infringers. This paper extends traditional model for estimation of patent value. We classify patentees by technology level: Patentees with low technology level are motivated to imitate patentees with high technology level. This leads to an early lapse of patent right by patentees with both high and low technology level. With this model, we estimate the value of invention patents in China. Although patent value of Chinese firms is lower than that of foreign firms, the differences are not as large. This is mainly because of the existence of potential patent value. This value is dropped, since the motivation of imitating foreign patents leads to the lapse of their own patents. Technology contained in the patent would thus not be further developed. The infringement behavior is more likely to occur in technology fields with less technology gap between Chinese and foreign firms, which may be due to an easier copy of technology. The strengthening of patent protection works, as two patent law amendments in 1993 and 2001 reduces the infringement. Policy implications are made at the end of the study.

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1. Introduction

Patents play an important role in economic development and social welfare by balancing patent owners' exclusive benefits from technology within a limited time frame and knowledge spillover in society in the long run. Many international scholars focused on the legal protection period, based on the patent renewal information, as an important implication for patent value (Pakes, 1986; Schankerman & Pakes, 1986; Maurseth, 2005; Bessen, 2008). Patent value is a measure of the reward that the patent system provides inventors, and it helps to account for the value of intangibles and to measure the productivity and quality of R&D (Bessen, 2008). The basic argument is that the value of a patent can be revealed based on its owner's beliefs, by examining the corresponding renewal status of the specific patent, and apparently, the effective patent should be considered as worth more than the renewal fee required to keep it in force. Thus, it is reasonable to measure the patent value over its renewal payment during a certain period. Such research has been increasing in recent years, including studies by Schankerman and Pakes (1986), Pakes (1986), Sullivan (1994), Putnam (1996), Schankerman (1998), Lanjouw (1998), Lanjouw, Pakes, and Putnam (1998), Donoghue, Scotchmer, and Thisse (1998), Cornelli and Schankerman (1999), Deng (2007), Grönqvist (2009), Bessen (2008), Baudry and Dumont (2006), Barney (2002), Serrano (2005).

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The measurement is based on the requirement that patent holders pay renewal fees to keep their patents in force. The researchers assumed that renewal decisions are based on purely economic criteria and that patent owners only renew their patents if the expected value of holding those patents for an additional year is sufficiently higher than the cost of renewal (Pakes, 1986). Based on the model initially developed by Schankerman and Pakes (1984, 1986), researchers provided measurement of patent value with European patents (Deng, 2007, 2011; Grönqvist, 2009; Putnam, 1996; Sullivan, 1994), U.S. patents (Barney, 2002; Bessen, 2008; Serrano, 2005).

As one of the biggest developing countries, technology progress of China received much attention. The number of patent application has been booming since 2000. Zhang and Chen (2012a) estimated the value of invention patents filed during 1985–2009 and found the value of Chinese filed patents is lower than those filed by foreigners. Huang (2012) confirmed this by using both invention patents and utility model.

However, the above researches may all have ignored an important issue, i.e., the impact of patent infringement on the private value of patent during the renewal period. Although the intellectual property law has led to the creation of a comprehensive legal framework to protect both local and foreign intellectual property, copyright violations are still common in China (USTR, 2009). Since there is a large technology gap between China and developed countries (Lai, Wang, & Zhu, 2009), infringement may be a shortcut for obtaining technologies. Intellectual property violations are even committed by prominent members of the automotive and electronics industries in China (USTR, 2009). On the other hand, as infringement benefits local economy, local protectionism may dilute the strength of central legislation or the power of law enforcement. When infringements have good connections with local governmental or law enforcement officials, they may find an umbrella for their infringement activity (Priest, 2006).

Lanjouw (1998), Lanjouw and Schankerman (2001), Lanjouw and Schankerman (2001), Marco (2005) studied the patent infringement and litigation. They investigated the willingness and cost of litigation, the probability of winning the trial, and their impact on patent value. All the above empirical studies were based on the hypothesis that patent value will become zero, if patentees either lose the trial or do not prosecute the infringement, and thus patent lapses. However, in reality patentees may not behave like the above studies. Even if there are infringers and patentees lose the trial, they will still renew the patent (Yiannaka & Fulton, 2011). This might be due to a positive benefit, even if there are infringers and benefit is reduced (Langinier & Marcoul, 2009). However, if the patent lapses, more legal imitators will appear, the benefit will become zero. Therefore, a rational patentee will renew the patent, even if the legal system could not provide an effective protection to the patent. Patent benefit is thus shared between patentees and infringers. Besides infringement, it is difficult to identify imitation with non-infringements, which is usually very common in developing countries (Gallini, 1992). Since social welfare will be improved in the short term by indulging in infringement (Klemperer, 1990), most governments in developing countries keep silent about the imitation with non-infringements (Goldberg, 2010). Therefore, it is difficult for patentees to seek effective legal protection in developing countries.

Even if infringement will not lead to a zero value of patent, the patent value will surely be reduced. This is confirmed by comparing patent renewal data between China and Europe. As is shown in Fig. 1, most patents filed by U.S., Japan, E.U. in EPO (European Patent Office) can survive longer period. The ratio of patents lapses within 4 years after patent grant is almost zero. And about 20%–50% patents are renewed full term (18 years) for each country. This phenomenon is the same in the USPTO (The United States Patent and Trademark Office), where about 41.5% patents are renewed full term (Bessen, 2008). In comparison, the renewal period in SIPO (State Intellectual Property Office of China) is much shorter. As is shown in Fig. 2, 40%–60% patents filed by the U.S., Japan and E.U. patentees will lapse within 4 years, and almost no patents are renewed full term (18 years). Thus, there is a large gap of the length of patent renewal period between China and Europe. This may be caused by the differences of the private value of patents in these two countries. Patentees are only willing to renew patents with higher value, so that patent benefit can be kept longer. Since patents from the same country are more likely to own similar technology, the reason that they produce different benefits in different markets may be more likely due to the difference of legal protection. Since China lacks advanced technology and intellectual property is not well protected, it is common to see the patent infringement, which reduces the private value of patents, the willingness of patent renewal is thus low.

Only 30% patents filed by Chinese firms are renewed over 4 years, while this ratio is between 40% and 60% for the U.S., Japanese and E.U. patents (See Fig. 2). Almost no patents filed by Chinese firms are renewed over 10 years, while 10% patents filed by the U.S., Japanese and E.U. firms are renewed over 10 years. Thus the patent age of Chinese firms is shorter than that of the U.S., Japanese and E.U. firms, which reflects the technology gap between China and developed countries. Since the patents are incompletely protected and there is more advanced technology, Chinese firms are motivated to imitate foreign patents and give up their own.

Since it is difficult to seek effective protection for the patent, patentees may negatively treat the infringement, which may be one of the cases that most studies have not made an in-depth investigation. In developing countries that lack technologies, patents are usually not well protected. It is common to see patentees and infringers co-exist in the market. In such case, the formation of patent value is quite different from that in the completely protective market in developed countries. It is necessary to make a further study of the measurement of patent value in the incompletely protective market. This will help us gain more knowledge about how the incompletely protective patent system impact patenting behavior. In addition, the patent law in China has been amended three times since the patent system is officially established in 1985, which incorporates various new provisions to strengthen protection and enforcement of patent rights. We also investigated the impact of patent protection on infringement in the following study.

The rest of this paper is organized as follows. Section 2 presents the theoretical model, Section 3 provides an empirical analysis based on the theoretical model, Section 4 discusses and concludes.

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