J. Eng. Technol. Manage. 36 (2015) 52–77

Contents lists available at ScienceDirect

Journal of Engineering and Technology Management

journal homepage: www.elsevier.com/locate/jengtecman

Determinants of firms' patenting or not patenting behaviors

Kuo-Feng Huang [a,*], Tsung-Chi Cheng [b]

[a] Department of Business Administration, National Chengchi University, 64, Sec. 2, Zhi-Nan Road, Taipei 116, Taiwan
[b] Department of Statistics, National Chengchi University, 64, Sec. 2, Zhi-Nan Road, Taipei 116, Taiwan

ARTICLE INFO

JEL classification:
O32

Keywords:
Patenting
Innovation competence
Innovation
Zero-inflated Poisson regression model
Patent

ABSTRACT

We distinguish between two firm patenting behaviors ('never patent' and 'always patent') and present a two-factor (capability and willingness) patenting behavior framework to enrich existing research. We examine innovative activities on 165 Taiwanese information and communication technology firms by using a zero-inflated Poisson regression model. Our results suggest that determinants of increasing probability of patenting are not completely the same as ones of decreasing probability of not patenting. Moreover, while capability factors are positively associated with propensity to patent, willingness factors moderate the relationship between capability factors and propensity to patent.

Introduction

Experts agree that intellectual property protection is a necessary and very important mechanism for protecting firm competitiveness (Amara et al., 2008; Teece, 2000), since risks of unanticipated knowledge leakage or imitation are always present (Falvey et al., 2006). Companies gain effective technology protection through intellectual property laws and other technology protection actions that mitigate such risks as firms commercialize innovative products in the marketplace (Cohen et al., 2000),

* Corresponding author. Tel.: +886 2 29393091; fax: +886 2 29398005.
E-mail addresses: kfhuang@nccu.edu.tw (K.-F. Huang), chengt@nccu.edu.tw (T.-C. Cheng).

http://dx.doi.org/10.1016/j.jengtecman.2015.05.003
0923-4748/

particularly in the fast-changing high-tech industries[1] (Nonaka and Teece, 2001; Teece, 2000), such as the semiconductor sector (Cohen et al., 2000; Grindley and Teece, 1997; Hall and Ziedonis, 2001; Reitzig, 2003; Rivette, 1993) and biotechnology sector (Baum and Silverman, 2004; Zucker et al., 1998, 2002). Several technology protection mechanisms are available, including patent, copyright, and trademark strategies (Grindley and Teece, 1997). Patenting, however, is one of the most important technology protection mechanisms employed by innovative firms both in developed countries such as the US and Japan (Cohen et al., 2002) and in emerging countries such as China (Zhao, 2006). Empirical studies have suggested that in addition to increasing incentives for innovate products and processes (Cohen et al., 2000, 2002; Kingston, 2001; Levin et al., 1987), patenting can prevent competitors from duplicating patented research and technologies (Cohen et al., 2000, 2002; Kingston, 2001; Levin et al., 1987), signal a company's entry into new innovative areas or markets (Harabi, 1995; Robertson et al., 1995), facilitate cross-licensing activities (Cohen et al., 2002; Gambardella et al., 2007; Kingston, 2001), increase the business evaluation required for mergers or acquisitions (Puranam and Srikanth, 2007), prevent others from duplicating patents (Walsh et al., 2003), or secure freedom to operate (Walsh et al., 2003). All of these motivations, in the long run, help firms benefit from the protection of innovation results. In the short term, patent trolls collect patents to sue other companies (Cohen et al., 2000), as was the case in litigations between Apple and Samsung, or to delay the technological development of competitors (Gómez-Uranga et al., 2014). Google, for instance, bought out Motorola not only to make use of the Motorola's research and development (R&D) resources but also to use Motorola's patents to block other wireless competitors (Vaughan-Nichols, 2011).

In order to sustain competitive advantage in dynamic markets via patenting, firms must nurture innovation capabilities (Jacobson, 1992). A variety of technological capabilities enables firms to innovate and then increase propensity to patent. Prior studies have confirmed a positive relationship between these capabilities, such as R&D and resource allocation capabilities (Yam et al., 2004), and innovation (normally empirically measured by number of patents) (Walsh and Linton, 2002).

In addition to technological capabilities, other factors, which affect firms' possibility to patent, also have been investigated in prior studies. These include firm size (Arundel and Kabla, 1998; Brouwer and Kleinknecht, 1999; Chabchoub and Niosi, 2005), R&D expenses (Suzuki et al., 2006), secrecy degrees (Arundel and Kabla, 1998), geographical clustering patterns (Chabchoub and Niosi, 2005), product mix combinations (Chabchoub and Niosi, 2005), sector differences (Cohen et al., 2000), and patent portfolio races (Hall and Ziedonis, 2001). However, an inquiry of why firms decide not to patent has somewhat received less attention. Firms that never patent are normally regarded as expressing no, or at least limited, interest in patenting to keep innovations undisclosed (Arora and Ceccagnoli, 2006). Alternatively, firms may decide not to patent simply due to legal costs involved, such as high patent maintenance fees (Graevenitz et al., 2013; Grupp and Schmoch, 1999). High patent application and maintenance costs especially prevent startup firms, which typically exhibit resource shortages (Hite and Hesterly, 2001), or manufacturing-only firms (i.e., original equipment manufacturer, OEM), which normally have low margins (Dedrick et al., 2010), from patenting unless absolutely necessary. Moreover, firms may operate in legal environments characterized by patent imitation and costly litigation charges, or firms may engage in low differentiation environments (as may be the case in some contract manufacturing sectors), rendering innovation less attractive. As a result, firms have less incentive to patent. However, firms that never patent are not necessarily those void of innovation capabilities or strategies. Thus, the main purpose of this paper is to differentiate the attributes affecting patenting or not patenting.

Most prior studies have attempted to explore which factors affect propensity to patent. For instance, Mansfield (1986) identified differences in patent propensity over industries and time, while Griliches (1988) asserted that business cycles shape patent propensity. Brouwer and Kleinknecht (1999) found that firms' propensity to patent is significantly higher among R&D collaborators, and varies across sectors and different firm sizes. Arundel and Kabla (1998) suggested that propensity to patent increases with firm size, and perceived patents as an important means of preventing

[1] High-tech firms are characterized by investing a larger fraction of their budget in R&D activities (Czarnitzki and Thorwarth, 2012). In fast changing industries, rapid technological change causes knowledge and capabilities to become obsolete more rapidly than in other industries (Christensen et al., 1998).