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Protecting knowledge: How legal requirements to reveal information affect the importance of secrecy

Wolfgang Sofka[a,b], Pedro de Faria[c,*], Edlira Shehu[d]

[a] Department of Strategic Management and Globalization, Copenhagen Business School, Kilevej 14, DK-2000 Frederiksberg, Denmark
[b] University of Liverpool Management School, Strategy, International Business and Entrepreneurship Group (SIBE), Chatham Street, Liverpool, L69 7ZH, United Kingdom
[c] Department of Innovation Management and Strategy, Faculty of Economics and Business, University of Groningen, Nettelbosje 2, 9747AE Groningen, The Netherlands
[d] Department of Marketing and Management, University of Southern Denmark, Campusvej 55, DK-5230 Odense M, Denmark

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ABSTRACT

Most firms use secrecy to protect their knowledge from potential imitators. However, the theoretical foundations for secrecy have not been well explored. We extend knowledge protection literature and propose theoretical mechanisms explaining how information visibility influences the importance of secrecy as a knowledge protection instrument. Building on mechanisms from information economics and signaling theory, we postulate that secrecy is more important for protecting knowledge for firms that have legal requirements to reveal information to shareholders. Furthermore, we argue that this effect is contingent on the location in a technological cluster, on a firm's investment in fixed assets and on a firm's past innovation performance. We test our hypotheses using a representative sample of 683 firms in Germany between 2005 and 2013. Our results support the moderation effect of a technological cluster and a firm's investment in fixed assets. Our findings inform both academics and managers on how firms balance information disclosure requirements with the use of secrecy as a knowledge protection instrument.

1. Introduction

The threat of imitation by competitors of a firm's unique knowledge is central to theories on knowledge-based competitive advantages of innovative firms (Spender and Grant, 1996). Many firms counter this threat by keeping their R&D activities secret. Then again, legal requirements and accounting standards require firms to disclose information regularly to shareholders, and this information is also potentially available to competitors. The goal of this study is to explore how these requirements change the importance of secrecy for protecting knowledge in innovation activities. Considerations for mandatory information disclosure are largely absent in existing literature, predicting that secrecy is most important for firms lacking resources and technological or legal opportunities to apply for patent protection (Bos et al., 2015, provide a recent review). We draw on information economics and signaling theory and argue that the importance of secrecy is influenced by the visibility of a firm's activities to potential imitators. The more visible a firm, the more vulnerable it is for imitation.

Secrecy is a widely used and efficient knowledge protection mechanism in virtually all industries and firms of all types and sizes (Bos et al., 2015; Hall et al., 2014; Harabi, 1995; James et al., 2013). Firms actively restrict information flows both within and outside their boundaries with the objective of limiting unintended information spillovers (James et al., 2013). Research has emerged that stresses secrecy as an important factor in "make or buy" decisions (Cassiman and Veugelers, 2006), its relation with other protection mechanisms such as lead-time or patenting (Arundel, 2001; Cohen and Walsh, 2000) and its effect on strategic alliance decisions (Katila et al., 2008). However, despite the wide use of secrecy as a knowledge protection instrument in managerial practice, we know little about the importance of secrecy for firms that are increasingly visible to potential imitators.

The essence of secrecy is the creation or extension of an information asymmetry between a firm and potential imitators with regard to the firm's knowledge stock. We argue that the importance of secrecy as a knowledge protection instrument depends on how visible a firm is to its competitors. Since the quality of a firm's knowledge is often difficult for external parties to directly observe, potential imitators rely on observable quality signals to select their imitation targets (Stuart et al., 1999). The major sources of information for competitors are firms' own financial reports, where firms disclose information based on legal regulations of a specific country (Fishman and Hagerty, 2003). We argue that firms that are legally required to share information with their shareholders will be more visible to potential imitators. Consequently,

* Corresponding author.
E-mail addresses: ws.smg@cbs.dk (W. Sofka), p.m.m.de.faria@rug.nl (P. de Faria), edsh@sam.sdu.dk (E. Shehu).

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secrecy will become more important as a knowledge protection instrument because visible firms will find it more important to create an information asymmetry by using secrecy to protect their knowledge from imitation. Furthermore, we hypothesize that this effect of legal mandatory information disclosure requirements on the importance of secrecy is moderated by the location of a firm within a technological cluster, the level of investment in fixed assets and its past innovation performance. All these factors increase the firm's visibility to potential partners and, when combined with mandatory information disclosure, lead to a stronger increase in the importance of secrecy.

We test the hypotheses using a representative sample of 683 firms in Germany between 2005 and 2013. We show that secrecy is more relevant for protecting knowledge for firms that have legal requirements to reveal information to shareholders. Moreover, we find support for the moderation effect of technological clusters and firms' investment in fixed assets. Our findings have important implications for two primary streams of research. First, we add to the literature on knowledge protection by showing specific contingency factors for when secrecy is especially important. Existing literature on knowledge protection and appropriability has described the importance of secrecy as depending on knowledge characteristics, industry factors and cost considerations (James et al., 2013; Bos et al., 2015). We go beyond these findings, and provide a theoretical model that links the importance of secrecy to the visibility of the firm. Second, we contribute to a stream of research that has compared the effects of various knowledge protection instruments and their interactions but that treats them as exogenous (Hussinger, 2006; Jensen and Webster, 2009). Our findings show that this assumption is too strong and that the importance of secrecy can be traced back to how visible the firm is. More comprehensive models will be able to eradicate a potential source of bias by taking these endogenous relationships into account when estimating performance effects. These academic implications have consequences for managerial decision-making. Our findings show that firms need to adjust their knowledge protection if they are more visible to potential imitators. Firms with mandatory requirements to disclose knowledge located in technological clusters and that make higher investments in fixed assets will need to prepare for potential imitators which may previously have overlooked the firm. Under such conditions, secrecy becomes more important for knowledge protection, and firms should reassess access to sensitive laboratories, databases or R&D personnel.

The remainder of the analysis is structured as follows. The next section reviews core theoretical constructs and mechanisms associated with secrecy as a knowledge protection instrument. In the hypotheses development section, we elaborate on our predictions regarding the relationship between firm visibility and the importance of secrecy. The subsequent section describes the empirical study, followed by the results. We conclude by discussing the results, deriving conclusions and identifying directions for further research.

2. Theoretical framework

Our theoretical model is directed at explaining heterogeneity across firms regarding the importance they attribute to secrecy as a knowledge protection mechanism. While all firms have strong incentives to protect their knowledge from competitors, some find secrecy more useful than others, thus reflecting the importance of secrecy for knowledge protection (Conti, 2014). We begin by defining key constructs that establish the theoretical mechanisms of knowledge protection by secrecy and that differentiate secrecy from other forms of knowledge protection. This provides us with a basis for extending the framework in the hypotheses section.

Firms can increase their innovation performance if they create innovations that allow them to set higher prices based on an at least temporary monopoly position in the product market, or benefit from comparatively lower costs due to process innovations. In both cases, the competitive advantage disappears once competitors acquire the underlying knowledge of the innovation and imitate products or processes (Arrow, 1962). Consequently, sustainable competitive advantage can only be achieved if competitors can be prevented from using a firm's knowledge (Liebeskind, 1996).

All forms of knowledge protection are centered on the idea of making the imitation of a firm's knowledge as costly and risky as possible (for a review on imitation, see Ordanini et al., 2008). In fact, there is considerable evidence that imitation is oftentimes incomplete (Westphal et al., 2001) or error-prone (Denrell, 2003). Errors in imitation are consequential because of the substantial related costs. Indeed, estimates of imitation costs range between 25 percent (Shenkar, 2010) and 65 percent of the original innovation expenditures and can take 70 percent of the time to develop (Mansfield et al., 1981). Among firms' active strategies to protect their knowledge, patenting and secrecy are the dominant forms. While the former has received ample attention in management research (e.g., Levitas and McFadyen, 2009; McGahan and Silverman, 2006), the latter has been much less explored theoretically. This oversight is surprising because secrecy has been found to be among the most important forms of knowledge protection for firms of all sizes and industries (Arundel, 2001; Harabi, 1995). Our focus is therefore on secrecy.

Patents require the disclosure of the knowledge associated with the innovation and prevent imitation through the threat of punishment in court. The mechanisms underlying secrecy are fundamentally different because they try to prevent or at least delay the imitation process by non-disclosing the underlying knowledge. We define secrecy as all restrictions at the firm level that prevent unintended knowledge flows outside of firm boundaries. The essence of secrecy is, therefore, to make the imitation search process as costly and unpredictable as possible by preventing any information outflows concerning internal knowledge. By making knowledge invisible to outsiders, secrecy makes it difficult for imitators to identify a firm as a promising source for imitation and to access its knowledge once it has been identified. The widely used example for the latter is the original Coca-Cola recipe, which has never been legally protected, but which has been kept secret (Hannah, 2005). Often, the implementation of secrecy also has a legal component (Png, 2017; Castellaneta et al., 2016). However, in contrast to the legal protection by patents that aim at preventing the use of protected knowledge but not its diffusion, legal trade secrets have the objective of reducing the risk of misappropriation and imitation by limiting information flows (Castellaneta et al., 2017).

While knowledge per se has some characteristics of public goods, firms can limit access to where it is physically produced and stored, who can access it and whether the authorized personnel can transfer it. Secrecy measures are therefore sets of rules that limit the transfer of knowledge to specified others, social interactions with them or restrictions on physical access to certain locations, e.g., laboratories (Liebeskind, 1996). Employees may be granted access to knowledge only after they have made a contractual commitment to knowledge protection, e.g., non-competition clauses for discontinuations of labor contracts (Katila et al., 2008). Secrecy is frequently used because of its flexibility compared with patenting. It can be applied to all types of knowledge (e.g., non-codified, tacit, early stage) and achieved through internal procedures instead of legal procedures, and it does not expire (Encaoua et al., 2006; Hannah, 2005; Maurer and Zugelder, 2000). In contrast, only 32 percent of all inventions are ever patented and patent propensity varies significantly across industries, e.g., 74 percent of all innovations are patented in pharmaceuticals (Arundel and Kabla, 1998).

Despite its broad applicability, the effectiveness of secrecy depends on the nature of the knowledge that the firm wants to protect (Bos et al., 2015). Secrecy is particularly effective for protecting knowledge that by its nature is easier to keep invisible from potential imitators. Consequently, secrecy is especially effective for protecting innovations based on complex or tacit knowledge that is difficult to codify and replicate (Amara et al., 2008), such as process innovations that tend to be hidden