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“How can We Signal the Value of Our Knowledge?” Knowledge-based Reputation and its Impact on Firm Performance in Science-based Industries



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This study shows that the value of a firm's knowledge stocks in a stakeholder group is determined by the rules, values, norms and social evaluations conducted in that group. Based on prior work on the knowledge-based view of the firm and institutional theory, we develop a model of the relationship between the reputation of a firm's knowledge stocks in the scientific and business communities, and the impact of these assets on firm performance. We test the model in a longitudinal research setting with a set of carefully sampled public biopharmaceutical firms. The results indicate that the social evaluations of knowledge stocks by both the scientific and business communities affect firm performance. We indicate the implications of our findings for academic thought and for management practice.

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Introduction

Since the publication of studies by Teece (1981; 1982), Nelson and Winter (1982), and Winter (1987), the knowledge-based view of the firm (KBV) has become increasingly prominent in organization theory (Nonaka et al., 2006) and strategic management (Grant, 1996; Gupta and Govindarajan, 2000; Kogut and Zander, 1992; Spender, 1996a,b; Szulanski, 1996). A central tenet of KBV — how a firm creates, transfers, and uses knowledge — impacts firm performance and relates directly to its ability to compete within an industry (Grant, 1996; Nonaka, 1994; Spender, 1996a). Scholars have addressed a variety of strategies for managing a firm's knowledge (Boisot and Griffiths, 1999; Bowonder and Miyake, 2000; Chen and Edgington, 2005; Chou and He, 2004; Nonaka, 1994; Teece, 1998; Teece, 2000), concluding that sustainable competitive advantage may be achieved by accumulating valuable knowledge stocks (Decarolis and Deeds, 1999).

Although several studies have concluded that knowledge stocks and a firm's capability to manage them impact firm performance (Decarolis and Deeds, 1999; Kyriakopoulos and De Ruyter, 2004; Zucker et al., 2007), empirical studies have shown mixed results in terms how different knowledge stocks impact firm performance (e.g., Bloom and Van Reenen, 2002; Decarolis and Deeds, 1999). In science-based industries, a firm's *raison d'être* is the production of knowledge. However, not all knowledge produced has the same scientific and economic value. One of the limitations of prior studies is their sole focus on the internal value of knowledge stocks and lack of consideration of the external evaluation of such knowledge stocks by the institutional environment. Therefore, these studies lack a satisfactory explanation of the interaction mechanism between knowledge stocks and firm performance. In this study, we complement the model of knowledge stocks with insights from institutional theory and argue that in knowledge-intensive industries, the amount of disclosed knowledge stocks is less important for the performance of a firm than the reputation built around this disclosed knowledge. This phenomenon reflects perceived expectations about a firm's future behavior based on the collective perception of past behaviors (Deephouse and Suchman, 2008). Accordingly, we define our research question as follows: does the reputation of a firm built through its knowledge stocks impact its market performance?

The original model of knowledge stocks and firm performance proposed by Decarolis and Deeds (1999) leaves room for improvement in at least two respects. First, knowledge-intensive and science-based firms, such as those in the biopharmaceutical industry, disclose part of their knowledge stocks in various forms such as products in pipeline, patents or scientific papers. It may be expected that external organizations surrounding the firm will recognize and evaluate these disclosed knowledge stocks along specific rules, norms, values and beliefs that define acceptable scientific and economic conduct (cf., Oliver, 1997). Nevertheless, prior studies have paid surprisingly little attention to the impact on firm performance of how a firm's disclosed knowledge stocks are evaluated by organizations surrounding the firm. This evaluation of a firm's knowledge

stocks generates for the firm a specific reputation that may signal the firm's capability in engaging in projects with long-term commitments to innovate (Deephouse and Suchman, 2008). To the best of our knowledge, this assertion has thus far not been examined in the literature. However, prior research demonstrates that a favorable reputation is a strategic asset that contributes to a firm's performance (Deephouse and Suchman, 2008; Dierickx and Cool, 1989; Roberts and Dowling, 2002; Weigelt and Camerer, 1988). Because firms control what knowledge to disclose, they may engage in reputation-building activities based on their knowledge stocks, with the aim of enhancing their performance. Therefore, it is questionable whether the sole amount of disclosed knowledge stocks, such as scientific papers or patents, positively impacts firm performance. Publishing a large body of scientific papers and patents may not necessarily generate a favorable reputation for the firm, as the perceived scientific and commercial quality of the content of each item may vary considerably.

Second, most empirical studies on the impact of a firm's disclosed knowledge stocks on firm performance employ cross-sectional research designs. However, such designs are limited in terms of making statistically valid inferences (cf., Bierly and Chakrabarti, 1996; Bowen and Wiersema, 1999; Hill and Hansen, 1991) and in supporting causal claims (cf., Antonakis et al., 2010). For example, Decarolis and Deeds (1999) claim that the number of patents of a biotechnology firm, considered as a variable representing knowledge stocks, has a significant, negative impact on firm performance (measured as IPO value). However, this claim stands in contrast to the observation that the average annual growth rate of patent applications of firms in biotechnology is oftentimes above average (OECD, 2004; OECD, 2008). These claims also oppose the results of longitudinal studies that show a positive and immediate impact of the number of patents a firm holds on its market value (e.g., Bloom and Van Reenen, 2002). Therefore, solid empirical support of the impact of knowledge stocks on firm performance is rather scarce.

The current study addresses these shortcomings in the literature by making three significant contributions. First, our study resolves some of the inconsistent findings from prior studies and advances KBV by extending the model of knowledge stocks and firm performance with insights from the sociology of organizations, in particular the reputational outcomes of social evaluation (Greenwood et al., 2008; Suchman, 1995). We provide an external view on knowledge stocks and develop a theoretical model to explain how a favorable reputation, which is granted by external organizations through the evaluation of disclosed knowledge stocks, impact firm performance. We show that a high level of favorable reputation of disclosed knowledge stocks impact firm performance by attracting customers and long-term investors in the marketplace. However, it is critical for managers to understand what type of reputation corresponds to the expectations of different stakeholder groups. Once they identify these expectations, they may actively build their reputation among the respective stakeholder groups by selectively publishing and patenting their knowledge stocks.

Second, we contribute to the literature on corporate reputation by operationalizing a firm's favorable reputation — built through the firm's disclosed knowledge stocks — using secondary data (see Helm and Klode, 2011). Reputation building due to the disclosure of knowledge stocks — in the form of scientific publishing and patenting activity — has been rarely studied (cf., Kotha et al., 2001). In our study, we show that managers can build a reputation around their publications and patents and use the Hirsch index (*h*-index) to measure this particular reputation. The *h*-index reflects perceived reputation by considering not only the quantity but also the quality of disclosed knowledge stocks. The index is an important tool for practical use because reputation must be measured to be managed (cf., Gardberg and Fombrun, 2002).

Third, we contribute to the empirical literature on strategic management and long-range planning by making statistically valid inferences about performance determinants. We test the proposed model of knowledge stocks and firm performance using longitudinal data from a sample of firms in the science-based biopharmaceutical industry, defined as firms developing and/or manufacturing human therapeutics with biotechnological methods. We use a comprehensive set of variables to analyze a coherent sample of public global biopharmaceutical firms. This study is one of the first approaches to use panel data regression techniques to analyze the time-resolved impact of knowledge stocks-related variables on firm performance in the biopharmaceutical industry.

The paper is structured as follows. In the next section, we briefly review studies on knowledge stocks and discuss conceptual foundations of how the evaluation of disclosed knowledge stocks contributes to a firm's favorable reputation; in the same section, we develop a model on the impact of favorable knowledge-based reputation on firm performance. The subsequent sections present the research design as well as the statistical results, and discuss our findings. Finally, we outline the implications for current research as well as managerial practice, and indicate areas for future research.

Theory and hypotheses

Drawing on Dierickx and Cool (1989) study on the role of asset accumulation in competitive advantage, Decarolis and Deeds (1999) provided a seminal investigation of the relative impacts of knowledge stocks and flows on firm performance. The model of knowledge stocks and flows is a key advancement of KBV, as it provides insights regarding a profile of investment in knowledge stocks and flows necessary to succeed in a particular industry. Knowledge stocks are accumulated knowledge assets internal to the firm (Decarolis and Deeds, 1999). They concern the content or outcome of knowledge creation, transfer, storage or reuse and accumulation through individual and organizational learning (Von Krogh et al., 2012). Decarolis and Deeds (1999) measured the amount of disclosed knowledge stocks of firms in the biotechnology industry using products in the pipeline, the number of patents and citations to firm publications (i.e., scientific papers). The results showed that products in the pipeline and citations of a firm's publications are significant predictors of firm performance, which the authors defined as the total market value of the firm's initial public offering (IPO) at the end of the first day of trading (Decarolis and Deeds, 1999, 960). A similar model was used by Biemans et al., (2007) to assess the scientific performance of

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