



The influence of CEO equity incentives on licensing

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ABSTRACT

In a study of life science firms, we find that, in accordance with predictions drawn from agency theory and behavioral agency theory, CEO stock ownership is negatively associated with licensing while CEO stock options are positively associated with licensing. Furthermore, by combining theoretical insights from the capabilities literature with both agency theory and behavioral agency theory, we predict that a key measure of capabilities in the licensing context—a firm's alliance experience—significantly influences the ways in which CEO equity incentives impact licensing. More specifically, we find that, in accordance with our theoretical predictions, alliance experience positively (negatively) moderates the relationship between CEO stock ownership (CEO stock options) and licensing. Our study contributes to the wider literature on the determinants of licensing by examining whether licensing is sensitive to CEO equity incentives. We also extend the capabilities literature on licensing by examining the contrasting influences of a firm's alliance experience on the relationship between CEO equity incentives and licensing. Our findings also inform behavioral agency-based research on the effects of equity incentives by highlighting the usefulness of a capabilities perspective in augmenting our understanding of the behavioral role of CEO equity incentives.

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1. Introduction

Out-licensing (hereafter 'licensing') is an important dimension of corporate entrepreneurship that has significant economic benefits for firms (Arora & Ceccagnoli, 2006; Deeds & Hill, 1996; Powell, Koput, & Smith-Doerr, 1996; Rothaermel & Boeker, 2008; Rothaermel & Deeds, 2004). Through licensing, firms can realize additional revenues (Davis & Harrison, 2002; Grindley & Teece, 1997), leverage external resources (Rothaermel & Boeker, 2008), gain market access (Gans & Stern, 2003) and preempt competition (Fosfuri, 2006). While licensing can enhance firm performance, it also exposes the firm to additional risks (Amaldoss, Meyer, Raju, & Rapoport, 2000; Callaghan, Gabriel, & Smith, 2009). For example, firms may jeopardize revenues in their product market (Anand & Khanna, 2000; Silverman, 1999) or lose control of their discovery (Arora, Fosfuri, & Gambardella, 2001).

Understanding the determinants of licensing has become a critical issue in research on corporate entrepreneurship and innovation (Arora & Ceccagnoli, 2006; Fosfuri, 2006; Gambardella, Giuri, & Luzzi, 2007; Haeussler, Patzelt, ., & Zahra, 2012; Volberda, Foss, & Lyles, 2010). To date, research on the determinants of licensing has tended to adopt either a transaction cost perspective (Williamson, 1975) or a capabilities perspective (Teece, Pisano, & Shuen, 1997). Researchers adopting a transaction cost perspective (e.g. Arora & Ceccagnoli, 2006; Gans, Hsu, & Stern, 2002, 2008) suggest that market-level factors—such as the strength of intellectual property rights and the functioning of the market for technology—increase licensing by altering the costs and risks in licensing.¹

Studies adopting a capabilities perspective (e.g. Ceccagnoli & Jiang, 2013; Powell et al., 1996; Rothaermel & Deeds, 2006; Schreiner, Kale, & Corsten, 2009) suggest that firm capabilities also impact licensing by altering the costs and risks in licensing. As capabilities are not directly observable in large-scale quantitative

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¹ In the current study, we hold market-level determinants of licensing constant by focusing on licensing in a single sector—the life sciences.

studies, researchers (e.g. Ceccagnoli & Jiang, 2013; Rothaermel & Deeds, 2006) focus on alliance experience as a proxy for, or an antecedent of, a firm's underlying capability to license.² These studies show that firms license more and more successfully with alliance experience.

The CEO is a further important determinant of licensing (Fosfuri, 2006; Rivette & Kline, 2000; Volberda et al., 2010). Typically, in technologically intensive sectors, the CEO plays a central role in the licensing decision (Bianchi, Chiaroni, Chiesa, & Federico, 2011). While the CEO is hired to act in the best interests of the firm, through an agency theoretic lens (e.g. Holmström, 1979), he or she is assumed to be both effort- and risk-averse (Fama & Jensen, 1983; Jensen & Meckling, 1976). Thus, the separation of ownership and control gives rise to agency concerns—concerns that extend to the CEO's role in the development and exploitation of technological know-how (e.g. Gamble, 2000; Hansen & Hill, 1991; Hill & Snell, 1988; Junkunc, 2007). To address agency concerns, boards seek to create incentive schemes that align executive and shareholder goals (e.g. Davila & Penalva, 2006; Lambert, Larcker, & Weigelt, 1993).

While traditional agency theory (Jensen & Meckling, 1976) highlights the importance of incentive contracts in aligning the interests of CEOs and shareholders, behavioral agency theorists (Wiseman & Gomez-Mejia, 1998) have extended the traditional agency model to explore the differing effects on risk-taking (in an agency setting) of the two dominant forms of CEO equity incentives: CEO stock ownership and CEO stock options. Behavioral agency theorists predict and show that CEO stock ownership leads to risk avoidance whereas CEO stock options lead to risk-taking (e.g. Devers, McNamara, & Wiseman, 2008; Sanders & Hambrick, 2007; Sanders, 2001; Wiseman & Gomez-Mejia, 1998).

In this study, we integrate insights from the capabilities literature and agency theory (both traditional agency theory and behavioral agency theory) to examine how CEO incentives impact licensing. First, we argue that licensing constitutes high-level risk-taking as the returns from licensing are very uncertain with reported failure rates of between 60% and 70% (Hughes & Weiss, 2007) with the added risks that licensing exposes firms to the risk of losing control of their discoveries (Arora et al., 2001) and losing revenue in the marketplace (Anand & Khanna, 2000; Silverman, 1999). Then, drawing on both agency theory (Fama & Jensen, 1983; Jensen & Meckling, 1976) and behavioral agency theory (Devers et al., 2008; Sanders & Hambrick, 2007; Sanders, 2001; Wiseman & Gomez-Mejia, 1998), we hypothesize that, as licensing constitutes high-level risk-taking and CEO stock ownership leads to risk avoidance, licensing is negatively related to CEO stock ownership (Hypothesis 1). Conversely, as CEO stock options lead to risk-taking, we hypothesize that licensing is positively related to CEO stock options (Hypothesis 2).

We then extend our analysis by considering the influence of firm capabilities on the influence of both forms of CEO equity incentives on the licensing decision. Previous work shows that greater experience in licensing increases a firm's capability to license with a resultant reduction in licensing risk. Extant research typically utilizes the firm's past alliance experience as a proxy for a firm's licensing capability, and empirical work shows that, as alliance experience increases, licensing also increases (e.g. Ceccagnoli & Jiang, 2013; Powell et al., 1996; Rothaermel & Deeds, 2006; Schreiner et al., 2009). Consequently, as alliance experience

influences licensing risk, we expect alliance experience to moderate the influence of CEO equity incentives on licensing (Hypothesis 3).

Earlier, we also argued that licensing is negatively related to CEO stock ownership as CEO stock ownership leads to risk avoidance. However, because alliance experience reduces licensing risk (both the actual risk of licensing and the risk perceived by the CEO), we hypothesize that alliance experience positively moderates the relationship between licensing and CEO stock ownership. Previously, we also argued that licensing is positively related to CEO stock options as CEO stock options lead to risk-taking. However, given the risk reduction effect of alliance experience, we hypothesize that alliance experience negatively moderates the relationship between licensing and CEO stock options (Hypothesis 4).

In our empirical work, we situate our study in the life sciences sector. We focus on the life sciences as licensing is a strategically important activity in the sector (Deeds & Hill, 1996; Powell et al., 1996; Rothaermel & Boeker, 2008; Rothaermel & Deeds, 2004; Somaya, Kim, & Vonartas, 2010). Locating our study in a single sector further allows us to control for market-level determinants of licensing (Arora & Ceccagnoli, 2006; Gans et al., 2002, 2008). Following prior theoretical and empirical work, we develop a measure of alliance experience based on the number of prior licensing deals at the firm level. However, we acknowledge that firm-level alliance experience is not necessarily equivalent to CEO-level alliance experience and we address this issue in our sensitivity analyses. We build our licensing, alliance experience, CEO equity incentive and other measures by combining several databases. Utilizing a range of alternate empirical estimation methodologies, we find strong support for each of our four hypotheses.

Our research makes three main contributions. First, our study contributes to the wider literature on the determinants of licensing by examining whether licensing is sensitive to CEO equity incentives—a prevalent means by which boards seek to influence CEO behavior (Datta, Musteen, & Herrmann, 2009; Reuer & Ragozzino, 2006). As the CEO plays a central role in the licensing decision, executive incentives represent an important—albeit under-researched—topic in licensing and the commercialization of innovation (Arora & Gambardella, 2010; Arora et al., 2001; Volberda et al., 2010; Xue, 2007; Zahra, 1996; Zahra, Filatotchev, & Wright, 2009).

Second, we extend the capabilities literature on licensing by examining the contrasting influences of CEO stock ownership and CEO stock options on the relationship between a firm's alliance experience and licensing. As the CEO is central to the development and utilization of firm capabilities (Cao, Maruping, & Takeuchi, 2006), the role of executive incentives is also an important—albeit under-researched—topic for scholars interested in capabilities (Gedajlovic, Lubatkin, & Schulze, 2004; Teece, 2007; Zahra & Filatotchev, 2004).

Third, our findings inform behavioral agency-based research on the effects of equity incentives (e.g. Devers et al., 2008; Larraza-Kintana, Wiseman, & Gomez-Mejia, 2007) by highlighting the usefulness of a capabilities perspective in understanding the contrasting role of CEO stock ownership and CEO stock options in decision-making contexts.

From a practical perspective, as equity incentives are pervasive in technologically intensive sectors where licensing is a strategically important activity (Core & Guay, 2002; He & Wang, 2009), our findings should also be of interest to boards and policymakers interested in encouraging active participation in the technology market.

The remainder of our paper is organized as follows. In Section 2, we develop our hypotheses. In Section 3, we describe our research design. We present our results in Section 4. In Section 5, we discuss

² Following prior literature, we use alliance experience as a proxy for firm capabilities in our empirical work. Consistent with prior literature, our use of the term 'alliance experience' is synonymous with both 'networking experience' and 'formal cooperation experience'.

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