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Multilateral alliances and innovation output: The importance of equity and technological scope

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ABSTRACT

The formation of R&D alliances has become an increasingly popular way to achieve improved innovation outcomes. However, R&D alliances face high failure rates due to the dual nature, cooperation and competition, of what can be a very challenging inter-firm relationship, a problem that is compounded when an alliance involves more than two partners. As such, it is important to understand the mechanisms that encourage cooperation in multilateral alliances to help firms achieve desired innovation outcomes. In this study, we hypothesize two such mechanisms: equity governance structure and multi-technology scope. We test our hypotheses using panel data from the pharmaceutical industry spanning 15 years. Our results support the idea that equity governance and having a multiple technology scope are positively related to innovation outcomes in multilateral alliances.

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1. Introduction

Knowledge-based resources are important drivers of firm profits, as they can be leveraged to create new products and new markets for firms in their pursuit of sustainable competitive advantage (Grant, 1996). As knowledge-based employees become more mobile and knowledge becomes more difficult to govern, firms are increasingly looking outside their company walls for sources of knowledge. The formation of strategic R&D alliances has become an increasingly common trend, allowing firms to pool their knowledge to create joint innovation and joint profits (Gassmann, Enkel, & Chesbrough, 2010; Lai & Chang, 2010). Despite the promise of greater profits for firms, alliances, including R&D alliances, seldom live up to managers' expectations and have high failure rates (Walter, Kellermanns, & Lechner, 2012).

Multilateral R&D alliances, involving three or more partners, account for a significant portion of inter-firm R&D cooperation. In the strategy literature, multilateral alliances have been reported to account for anywhere from 27% to over 50% of all alliances (Gulati, 1995; Makino & Beamish, 1998), particularly in technology-intensive industries such as software, communications, and pharmaceuticals (Li, Boulding, & Staelin, 2010).

When firms form alliances, two opposing motivations pull firms to act in very different ways. On one hand, firms are motivated to cooperate with each other to realize the desired outcome of an alliance, while potentially shortening innovation development time and spreading R&D costs and risk among alliance partners (Mariti & Smiley, 1983). On the other hand, firms are incentivized to compete with each other in an alliance as they attempt to obtain a larger portion of the shared benefit (Chen, Lee, & Lay, 2009; Hamel, 1991; Lavie, Lechner, & Singh, 2007; Zeng & Chen, 2003), and engage in organizational learning races to enhance their capabilities for future endeavors (Adobor, 2005; Nielsen, 2005; Norman, 2004; Walter, Lechner, & Kellermanns, 2007). This knowledge sharing versus knowledge protection problem is even more pronounced when multiple partners are involved in the alliances (Li et al., 2010).

In this paper we address two research questions which arise based on the current state of the literature regarding multilateral R&D alliances. First, do firms generally benefit from participating in multilateral R&D alliances in terms of the creation of knowledge-based assets? Second, in light of the complexity of these alliances, what are the specific mechanisms associated with innovation output for firms involved in multilateral R&D alliances?

We investigate multilateral alliance outcomes using two theoretical frameworks — transaction cost economics and social exchange theory. Using these theories, we develop several hypotheses related to the overall effects and moderating conditions driving multilateral alliance success, measured as innovation output. In previous literature, equity governance and multiple technology scope have been posited to help

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firms transfer tacit knowledge in bilateral alliances (Kogut, 1988; Mowery, Oxley, & Silverman, 1996; Oxley & Sampson, 2004), but little work has been done tying these mechanisms to innovation output. Controlling for R&D expenditures and firm size, we find that both equity governance and the inclusion of multiple technologies are positively related to innovation output in multilateral R&D alliances.

Our study makes the following contribution to the existing R&D alliance literature. First, we address multilateral R&D alliances. This is an under-researched area considering the unique challenges they face due to the increased complexity of coordination among partners. Second, we also caution the simplistic idea that more partners would lead to more innovations due to increased knowledge sharing, as these partnerships become increasingly complex and difficult to manage as partners are added. Finally, we propose two alternative mechanisms, equity governance structure and multi-technological scope, that facilitate knowledge sharing to achieve desired innovation outcomes.

2. Theoretical background and hypotheses development

2.1. Knowledge as the key resource in R&D alliances

The major difference between R&D alliances and other types of inter-firm collaboration is that firms in R&D alliances are working together to achieve innovation and new product development goals. The major resources that firms pool together in this type of collaboration are thus knowledge and technology know-hows (Oxley & Sampson, 2004). Tacit knowledge is not appropriable because it cannot be directly transferred, but can only be indirectly transferred through its application to productive activities (Grant, 1996). For explicit knowledge, anyone who acquires it can resell it without losing it. Thus, unless the knowledge is protected by legal safeguards such as patents or copyrights, knowledge is not appropriable by means of market transactions (Grant, 1996).

Using knowledge as the primary resource for alliance activities brings unique difficulties in contracting. Contract-based alliance governance can result in high transaction costs, because contracts are often incomplete and fail to fully specify all possible actions of each party (Hemphill & Vonortas, 2003). Partners often increase the complexity of their contracts when high asset specificity is involved (Reuer & Arino, 2007). The circumstances around strategic alliances, especially R&D alliances where knowledge and technologies are the focal resources, often are conducive to high costs for writing a complete contract (Hemphill & Vonortas, 2003). In an alliance where the shared goal is to develop a new technology, incomplete contracting for property rights is almost inevitable as the contracted assets do not even exist at the time of contracting (Oxley, 1997; Perry, Sengupta, & Krapfel, 2004).

Both environmental uncertainty and behavioral uncertainty are also present in technology-based alliances. Environmental uncertainty, such as market turbulence, technology uncertainties due to the fluid stage of development, lack of dominant design, and ill-defined technological trajectories makes writing a complete contract almost impossible (Hemphill & Vonortas, 2003; Perry et al., 2004). When uncertainties are present, writing a complete contract that would incorporate all the possible courses of the future thus becomes difficult due to the bounded rationality of management (Rindfleisch & Heide, 1997).

One important behavioral assumption in transaction cost economics is opportunism. It assumes that given the opportunity, firms may seek to serve their own interest at their partners' cost (Rindfleisch & Heide, 1997; Williamson, 1993). The inability to fully specify knowledge, and how it will be used in the future by the partners in a contract, could pose severe risks for firms sharing knowledge with their partners. The knowledge-recipient firms in R&D alliances may use it in product areas that are beyond the scope of the collaboration. This would normally result in a loss for the firm who initially invented the knowledge as there is no way they can retrieve the knowledge back from the partners once knowledge is transferred.

2.2. Multilateral R&D alliances and innovation output

In the current information age, business survival largely depends on a firm's ability to promptly respond to the pace of technological development, changing customer demands, shorter product life cycles, and the need for cross-product and cross-brand integration, all while dealing with increasing capital equipment costs (Lavie et al., 2007; Sampson, 2007). Multilateral alliances are one way many firms deal with these uncertainties, mitigate risk, and create competitive advantage. The advantage of involving multiple partners in an R&D alliance is very straightforward. Due to resource heterogeneity across firms, R&D alliances with more than two partners provide its members with a potentially more diversified knowledge pool from which to draw. Since R&D alliances are aimed at developing innovation, this more diversified knowledge store is beneficial to collaboration if firms are willing to share their expertise. Innovations, particularly radical innovations, are mostly a result of pooling knowledge from different areas and successfully integrating them into new product and service offerings (Lee & Cavusgil, 2006; Sampson, 2007). As such, multilateral alliances offer the increased benefit of knowledge diversity in R&D activities which is beneficial for innovation purposes (Lavie et al., 2007).

However, the involvement of more than two partners in an R&D alliance agreement also makes full contracting even more challenging. With an incomplete contract that governs the sharing and application of knowledge across firm boundaries, firms in the alliance are more likely to be more protective of their proprietary technological know-hows. This is due to the fact that firms will expose their valuable technological assets to a more pronounced potential opportunism hazards (Li et al., 2010). Partners who possess technological know-how in an alliance have a hard time separating the knowledge they intend to share from the knowledge they don't intend to share. As such, it is difficult for firms to prevent alliance partners from applying the knowledge to market opportunities beyond the scope and market domain of the alliance. In addition, once the knowledge is transferred to another firm, the recipient may share it with third parties, potentially resulting in significant competitive loss to the original knowledge holder (Li et al., 2010).

Monitoring these kinds of opportunistic risks in multilateral R&D alliances is also more challenging than in bilateral alliances. In a bilateral R&D alliance, exchanges of information and knowledge entail direct reciprocity between partners. Each partner has the power to “punish” the other party for non-cooperative behaviors by choosing to be non-cooperative themselves (Li et al., 2010). In a multilateral R&D alliance, the direct monitoring of partners' contributions becomes more difficult, as the number of partners increases. When partners fail to cooperate, harm is normally diffused across several partners. Further, it becomes more difficult to identify any one partner's non-cooperative behavior, and more difficult for any single partner to unilaterally impose sanctions. In addition, punishing mechanisms are less likely to be successful as it is more difficult for any single firm to effectively shape group dynamics in a multilateral R&D alliance (Li et al., 2010).

To summarize, firms in a multilateral R&D alliance face greater risks of opportunism from partners, and contracts may be insufficient to govern such opportunistic behaviors. Multilateral alliances offer a double-edged sword to firms. On one hand firms can benefit from greater knowledge diversity and the more effective development of innovative market offerings. On the other hand, these gains can be offset by the opportunism of partners which results in less knowledge sharing, and/or loss of knowledge-based competitive advantage in the marketplace caused by unintended knowledge leakage.

As such, we hypothesize:

Hypothesis 1. A firm's participation in multilateral alliances will not have a significant effect on its innovation outcome.

To benefit from the involvement of multiple partners in an R&D alliance, governance mechanisms need to be established that foster