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The antecedents of new R&D collaborations with different partner types: On the dynamics of past R&D collaboration and innovative performance

René Belderbos ^{a, b, e}, Victor Gilsing ^{d, f}, Boris Lokshin ^b, Martin Carree ^{b, *},
Juan Fernández Sastre ^c

^a Faculty of Economics and Business, Department of Managerial Economics, Strategy and Innovation, KU Leuven, Belgium

^b School of Business and Economics, Department of Organisation and Strategy, Maastricht University, The Netherlands

^c Facultad Latinoamericana de Ciencias Sociales, Ecuador

^d ACED, Department of Management, University of Antwerp, Belgium

^e UNU-MERIT, The Netherlands

^f Free University Amsterdam, The Netherlands

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ABSTRACT

We examine firms' propensity to adapt their R&D collaboration portfolio by establishing new types of R&D collaboration with different kinds of partners (suppliers, customers, competitors and universities & public research institutions). We argue that existing R&D collaboration with one of the two value chain partners (suppliers or customers) is associated with the formation of new R&D collaboration with the other value chain partner to ensure temporal alignment in innovation within the value chain. In contrast, issues related to governance and unintended knowledge spillovers suggest that 'horizontal' R&D collaboration with competitors only spurs R&D collaboration with other partner types if such competitor R&D collaboration has been discontinued earlier ('delayed temporal alignment'). We posit that persistent prior R&D collaboration with institutional partners is an antecedent to the establishment of new R&D collaboration with industrial partners, and that discontinuation of a particular type of R&D collaboration is likely to lead to a restart of such R&D collaborative effort. Strong prior innovative performance is expected to increase the probability that firms establish R&D collaborations with new partner types, except for R&D collaboration with competitors, since the most innovative firms may fear leakage of proprietary knowledge to rivals. We find broad support for these predictions in a large panel of Spanish innovating firms (2004–2011). Our findings highlight that it is not just the configuration of R&D collaborations with existing partner types that predicts tie formation with new partner types, but also the intertemporal pattern of prior R&D collaboration and managerial discretion provided by past innovation success.

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* Corresponding author. School of Business and Economics, Maastricht University, The Netherlands
E-mail address: m.carree@maastrichtuniversity.nl (M. Carree).

Introduction

For firms in technology-intensive industries, external R&D collaboration for innovation has become a pervasive phenomenon. R&D collaboration for innovation offers a number of substantive benefits, such as the possibility for mutual knowledge sharing, combining complementary skills with partners, scale economies in research, as well as the sharing of costs and risks (Ahuja, 2000a). A large body of literature has shown that R&D collaboration can contribute to different performance outcomes such as innovation (e.g. Rothaermel and Deeds, 2004; Gilsing et al., 2008; Srivastava and Gnyawali, 2011; Belderbos et al., 2015), patenting (Gittelman and Kogut, 2003), organizational growth or failure (e.g. Mitsuhashi and Greve, 2009) and manufacturing procurement efficiency (Gulati and Sytch, 2007). A related literature has considered alliance portfolios – as the aggregate of all alliances of a focal firm – with a particular interest in portfolio diversity and its performance consequences (Rothaermel and Deeds, 2004; Faems et al., 2005; Heimeriks et al., 2009; Parmigiani and Rivera-Santos, 2011; Wuys et al., 2012; Lahiri and Narayanan, 2013; Jiang et al., 2010; Hashai et al., 2015; Jacob et al., 2013; Hagedoorn et al. 2017). This is in line with the dominant, yet static, view in most of the R&D collaboration literature that emphasizes the stable value flowing from interfirm networks and R&D collaboration portfolios (Wassmer, 2010; Tasselli et al., 2015; Jiang et al., 2010; Hashai et al., 2015).

However, as several success stories on R&D collaboration for innovation have demonstrated, such as Procter and Gamble's connect and develop program, IBM's emerging business areas or Lego's open innovation strategy, companies regularly adapt their portfolio of R&D collaborations in order to secure future competitiveness. This resonates with an emerging view in the literature that to ensure that R&D collaboration for innovation remains beneficial, firms need to adapt and renew their portfolio of partnerships on an ongoing basis (Powell et al., 1996; Ahuja et al., 2012). In particular, in technology-intensive environments, rapid technological change may render existing knowledge and skills obsolete, implying that current R&D collaborations lose their value, and demanding adaptation of the R&D collaboration portfolio (Koka et al., 2006).

Despite its importance, we still have only a limited understanding of how firms adapt their R&D collaboration portfolio, and what the drivers of such adaptations are. The more widely studied outcome effects of a firms' R&D collaboration portfolios remain only partially understood if we lack an appreciation of how portfolios are created and get adapted before giving rise to such outcomes in the first place (Ahuja et al., 2012; Tatarinowitz et al., 2016). The few studies on this topic have been theoretical (e.g. Koza and Lewin, 1998; Koka et al., 2006) or qualitative in nature (e.g. Lavie and Singh, 2011), and share a common emphasis on studying the evolution of an alliance portfolio under influence of, or in response to, contingencies and/or changes in a firm's industry environment. While these studies have yielded some insightful characterizations of how R&D collaboration portfolios evolve, they have examined the evolution of alliance portfolios by emphasizing how exogenous changes in the environment affect portfolio change.

In this paper, we aim to develop an agency-oriented understanding by considering the decisions to enter into new R&D collaborations and therewith adapt the R&D collaboration portfolio as a function of dynamic patterns of prior collaborations. Our focus is on a firm's portfolio of R&D collaboration *types*, where we distinguish between customers and suppliers (vertical R&D collaboration), competitors (horizontal R&D collaboration) and research institutions and universities (institutional R&D collaboration).¹ We take a strategic perspective and move beyond the level of R&D collaborations with individual partner firms, to R&D collaboration decisions and portfolios at the level of collaboration types.

Conceptualizing R&D portfolios through the lens of different partner types is relevant, as R&D collaboration with different partner types gives rise to a potential for recombination that may spur the creation of innovations (Tidd et al., 2015; Faems et al., 2005; Duysters and Lokshin, 2011; Nieto and Santamaria, 2007; Belderbos et al., 2004a). To realize this recombination potential, a firm's standing R&D collaborations may imply a sequence of R&D collaborative activities where R&D collaboration with one partner type, e.g. a university or a competitor, may lead to subsequent establishment of R&D collaborations with other partner types, e.g. suppliers or customers. Hence, the adaptation of a firm's portfolio of R&D collaborations with different partner types is likely to have antecedents in prior patterns of R&D collaboration. This calls for a dynamic and integrative approach to analyze the establishment of new R&D collaboration types and therewith the adaptation of R&D portfolios – the approach that we take in this study.

Studying decisions to collaborate and adapt R&D portfolios in an integrated manner is important as there is, as we will argue and show, strong heterogeneity in how existing collaborations with different partner types influence the formation of R&D collaboration with new partner types. We argue that distinct patterns of relationships between the dynamics of prior R&D collaboration (recently established, persistently pursued, or recently discontinued prior R&D collaboration) and the establishment of R&D collaboration with new partner types are likely to occur. This is because recombinatory search and accomplishing complementarity in R&D collaboration requires temporal alignment of R&D collaborations. Hence, standing R&D collaborations with a specific partner type predict subsequent R&D collaboration formation with another type, or the re-establishment of R&D collaboration with the same partner type. We posit that salient differences can be expected in this regard between institutional (universities & research institutes), vertical (buyer and supplier), and horizontal (competitor) R&D collaboration. More specifically, we expect important benefits of inter-temporal alignment in R&D collaboration with the

¹ We note that R&D collaboration with universities & public research institutes has also been referred to as 'upstream' R&D collaboration (Bercovitz and Feldman, 2007; Rothaermel and Deeds, 2004). In the current study we reserve the term 'upstream' for firms that are situated upstream from the focal firm in the value chain: suppliers.

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