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Behavioral antecedents of firm's ego-network competitiveness: The case of the global pharmaceuticals

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ABSTRACT

Intra-industry alliance networks provide a firm with both collaborative opportunities and competitive challenges. When forming alliance networks within a particular industry, firms need to consider to which extent they compete in the same markets with their alliance network partners, who are also their industry peers. However, previous literature has not exhaustively addressed the antecedents of a firm's competitive behavior with their alliance network peers – i.e., a phenomenon we label ego-network competitiveness. This study draws on extensive panel data from the top global pharmaceuticals to examine this question. Combining behavioral and network perspectives, we test two competing hypotheses on how ego-network competitiveness varies relative to performance feedback and whether structural prominence moderates this relationship. Our results show that performance above and below aspirations increases ego-network competitiveness through high-intensity responses (i.e., problemistic and slack search). We also find that performance above aspirations increases ego-network competitiveness for firms with high structural prominence.

1. Introduction

Interfirm alliances are a contested and dynamic relational context involving various tensions between alliance partners. Among different potential tensions, the co-existence and interplay of cooperation-competition have been identified consistently among the most prominent ones (Das and Teng, 2000; Inkpen, 2000; de Rond and Bouchikhi, 2004; Hoffmann et al., 2018). Whereas the cooperation dimension of this tension has been discussed at length, more research is needed on the other dimension– i.e., the competitive behavior in alliances and specifically on alliances between actors within the same global industry (in our study's case, pharmaceuticals). Intra-industry alliances are a context where partnering firms are potential competitors, providing a feasible empirical context to study why and how competitive behavior emerges in alliances. Several literature streams have discussed this phenomenon, including strategic alliances (Silverman and Baum, 2002; Gimeno, 2004; Ang, 2008), coopetition (Ritala and Hurmelinna-Laukkanen, 2009), innovation (Corbo et al., 2022), venture capital (ter Wal et al., 2016), and ecosystems (Shipilov and Gawer, 2020). Alliance partners whose markets overlap operate under similar infrastructure and assumptions and possess knowledge of customer needs and technologies (Ang, 2008; Ritala and Hurmelinna-Laukkanen, 2009; Yan et al., 2020). This overlap makes such alliances more accessible and beneficial (Inkpen, 2000) but also involves the potential for competitive tensions (Bouncken and Fredrich, 2016).

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While individual alliances are typically dyadic, firms are often embedded in networks of multiple alliances (or alliance portfolios). Recognizing such embeddedness is essential since individual alliance outcomes (e.g., performance) and change (e.g., formation, termination) are affected by the structure and inter-alliance dynamics in alliance portfolios (Wassmer, 2010). Furthermore, competitive behavior matters at the network level; research has shown that competitive intensity relative to alliance network partners affects firm innovation and market performance (e.g., Ritala, 2012; Park et al., 2014). Nevertheless, previous research does not fully explain the antecedents of this critical choice – i.e., *what drives competitive behavior in alliance networks*? Addressing this question would provide more understanding in the ongoing research (Sanou et al., 2016; Choi et al., 2022; Greven et al., 2022).

To move the field forward, we use 'ego-network competitiveness' as a focal firm-level construct to describe a firm's competitive behavior relative to its alliance network (or portfolio). In essence, ego-network competitiveness represents the intensity with which a firm competes within a network of interfirm relations (Chen, 2011; Upson et al., 2012; Withers et al., 2018). Ego-network competitiveness differs from a firm's competitive behavior in dyadic alliances, given that the number of alliances grows, altering the nature of competitive behavior when embeddedness in a network context is considered (Gnyawali and Madhavan, 2001; Wassmer, 2010; Sanou et al., 2016).

A helpful theoretical lens that can disentangle the antecedents of ego-network competitiveness is related to the behavioral perspective, anchored in the behavioral theory of the firm (Gavetti et al., 2012). The behavioral perspective focuses on referential performance (i.e., performance feedback) by conceptualizing how decision-makers rely on organizational aspirations to identify problems that demand attention (Joseph et al., 2016). The behavioral perspective helps explain search strategies and choices when a firm outperforms or underperforms relative to its industry peers (Joseph and Gaba, 2015; Tarakci et al., 2018; Kotiloglu et al., 2021). In particular, the behavioral perspective is considered an underutilized and plausible view of a firm's bounded rational decision-making, such as competitive behavior in alliance networks (Makarevich, 2018). In these instances, the behavioral perspective highlights that competitive behavior depends on whether firm performance is above or below aspirations. Performance feedback literature has provided several different types of predictions for responses to such feedback; in this study, we will test the two competing sets of hypotheses – with 'high-intensity' and 'low-intensity' behavioral responses for above-aspiration and below-aspiration performance.

Performance above aspirations may trigger either a high-intensity slack search response to strategically use the available slack (i.e., resources) resulting from firm outperformance (Greve, 2003) or a low-intensity inertia response to persist with existing strategies that contribute to successful performance and are considered more efficient than implanting new approaches (Kim et al., 2015). In this vein, we argue that performance above aspirations leads to either increased ego-network competitiveness due to slack search (Greve, 2003) or decreased ego-network competitiveness due to organizational inertia (Lampel and Jha, 2017).

In turn, 'performance below aspirations' may trigger either a high-intensity, 'problemistic search' response to address the underperformance (Posen et al., 2018) or a low-intensity, 'threat rigidity' response to safeguard core capabilities threatened by the underperformance (Osiyevskyy et al., 2017). In this vein, we posit that performance below aspirations leads to increased ego-network competitiveness due to problemistic search (Posen et al., 2018) or decreased ego-network competitiveness due to threat rigidity (Osiyevskyy et al., 2017).

While the behavioral perspective helps to understand the antecedents of ego-network competitiveness, we argue for a need to contextualize the setting in which these antecedents arise. In particular, the network perspective can complement the behavioral perspective, which helps to situate our explanations within a networked context of alliances. Indeed, research has shown that competitive opportunities and motivations are enabled and constrained by a firm's structural prominence in social networks (Sanou et al., 2016). The network perspective helps contextualize our main arguments on firm embeddedness in inter-organizational networks and the competitive behavior such embeddedness implies (Gilsing et al., 2008; Baum et al., 2012; Sanou et al., 2016). We use this perspective to argue that a prominent position in alliance networks provides a firm with an awareness mechanism to discern and monitor the consequences of ego-network competitiveness. Such awareness is explored via the concept of 'structural prominence,' defined as a firm's central position in the network that shapes its competitive behavior (Gnyawali and Madhavan, 2001; Sanou et al., 2016; Cui et al., 2018). Structurally prominent firms are more intense and varied in their competitive moves (Gnyawali et al., 2006; Sanou et al., 2016) and able to engage in multimarket contact with competitors (Chiao et al., 2015). Thus, we expect structural prominence to strengthen the positive relationship between performance feedback and ego-network competitiveness.

We test our assumptions using panel data from the top global pharmaceuticals between 1991 and 2012. Our findings show that a firm's ego-network competitiveness increases when performance is above and below aspirations. However, this increase is observed only for high-intensity responses such as slack search and problemistic search. Furthermore, our results show that structural prominence strengthens the positive relationship between performance above aspirations (slack search) and ego-network competitiveness.

Our study combines the behavioral and network perspectives to analyze antecedents of ego-network competitiveness. Both these perspectives draw from an understanding that a firm is an embedded actor in intra-industry settings such as alliance networks. In this vein, we contribute to both behavioral and network literature in two ways. First, we show how behavioral antecedents based on performance feedback drive ego-network competitiveness. By demonstrating such a relationship, we add knowledge to a poorly understood behavioral phenomenon related to performance feedback in collaboration and competition (Makarevich, 2018; Diwei Lv et al., 2021). Second, we add a network-related explanation to the behavioral antecedents of ego-network competitiveness by observing the moderating role of structural prominence. Structural prominence is a stabilizing factor against the termination of alliances with competitors (Polidoro et al., 2011). However, its contingency role in calibrating ego-network competitiveness has not received attention. Together, these two contributions increase our understanding of behavioral drivers that affect ego-network competitiveness.

2. Theory and hypotheses

2.1. Conceptualizing ego-network competitiveness

Competitive behavior between alliance partners has been analyzed under different theoretical lenses, such as organizational learning (Khanna et al., 1998; Inkpen, 2000; Bouncken et al., 2015; Bouncken and Fredrich, 2016; Cui et al., 2018; Prato and Stark, 2022), organizational ecology (Silverman and Baum, 2002), game theory (Ritala and Hurmelinna-Laukkanen, 2009) and resource-based view (Luo, 2007; Wong et al., 2007; Ang, 2008; Robert et al., 2009). Along these research streams, the focus has been mainly on the implications of firms' competitive behavior.

Conversely, research on the antecedents of competitive behavior, generally in dyadic alliances and particularly in alliance networks, has been less extensive (Choi et al., 2022; Greven et al., 2022). This limitation is noteworthy for several reasons. First, competitive behavior in alliance networks is not always easy to observe because competition between partners involves conflicting interests and tensions (Bengtsson and Kock, 2000; Ritala and Tidström, 2014), some of which might be latent or difficult to observe to outsiders. Second, partner opportunism adds to the difficulties of creating value from competitively oriented alliance networks, as this may outweigh the advantages of being embedded in such networks (Silverman and Baum, 2002; Das, 2004; Devece et al., 2019). Therefore, such alliance networks might be hard to come by in specific industries, and evidence of such networks is thus sparse. However, in global high-tech industries such as pharmaceuticals (as in this study) or information and communications technology (see, e.g., Basole et al., 2015)), firms may exhibit different levels of competitiveness. Finally, alliance networks with competitors are inherently dynamic because a firm's network position relative to its network competitors varies over time (Madhavan et al., 2004; Luo, 2007). Therefore, alliance networks involving insights into the changes in competitive aspects might be challenging to study with cross-sectional or limited data sets. In this vein, exploring why and how a firm calibrates its competitiveness becomes essential to understand the antecedents of competitive behavior in alliance networks.

In exploring the antecedents of a firm's competitive behavior in alliance networks, we utilize the concept of *ego-network competitiveness*. Following the classic conceptualization of graph theory and social network analysis (Wasserman and Faust, 1994), 'ego' denotes the focal firm (i.e., we focus on the firm-level analysis), and 'network' denotes all the direct ties (i.e., alliances) connected to the focal firm. The 'competitiveness' part of the concept denotes the level of competitive intensity in a firm's ego network, helping to explain competitive engagement in alliance networks (Cui et al., 2018). Previous literature shows that simultaneous collaboration and competition – or 'coopetition' – within dyadic alliances creates specific strategic benefits and opportunities that are different from alliances between non-competitors (Luo, 2007; Bengtsson and Kock, 2014; Bengtsson et al., 2016; Dorn et al., 2016; Hoffmann et al., 2018). However, the antecedents of firm competitive behavior in dyadic alliances differ from those in alliance networks. As the number of partners grows, so does a firm's alliance portfolio, and as a result, a firm's attention shifts from a dyadic context to a network of relationships with important implications for ego-network competitiveness (Bouncken and Fredrich, 2016; Ritala et al., 2017; Cui et al., 2018; Wang and Gao, 2021). The latter becomes a key consideration in intra-industry settings where alliance network partners represent current or potential competitors (in our case, top global pharmaceuticals). In this vein, ego-network competitiveness can

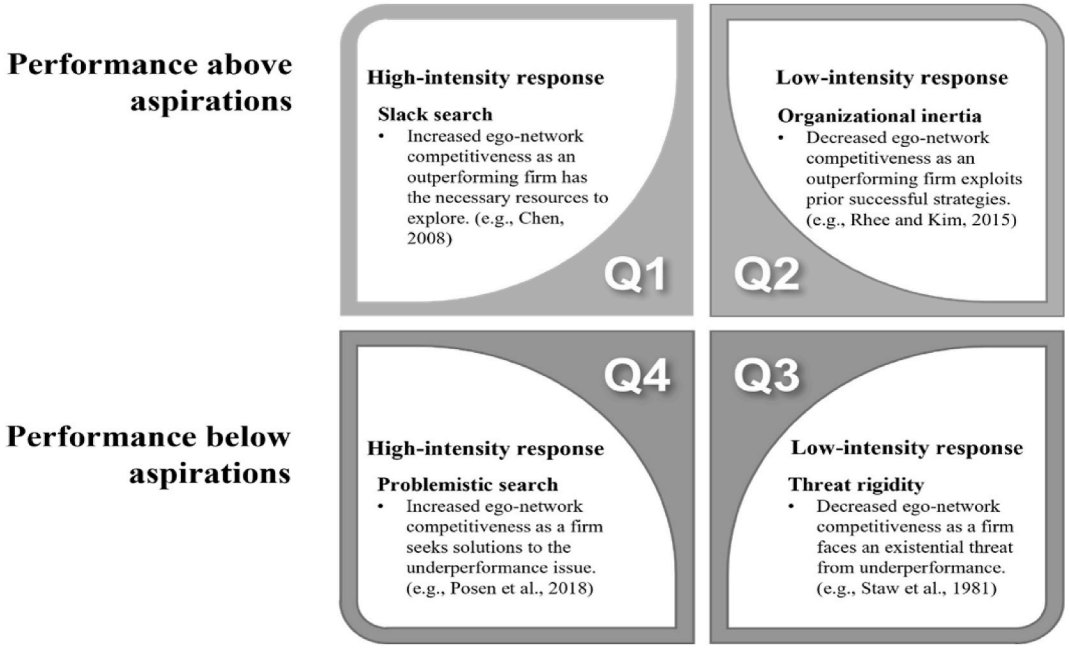

Fig. 1. A conceptual framework of ego-network competitive responses to performance feedback.

potentially facilitate and limit a firm's competitive opportunities in intra-industry alliance networks.

2.2. High-intensity vs. low-intensity responses to performance feedback

Previous research has considered firm behavior, including uncertainty, opportunism, and rent-seeking, as essential drivers of competitive behavior with alliance partners (Greenwood et al., 1997; Lado et al., 1997; Yami et al., 2010; Mas-Machuca, 2013; Park et al., 2014; Barber and Diestre, 2019). Some authors have examined potential drivers of competitive behavior using the concept of 'attention' a firm must allocate when collaborating with competitors (Ocasio, 1997; Yami et al., 2010). More akin to our work, Makarevich (2018) uses performance feedback to advance a behavioral perspective on cooperation among competitors in venture capital (i.e., VC) syndicates. However, the study by Makarevich focuses on the probability of achieving an IPO as an indicator of success in VC syndicates. It also presents different dynamics compared to intra-industry alliance engagements, especially regarding a firm's structural prominence as a function of alliance engagement (Shijaku et al., 2016; Kavusan and Frankort, 2019).

The above-mention research is linked to performance feedback literature, which elucidates that a firm possesses aspirations that define acceptable performance (Greve, 2008; Gavetti et al., 2012; Posen et al., 2018). According to the classic behavioral explanation, performance above or below aspirations lead to increased organizational change. However, another line of behavioral arguments suggests that there are reasons why a firm might refrain from increased organizational change when its performance trails or exceeds aspirations (Ref and Shapira, 2017). These competing explanations can be conceptualized as 'high-intensity' and 'low-intensity' responses to performance feedback (see Fig. 1).

In this conceptualization, 'high/low intensity' refers to the visibility of organizational change (Greve, 1998; Wezel and Saka-Helmhout, 2006). Specifically, the high-intensity response refers to firm behavior that incorporates a change for an alternative competitive stance in the market, reflecting a firm's attempt to change the status quo based on the performance feedback received. High-intensity responses can be visible for performance above and below aspirations. For performance above aspirations, denoting that a firm is outperforming relative to its goals, a high intensity, 'slack search' response is triggered, stimulated by a firm's underutilized resources (Levinthal and March 1981; Chen, 2008). For performance below aspirations, denoting that a firm is underperforming relative to its goals, a high-intensity, 'problemistic search' response is triggered to identify a solution to the underperformance (see Q4, Fig. 1) (Argote and Greve, 2007; Ocasio et al., 2017; Posen et al., 2018).

Performance feedback literature also suggests a low-intensity response depending on performance above or below aspirations. For performance above aspirations, extant research highlights an 'inertia' response based on exploiting successful strategies and avoiding risky organizational change (see Q2, Fig. 1) (Rhee and Kim, 2015). A low-intensity, 'threat rigidity' response is witnessed for performance below aspirations when a firm tries to safeguard its core activities in situations of significant underperformance (see Q3, Fig. 1) (Staw et al., 1981; Chattopadhyay et al., 2001).

Since collaborating with current or potential competitors and industry peers involves high-performance feedback (Diwei Lv et al., 2021), we expect such feedback to be a key driver in a firm's decision to calibrate its competitiveness in alliance networks among industry peers. The following sections provide in-depth arguments and competing hypotheses about how performance feedback affects ego-network competitiveness.

2.3. Ego-network competitiveness as a response to performance above aspirations

Performance feedback research has shown that performance above aspirations enables two types of behavioral outcomes, depending on the response intensity: a) a high-intensity, slack search response by experimenting, changing, or identifying new opportunities (Bromiley, 1991; Nohria and Gulati, 1996) or b) a low-intensity, inertia response relying on the exploitation of an existing advantageous strategy, especially in situations where environments are uncertain (Stieglitz et al., 2016).

High-intensity slack search (see Quadrant 1, Fig. 1) stems from the idea that success provides firm access to additional resources and instills confidence in its managerial abilities (Baum and Dahlin, 2007). For several reasons, a firm may pursue a slack search when it experiences performance above aspirations. In a networked environment, firms can access resources from multiple partners. Such capability enhances ego-network competitiveness concerning network partners through, e.g., increases in geographic proximity (Madhavan et al., 2004). Furthermore, slack search is known to provide the ability for a firm to be closer to its intra-industry peers (Martínez-Noya and García-Canal, 2021). Thus, we expect that a firm performing above aspirations will pursue a slack search response – particularly a type of "proximity-seeking" behavior – increasing ego-network competitiveness relative to its alliance network partners (Runge et al., 2022).

Conversely, low-intensity inertia (see Quadrant 2, Fig. 1) has been defined as a continuous commitment to existing markets (Baum et al., 2005; Lampel and Jha, 2017). In this sense, inertia is considered a conservative organizational behavior that stems from current performance being classified as a success (Greve, 1998). Previous literature has shown that a firm performing above aspirations is less likely to change its strategy if its aspirations are based on rival referents (Lampel and Jha, 2017). However, since increasing competitiveness heightens the risk of costly retaliatory moves by competitors (Chen and Miller, 1994), a firm may be reluctant to engage in high-risk actions (e.g., increases in market commonality), instead opting for mutual forbearance (Markman et al., 2009; Ryu et al., 2020). Such behavior is relevant, especially if competitors are a firm's alliance partners, as inertia affects partner selection strategies (Li and Rowley, 2002). Thus, we expect performance above aspirations to decrease ego-network competitiveness via an inertia response. Overall, reflecting the arguments above, based on both high and low-intensity behavioral responses to performance above aspirations, we posit the following competing hypotheses.

Hypothesis 1a. (H1a): Performance above aspirations leads to increased ego-network competitiveness via a high-intensity slack search response.

Hypothesis 1b. (H1b): Performance above aspirations leads to decreased ego-network competitiveness via a low-intensity inertia response.

2.4. Ego-network competitiveness as a response to performance below aspirations

Performance feedback literature has given extensive attention to behavioral responses triggered when a firm performs below its aspirations (see Quadrant 3, Fig. 1), leading to a search process to find solutions and seek alternatives for the behavior that had led to the underperformance (Greve, 2003; Gaba and Joseph, 2013).

Whereas studies on problemistic search are numerous (for a review, see (Posen et al., 2018)), research on problemistic search as an antecedent to a firm's competitive behavior is much more limited. In general, research on this issue agrees that performance below aspirations does lead to organizational change (Ferrier et al., 2002; Boyle and Shapira, 2012; Kacperczyk et al., 2015). This is because performing below aspirations increases organizational risk-taking, and underperformance may be perceived as a sign of a firm's competitive disadvantage relative to its network peers. Underperformance becomes an even stronger risk-taking driver due to the sense of urgency perceived by a firm when underperforming relative to its alliance network competitors. Such haste is driven by stakeholder pressure as managers are expected to perform on par with a firm's competitive peers (Rhee and Kim, 2015). In alliance networks, such perception is magnified as the information travels faster between networked actors (Gulati and Gargiulo, 1999; Koka and Prescott, 2002). Consequently, we argue that performance below aspirations affects a firm's ego-network competitiveness. This behavioral response will be either high-intensity (i.e., problemistic search) or low-intensity (i.e., threat rigidity).

In a high-intensity, problemistic search response, a firm's ego-network competitiveness will increase for two reasons. First, firms are known to pursue aspiration-driven goals related to market share gains (Greve, 1998; Ferrier et al., 1999; Baum et al., 2005; Shipilov and Li, 2008). In alliance networks, a firm performing below aspirations will increase its actions to match the market presence of its better-performing competitors. Second, problemistic search enables a risk-taking strategy such as new market entries (Ref and Shapira, 2017; Duke et al., 2021). This behavior leads to more common markets with alliance network peers, which translates to increased network competitiveness.

A low-intensity, threat rigidity response represents the other theoretical explanation of underperformance behavior (see Quadrant 4, Fig. 1) (Greve, 2011). Conceptually, threat rigidity represents a behavioral response to underperformance that leads to restricted information processing and centralized control and makes organizational change less likely (Staw et al., 1981; Greve, 2011). The underlining idea is that an underperforming firm may become rigid and rely on experienced responses whenever faced with threats to its survival (e.g., financial distress) (Hu et al., 2011; Kuusela et al., 2017). This 'survival' mode leads to risk-aversion conduct opposite to the risk propensity observed in the problemistic search scenario. In practice, this means that a firm will be less likely to initiate risky actions and will try to shield itself as much as possible through strategic decisions such as collaboration reduction with potential partners (Iyer and Miller, 2008). Such 'shielding' could lead to firm disengagement with competitive intra-industry peers since market commonality leads to a higher probability of retaliatory action from rivals (Gimeno, 2004). In alliance networks, this probability is amplified because network embeddedness reinforces a firm's competitive efforts with potential partners (Shipilov, 2009). Overall, reflecting the arguments above, based on both high and low-intensity behavioral responses to the performance below aspirations, we posit the following hypotheses.

Hypothesis 2a. (H2a): Performance below aspirations leads to increased ego-network competitiveness via a high-intensity problemistic search response.

Hypothesis 2b. (H2b): Performance below aspirations leads to decreased ego-network competitiveness via a low-intensity threat rigidity response.

2.5. The moderating role of structural prominence

Intra-industry settings, such as airlines, banking, and pharmaceuticals, are prime examples of contexts with high risks and development costs, driving firms towards alliance engagement, including current and potential competitors. Examining the alliance network is essential to understanding a firm's competitiveness in such settings. In this regard, however, previous literature has focused mainly on unique collaborations, such as strategic alliances among competitors, especially concerning the drivers of competition and cooperation in these relationships (Klein et al., 2020; Greven et al., 2022). Even so, previous literature has recognized the importance of alliance networks as a collaborative context among competitors (for a review, see (Bengtsson and Raza-Ullah, 2016)). Alliance networks matter since focusing on single alliances does not represent a firm's competitive opportunities in intra-industry settings (Luo, 2007). Instead, these opportunities are driven by the alliance networks in which a firm is embedded (Wassmer, 2010; Kavusan and Frankort, 2019) as they constrain and facilitate opportunities to calibrate a firm's ego-network competitiveness.

While our main hypotheses outlined thus far provide a set of competing explanations, a firm's decision to calibrate its competitive stance versus its alliance network partners does not occur in isolation from the network itself. Scholars focused on structural embeddedness claim that a firm's network position is a necessary contingency factor that affects competitive strategy decisions in the alliance network (Gnyawali and Madhavan, 2001). Therefore, we argue that ego-network competitiveness is not simply a function of performance relative to aspirations. Instead, this relationship is contingent upon another relevant factor: the central positioning of a

firm in the alliance network. Thus, when deciding about ego-network competitiveness, a firm must consider its structural positioning, as networks provide firms with market power relative to their partners (Gnyawali et al., 2006; Polidoro et al., 2011).

Alliance literature has consistently highlighted the relevance of 'power' based on structural prominence (Iurkov and Benito, 2018; Kang and Zaheer, 2018). 'Structural prominence' (operationally measured as degree centrality) in alliance networks increases a firm's resource flows, thus, enhancing its market power relative to competitors. Conversely, less structurally prominent firms (i.e., low degree centrality) in a network will experience lower relative bargaining and market power (Shipilov, 2009). In contrast, performance feedback drives ego-network competitiveness relative to its alliance partners (Makarevich, 2018); in the following section, we argue that high structural prominence moderates this effect in alliance networks (Sanou et al., 2016).

2.6. Interaction between performance above aspirations and structural prominence

We argue that the impact of the performance below aspirations on network competitiveness is contingent upon the extent to which a firm is embedded in alliance networks (i.e., high structural prominence), as this reflects a position of prestige (Kirkham et al., 1991; Shijaku et al., 2020). Therefore, a highly prominent firm will likely take a more competitive stance (Sanou et al., 2016). Several reasons support our argument. First, structural prominence guarantees increased volume and diversity of potentially risky competitive actions (Gnyawali et al., 2006), thus making network competitiveness easier. Second, structural prominence (Gulati and Gargiulo, 1999) provides an understanding of the opportunities and terms of cooperation via improved information and asset flow (Godart et al., 2014), which helps a firm's decision-making concerning multimarket contact strategy (Shipilov, 2009). Third, structural prominence provides a firm with market power (van Reeven and Pennings, 2016) through heightened bargaining power and control (Powell et al., 1996; Shipilov, 2009), lowering adverse effects related to network competitiveness. These factors enable a firm to learn about competitive opportunities in alliance networks and develop capabilities to enact them (Gnyawali et al., 2006). Conversely, a firm with low structural prominence is likely to make less aggressive changes in ego-network competitiveness, despite its potential outperformance as it lacks the necessary information to understand potential retaliatory tactics that competitors may use as a competitive response. This is because low prominence affects the ability of a firm to process information and combine knowledge (Wang et al., 2013). Further, low prominence may lead to decreased chances of engaging with network peers (Ho and Pollack, 2014). Therefore, we expect that performance above aspirations increases ego-network competitiveness for structurally prominent firms regardless of the response (i.e., high or low intensity). Formally stated.

Hypothesis 3. (H3): For firms with high structural prominence, performance above aspirations leads to increased ego-network competitiveness.

2.7. Interaction between performance below aspirations and structural prominence

The moderating effect of structural prominence extends to the underperformance scenario as well. Again, we argue that high structural prominence strengthens a firm's ability to make competitive moves. High structural prominence gives firms better access to resources and knowledge regarding alliance linkages and shared ties with partners and competitors (Sanou et al., 2016; Granovetter and Swedberg, 2018). This positioning improves the ability to conduct competitive moves without potential retaliation (Dittrich et al., 2007). Performance below aspirations is likely positively associated with ego-network competitiveness for structurally prominent firms. This effect is because underperforming firms are more inclined to enter new markets (Greve, 1998; Baum et al., 2005; Shipilov and Li, 2008) and move away from those that underperform (Greve, 2003; Ref and Shapira, 2017). Structural prominence has a role in these mechanisms as it enables a firm to observe its competitors more accurately, given that alliance networks provide rich access to information (Gulati, 1995) and, therefore, promptly enact any competitor's move (Chen et al., 2007; Upson et al., 2012). Conversely, a firm with lower structural prominence experiences less bargaining power and negotiation possibilities, given its lower multimarket contact and lower access to valuable resources and knowledge (Shipilov, 2009). Consequently, we expect that for structurally prominent firms, performance below aspirations increases ego-network competitiveness regardless of the search response (i.e., high or low intensity). Formally stated.

Hypothesis 4. (H4): For firms with high structural prominence, performance below aspirations leads to increased ego-network competitiveness.

3. Methods

The global pharmaceutical industry is chosen to test our hypotheses due to the intensive interplay between collaboration and competition and the fact that alliance engagements are a common practice in this industry. Specifically, based on sales output, we use the Pharma Intelligence database to collect 11,855 strategic alliances between 56 top global pharma firms from 1991 to 2012. Such a global perspective is reflected by the presence in the dataset of firms from different regions such as Europe (e.g., GlaxoSmithKline (United Kingdom), Bayer (Germany), Grifols (Spain)), Middle East (e.g., Teva Pharmaceutical Industries (Israel), America (e.g., Pfizer (United States)), Asia (e.g., Ranbaxy Laboratories (India), Chugai Pharmaceutical (Japan)), and Australia (e.g., CSL). We use Compustat and Datastream databases supplied by firms' annual report information for financial information.

To build the collaborative and competitive networks, we model each year over the sample period as a separate network, formally characterized as a symmetric N x N 'weight' matrix, whose generic entry wij = wji >0 measures the interaction intensity between any two competing actors (zero if no link exists between actor i and j). Consequently, using R software, we build 22 symmetric 56 x 56

matrices to capture the structural prominence of all firms for the given period. To capture the dynamic nature of networks (Ahuja et al., 2012) and provided that the traditional lifecycle of an alliance is usually five years, as previous literature suggests (Zaheer and Soda, 2009), we use a five-year moving window period (e.g., 1991-95, 1992-96). It is worth mentioning that in these networks, all firms have interacted with each other through alliances with varying engagement frequencies.

Our analysis is firm-level-based, where performance feedback and structural prominence are examined regarding their effect on the firm's ego-network competitiveness. In operational terms, this allows us to understand the antecedents of a firm's general strategic posture concerning its market commonality (please see the description of the dependent variable below) relative to alliance network partners.

3.1. Dependent variable

Market commonality has been used to understand the nature of ego-network competitiveness (Fuentelsaz and Gómez, 2006; Park et al., 2014; Withers et al., 2018). Therefore, in line with prior literature, we use market commonality as a proxy for our measure of *ego-network competitiveness* (Chen, 2011; Upson et al., 2012), defined as the highest degree of presence that networked competitors manifest in markets in which they overlap. We calculate this variable by creating a matrix of market commonalities between each firm in the alliance network using the following equation:

$$M_{ab} = \sum [(P_{ai} / P_a) \times (P_{bi} / P_i)]$$

where P_{ai} = sales by firm a in product-market i,

P_a = total sales by firm a,
P_{bi} = sales by firm b in product-market i,
P_i = total sales of all firms in product-market i, and
i all product-markets in which firms a and b compete.

To obtain a firm-level measure of ego-network competitiveness, we average the market commonality measure (M_{ab}) across the total sample of the firms present in the alliance networks. A higher value in this measure means that a firm's ego-network competitiveness is, on average higher over the whole portfolio of its alliance network partners.

3.2. Independent variables

As seen in prior performance feedback literature (Bromiley, 1991; Washburn and Bromiley, 2012; Bromiley and Harris, 2014; Lu and Wong, 2019), to measure performance feedback, we focus on industry-based aspirations defined according to the following equation: $(A_{it} = 1.05^{*}SelfPerformance_{i\ t-t})$. The performance target is assumed to be (1.05* self) if a firm's performance is above the industry (i.e., sample size) average; otherwise, overcoming the industry average is the salient performance target. Finally, we compute performance relative to aspirations as the difference between a firm's current performance and its aspirations. This operation is done separately for firms that *perform above aspirations* (PAA) and for firms that *perform below aspirations* (PBA) using both Return on Assets (ROA) and Return to Equity (ROE) to measure self-performance for the lagged year. When interpreting the results, it is essential to note that PAA has positive and zero values, whereas PBA has negative and zero values. Thus, negative values for performance below aspirations require a reverse interpretation of the coefficient direction.

It is essential to mention that by aspirations, in our study, we refer to social aspirations (Gaba and Bhattacharya, 2012). Two reasons point to this choice. First, knowing that a firm constantly benchmarks its performance with network peers (Makarevich, 2018), social aspirations are likely more relevant than historical aspirations, contextualized by a firm's past performance (Shipilov et al., 2011; Rhee and Kim, 2015). Second, social aspirations constitute the baseline performance level because managers focus on a firm's performance relative to a reference group (Kim et al., 2015).

Structural prominence is a network measure defined as the number of ties (i.e., alliances) for each actor (i.e., the number of firms tied to a firm), modified to consider the sum of weights in each tie (Fahnestock, 1975; Opsahl et al., 2010). In this sense, structural prominence is similar to degree centrality (Hu et al., 2021). The weighted scores of the variable are obtained via UCINET 6 software commonly used in alliance network studies (e.g. (Zhao et al., 2021),).

3.3. Control variables

Our controls include *absorptive capacity,* defined as the ratio of R&D expenses to sales, as this measure is typically associated with problem and slack search (Greve, 2003; O'Brien and David, 2014). We also control for two types of financial slack since, according to performance feedback research (O'Brien and David, 2014; Kuusela et al., 2017), slack (i.e., resources) highly depends on whether a firm's performance is above or below aspirations. Specifically, suppose a firm is performing above aspirations. In that case, it will have more short-term slack at its disposal, while if its performance is below aspirations, such slack may be lacking because a firm will be using resources to improve its performance. Thus, we control for the *current ratio*, measured as the ratio of current assets to current liabilities, and *potential slack*, measured as the ratio of total long-term debt to total assets. We also control for *product scope* measured as the ratio of pharmaceutical market sales to total sales due to its effect on network competitiveness (Markman et al., 2009), and firm *age*

Table 1
Descriptive statistics and correlations.

Variable	Obs.	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10
1. Ego-network competitiveness	1067	0.401	0.136	1									
2. PAA	1021	0.052	0.348	0.008	1								
3. PBA	1021	−0.095	0.360	−0.004	0.042	1							
4. Structural prominence	966	0.125	0.097	0.007	−0.139***	0.030	1						
5. Absorptive capacity	1076	0.260	0.782	0.089*	0.003	−0.054	−0.082	1					
6. Current ratio	1024	2.971	2.897	0.024	−0.000	0.038	−0.169***	0.328***	1				
7. Potential slack	853	0.433	0.601	−0.052	0.011	−0.033	−0.117**	−0.008	0.011	1			
8. Size	1077	8.647	1.746	0.017	−0.049	0.114**	0.358***	−0.373***	−0.465***	−0.197***	1		
9. Scope	1006	0.885	0.254	−0.202***	0.090*	−0.020	0.054	0.120**	0.280***	0.074	−0.388***	1	
10. Age	1161	76.160	56.316	0.058	−0.038	0.039	0.052	−0.200***	−0.323***	−0.061	0.551***	−0.482***	1

Note: *p < 0.05, **p < 0.01, ***p < 0.001.

Table 2
Determinants of ego-network competitiveness.

Model	Controls (model 1)		Main effects (model 2–4)						Interactions (model 5–7)					
	1	*p-value*	2	*p-value*	3	*p-value*	4	*p-value*	5	*p-value*	6	*p-value*	7	*p-value*
Current ratio	−0.002	(0.149)	0.002	(0.160)	0.002	(0.117)	0.003	(0.119)	0.002	(0.152)	0.003	(0.125)	0.003	(0.112)
Potential slack	−0.003	(0.593)	−0.005	(0.397)	−0.005	(0.422)	−0.005	(0.395)	−0.005	(0.378)	−0.005	(0.430)	−0.006	(0.381)
Size	0.007	(0.036)	0.002	(0.516)	0.004	(0.196)	0.004	(0.176)	0.002	(0.508)	0.004	(0.189)	0.004	(0.156)
Scope	0.220	(0.000)	0.214	(0.000)	0.214	(0.000)	0.214	(0.000)	0.213	(0.000)	0.214	(0.000)	0.214	(0.000)
Age	−0.004	(0.011)	−0.006	(0.002)	−0.006	(0.001)	−0.006	(0.001)	−0.006	(0.002)	−0.006	(0.001)	−0.006	(0.001)
Absorptive capacity	0.009	(0.008)	0.010	(0.002)	0.011	(0.001)	0.010	(0.002)	0.010	(0.002)	0.011	(0.002)	0.010	(0.002)
Structural prominence			0.042	(0.727)	0.043	(0.723)	0.042	(0.733)	0.043	(0.719)	0.042	(0.729)	0.042	(0.727)
PAA (*H1a* and *H1b*)			−0.002	(0.451)			−0.001	(0.741)	0.016	(0.083)			0.019	(0.053)
PBA (*H2a* and *H2b*)					−0.012	(0.010)	−0.012	(0.014)			−0.007	(0.048)	−0.011	(0.017)
PAA x Structural prominence (*H3*)									0.163	(0.047)			0.183	(0.027)
PBA x Structural prominence (*H4*)											0.085	(0.361)	0.034	(0.725)
Intercept	0.533	(0.001)	0.702	(0.000)	0.697	(0.000)	0.689	(0.000)	0.708	(0.000)	0.697	(0.000)	0.704	(0.000)
Within	0.083		0.124		0.123		0.124		0.125		0.124		0.125	
N	635		534		534		534		534		534		534	

operationalized as the foundation year minus the year considered in the 1991–2012 panel analysis. We do so since, as firm performance declines with age, this will likely affect its aspirations (Loderer and Waelchli, 2011). Finally, we control for *size*, operationalized as the logarithm of the firm's total assets, a measure commonly used in performance feedback analysis (e.g. (Diwei Lv et al., 2021),).

4. Results

Our chosen fixed-effect model with nonparametric standard errors is preferred for several reasons. First, we detected cross-sectional dependence in our data via the Pesaran test (Pesaran, 2015). Second, the data exhibited serial correlation via the Cumby-Huizinga test, which could affect the efficiency of the panel OLS estimators. Third, the Hausman test on random effects favored using fixed effects (Everts, 2003). Estimates did not show multicollinearity problems, and all tests were run with Stata 17 software. Additionally, in line with performance feedback literature (Gaba and Joseph, 2013), all independent variables lagged by one year. Table 1 displays the descriptive statistics and correlations for our chosen variables.

Table 2 shows estimates of a fixed-effect regression model with Driscoll & Kraay standard errors (Driscoll and Kraay, 1998). Hypothesis 1a, regarding the positive effect of the performance above aspirations (PAA) on ego-network competitiveness via a slack search response, is supported (Model 7, b = 0.019, p = 0.053), meaning that Hypothesis 1b, regarding the negative effect of the low-intensity inertia response, is rejected. Conversely, Hypothesis 2a, regarding the positive effect of performance below aspirations (PBA) via a problemistic search response, is supported (Model 7, b = −0.011, p = 0.017), meaning that Hypothesis 2b, regarding the negative effect of the low-intensity threat rigidity response, is rejected.

Models 5–7 incorporate the two-way interactions between PAA, PBA, and structural prominence, whose coefficients are predicted by Hypotheses 3 and 4. Hypothesis 3 is supported as structural prominence increases the effect of PAA on market commonality (Model 7, b = 0.163, p = 0.047). Conversely, Hypothesis 4, indicating the moderating effect of structural prominence on the relationship between PBA and network competitiveness, finds no support in our results (Model 7, b = 0.034, p = 0.725). Fig. 2 (A) shows that for plus/minus one standard deviation, the interaction between performance feedback and structural prominence positively affects ego-network competitiveness for PAA. Thus, high structural prominence in alliance networks increases ego-network competitiveness. This is not the case for the interaction between PBA and structural prominence (see Fig. 2 (B)).

4.1. Post-hoc analysis

We conducted several sensitivity tests to validate our results. First, to gauge the heterogeneity of a firm's behavior concerning ego-network competitiveness, we ran regression models using new market commonality-based dependent variables above and below the industry average, with results similar to our original models (see Appendix, Figure A1). Second, since our performance feedback calculation is based on a 1.05 multiplier, we reran our analysis with 1.25 and 1.50 multipliers, respectively, akin to previous literature (Bromiley, 1991), and the results hold (see Appendix, Figure A2). Third, another set of estimates where performance feedback is based on a weighted measure of social and historical dimensions (Dothan and Lavie, 2016) produced similar results (see Appendix, Figure A3). Finally, we tested the main effects using an alternative structural prominence measure, namely 'betweenness centrality' as seen in network theory literature (Gilsing et al., 2008), with results similar to our structural prominence measure based on degree centrality (see Appendix, Figure A4).

5. Discussion

Our results provide novel evidence on the behavioral antecedents of a firm's competitive engagement with its alliance network partners. While the literature has widely demonstrated the implications of a firm's centrality and competitive stance in networks (e.g., Gnyawali et al., 2006; Sanou et al., 2016), the antecedent of such stance has been less explored. Our study contributes to this nascent research area, providing scholarly and practical implications. Our empirical analysis focused on alliance networks in an intra-industry of global pharmaceuticals, representing a typical situation of high-tech sectors where firms compete and collaborate globally.

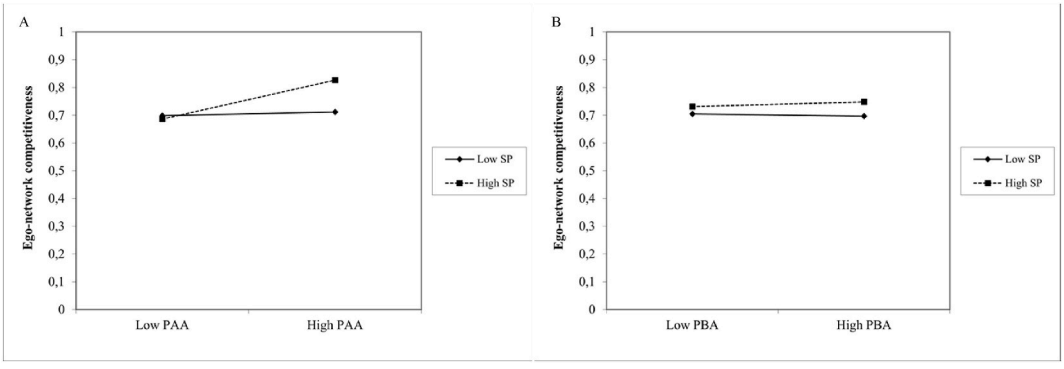

Fig. 2. Interactions between performance feedback and structural prominence on ego-network competitiveness.

Theoretically, we focus on ego-network competitiveness, which stems from market commonality and addresses focal firm competitive intensity relative to its alliance network peers.

In measuring ego-network competitiveness, we averaged this dimension at a firm level, allowing us to view the heterogeneity among the sample. Given the potential innovation and performance benefits of the interplay between collaboration and competition (Gnyawali and Park, 2011; Ritala, 2012; Arslan, 2018; Hoffmann et al., 2018; Estrada and Dong, 2020), it is essential to understand the behavioral antecedents of ego-network competitiveness (see also (Czakon et al., 2020)). In this regard, our study provides several valuable and novel contributions to the literature.

Our main contribution is to establish and empirically test a performance feedback-based explanation for the behavioral antecedents of competitive choices in a firm's alliance networks. As a firm performs above or below its aspirations relative to its alliance network peers, it adjusts its competitive behavior, leading to changes in ego-network competitiveness. Whereas previous literature has focused on the behavioral antecedents of coopetition (Czakon et al., 2020), our study is the first to link ego-network competitiveness to the concept of performance feedback explicitly. The latter is a well-known mechanism in behavioral literature that helps predict firm behavior in a network context (Makarevich, 2018; Kavusan and Frankort, 2019).

Our main effect results show that performance above aspirations increases ego-network competitiveness via a high-intensity slack search response. This means that an outperforming firm relative to its network partners is also more competitive as it has the necessary resources to engage in foothold moves (Upson et al., 2012). However, while our results support the slack search explanation, we find no support for the alternative low-intensity argument; inertia response is not preferred for outperforming global pharmaceuticals. One reason could be that global pharmaceuticals are multinationals with a proven track record (Gupta and Govindarajan, 2001), which means taking a low-risk stance when slack resources are available (Kuusela et al., 2017) may be viewed as a missed competitive opportunity with potential ramifications on firm's competitive advantage.

Further, our results show that performance below aspirations increases ego-network competitiveness via a high-intensity problemistic search response. This means that a firm that trails its alliance network peers in terms of performance will be more risk-taking in its competitive actions concerning market rivalry, displaying a problemistic search behavior (Posen et al., 2018). Such behavior stems from the fact that underperformance is typically a driver of organizational change, which in our case, is embodied by changes in ego-network competitiveness. This finding is supported by the established link between organizational change and competitive behavior (Baum and Singh, 1996).

However, our results do not support the competing low-intensity threat rigidity argument – i.e., that performance below aspirations would lead to low network competitiveness. This result can be interpreted in the context of global pharmaceuticals, which are likely to express high homogeneity and isomorphism in their alliance portfolios, regardless of performance differences (Koza and Lewin, 1998). Further, such firms are unlikely to endure financial distress typically observed for threat rigidity behavior (Greve, 2011).

We also examine the moderating effect of structural prominence in alliance network competitiveness. Our interaction results show that the relationship between performance above aspirations and structural prominence leads to increased ego-network competitiveness. Such a result supports the view that an overperforming firm is motivated and able to engage in competitive opportunities, leading to high market commonality (Chen et al., 2007; Withers et al., 2018; Ryu et al., 2020). This implies that a firm experiencing overperformance has the potential to become a power player in alliance networks in terms of market power increase (Shipilov, 2009). Consequently, a firm will likely receive the appropriate benefits, such as improved innovation ability and lesser threats from multimarket competitors.

Conversely, our interaction results show that the relationship between performance below aspirations and structural prominence does not affect ego-network competitiveness. A potential explanation for this unexpected result could be that structural prominence enhances a firm's visibility and competitive moves in the eyes of its network partners. With such increased visibility, an underperforming firm has 'all eyes' watching how it will respond to such performance issues. In this vein, competitors are probably geared and ready to respond to potential market overlap moves (Yan et al., 2020). Thus, increasing the focal firm's ego-network competitiveness may be costly due to competitive reactions and resulting dynamics. Such moves may also paint a firm as an unreliable partner and thus potentially undermine future alliances that would further increase its underperformance worries (Ahuja, 2000).

Our moderation effects were developed mainly with high structural prominence in mind. Nevertheless, in light of our results, we can raise a few notions about firms with low structural prominence. Specifically, interaction effects show that low structural prominence has a nonsignificant moderating role in the relationship between performance feedback and ego-network competitiveness. Given that firms with low structural prominence could miss out on much of the valuable information flowing in the network (Shipilov, 2009), they might be more inclined to resist potentially risky organizational change, which would translate into lower ego-network competitiveness. This effect hints that firms with 'residual' network roles might have lower incentives to engage in competitive behavior with their peers.

From a practical perspective, our study provides valuable insights primarily to the top management and top management teams who focus on issues such as a firm's competitive strategy, choices over market presence, and strategic alliance formation and dissolution. Our study provides empirical results that help managers assess and discover potential opportunities and blind spots for performance benchmarking relative to industry peers and competitors and the subsequent competitive strategy and alliancing choices. Our results also show that a firm tends to move more towards its alliance network partners' competitive market territory when it underperforms or overperforms relative to industry peers. This demonstrates that competitive moves in an intra-industry alliance network are used as a common strategy to either improve lagging performance or use the current market's success to broaden the new markets further. These two strategies will likely differ and require careful planning and understanding of the broader picture of a firm's partnerships and networks. Indeed, our results demonstrate that the firm's structural prominence (i.e., a central position in its alliance network) plays a role in the extent to which the firm increases its presence in its alliance network partners' markets.

Thus, it would be helpful for managers to analyze the firm's structural prominence in its networks to assess whether a firm can become a "power player" among its peers. If such a position exists, the firm might be freer to occupy the same market niches as its competitors. However, on the flip side, if the firm comes from an "underdog" position with minimal existing networks, the competitive moves might need more careful consideration. However, all these considerations must be combined with other firm strategic objectives and the goals of each alliance. Understanding the drivers of a firm's choices and potential opportunities and hindrances in competitive moves between alliance network partners is a good starting point for this broader analysis.

The findings of our study should be interpreted considering its limitations, which suggest opportunities for future research. First, due to availability issues, our alliance data ended in 2012. While we recognize that newer data would be helpful, it is known that the pharma industry is relatively stable relative to its alliance networks (Kumar and Zaheer, 2019). Therefore, our results should provide actionable insights in today's context. Future research in pharmaceuticals and other industries can help validate and refine our results with new datasets with potentially different measures to examine the key constructs.

Second, given the unique aspects of the global pharmaceutical industry, such as the prominence of horizontal alliance networks, additional research is needed to validate whether our findings generalize to other industries. For example, industries such as banking and airlines rely heavily on horizontal industry networks (Oum et al., 2004; Rowley et al., 2004; Garrette et al., 2009); thus, understanding antecedents of ego-network competitiveness would enhance our understanding of these types of industry contexts. Furthermore, other industries might involve different alliancing patterns, including the importance of vertical alliances between buyers and suppliers, which might involve different and interdependent dynamics with the horizontal alliance patterns (Belderbos et al., 2011). Indeed, engagement in alliances with different types of partners and from different industries implies performance implications for a focal firm (Jiang et al., 2010) and likely also affects the firm's choices to engage with different alliance partners in their networks in the first place. In addition, the emergence of ecosystems that cross-industry boundaries involve new types of implications of choices over complementary partners and how those are accessed (Aarikka-Stenroos and Ritala, 2017; Shipilov and Gawer, 2020). Future research could examine the drivers of a firm's competitive choices in these more complex industry, network, and ecosystem settings. For instance, questions arise about how firms engage in alliance portfolios with partners involved in multiple roles, such as a rivalrous role coupled with a supplier or a customer role. Further questions arise in whether and how cross-industry ecosystems change the firm's alliancing decisions, also depending on the firm's role as the ecosystem "orchestrator" or a complementary actor (Shipilov and Gawer, 2020).

Third, despite our robustness checks, the dynamic nature of the global pharmaceutical industry makes it challenging to remove endogeneity from our analysis entirely (Rocha et al., 2018). Alternative specifications and research designs could provide additional understanding to our research questions and beyond. For example, future research can address how this industry's relational interactions within and between core and peripheral actors (Cattani and Ferriani, 2008) affect ego-network competitiveness. Furthermore, core and peripheral actors are likely to exhibit significant performance differences. One option to analyze such differences would be through efficiency analysis enabled by Data Envelopment Analysis (DEA), a known method in extant research on performance measurement (Yin et al., 2020).

Fourth, regarding the nature of ownership, future research can expand on the effects of performance feedback for firms that engage in equity versus non-equity alliances with their rivals. In this vein, understanding underperformance or overperformance relative to competitors depending on the type of alliance network could yield essential insights into complementary capabilities in non-equity alliances (Gudergan et al., 2012) and knowledge sharing in equity alliances (Oxley and Sampson, 2004). For instance, it would be interesting to study whether underperformance leads to higher motivations to learn from the partners (to catch up with the competitive field) or whether overperformance leads a firm to adopt a more protective stance against rival firms that are also partners.

Finally, the mixed results concerning the competing hypotheses over the behavioral antecedents and the moderating role of structural prominence warrant further research on the behavioral mechanisms that drive network competitiveness. In this regard, a helpful direction toward better understanding would be the unification of the competing arguments related to the performance below and above aspirations. This is not trivial as conceptualizing performance feedback from theories such as prospect theory (i.e., risk propensity versus risk adversity), organizational learning (i.e., exploration versus exploitation), and dynamic capabilities (i.e., organizational change versus path dependency) requires not only a careful understanding of the underlining theoretical mechanisms but also richer data (e.g., from interviews and case studies). Therefore, future studies should examine the competing explanations regarding the behavioral antecedents of ego-network competitiveness with different conceptual and empirical approaches.

Data availability

The authors are unable or have chosen not to specify which data has been used.

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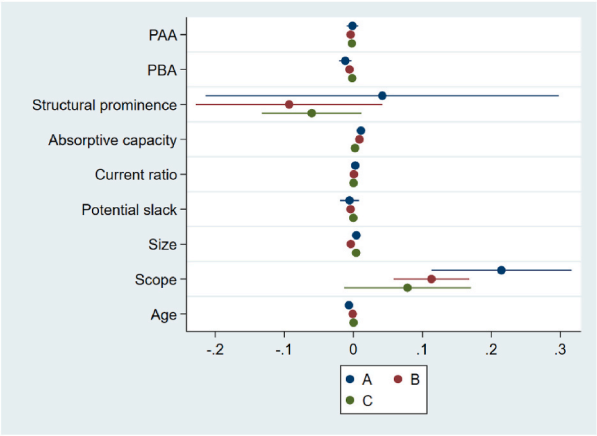
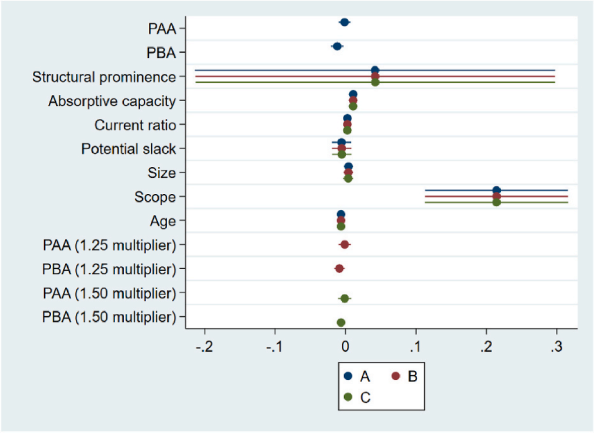
Appendix



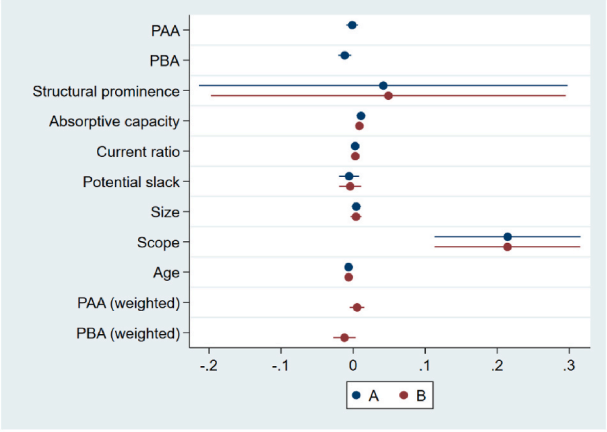
Note: A for the original model; B for the model with DV above industry average; C for the model with DV below industry average

Fig. A1. Marginal effects for supplemental analysis 1.



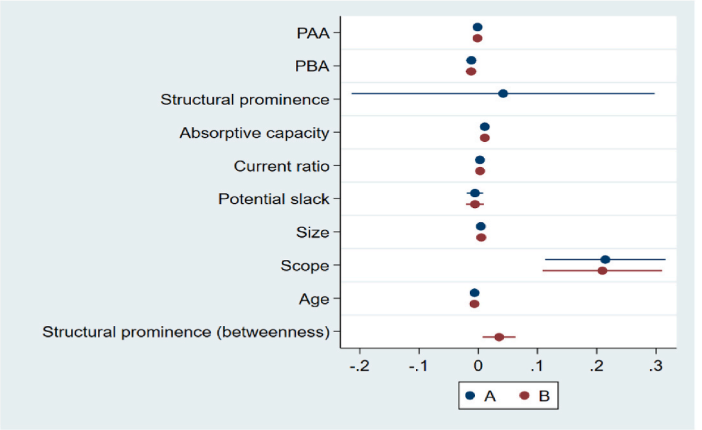
Note: A for the original model; B for the model with PAA/PBA (1.25 multiplier); C for the model with PAA/PBA (1.50 multiplier)

Fig. A2. Marginal effects for supplemental analysis 2.



Note: A for the original model; B for the model with weighted performance feedback

Fig. A3. Marginal effects for supplemental analysis 3.



Note: A for the original model; B for the model with structural prominence (betweenness centrality)

Fig. A4. Marginal effects for supplemental analysis 4.

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