INTRODUCTION

International business literature has highlighted the importance of networks in firm's internationalization efforts through the formation of international strategic alliances (ISA) (Lavie & Miller, 2008; Lu & Beamish, 2006; Vasudeva, Zaheer, & Hernandez, 2013; Yeniyurt & Carnovale, 2017; Zahra, Ucbasaran, & Newey, 2009). Researchers have found that ISA networks drive internationalization by providing mutual trade dependencies and synergistic value creation (Prashantham & Birkinshaw, 2015; Xia, 2011), as well as allowing partners to better balance the benefits and risks of going international (Das & Kumar, 2010; Li, Qian, & Qian, 2013; Lu & Beamish, 2006). In the ISA context, firm's network centrality is particularly salient as a reliable benchmarking tool with central firms gaining international visibility, power, experience, and social influence (Meschi & Wassmer, 2013; Tsai, Huang, & Wang, 2015).

These studies have greatly contributed to our understanding of firm's motivations for establishing ISA networks by highlighting the social perspective that drives firms to internationalize. Although not yet researched, internationalization through ISA networks may also be understood as a strategic reaction to a behavioral perspective that, rooted in the Behavioral Theory of the Firm (BTOF) argues how the aspiration-performance gap influences firm's organizational change and risk preferences (Baum, Rowley, Shipilov, & Chuang, 2005; Cyert & March, 1963; Greve, 1998). While performance below aspirations may trigger a "problemistic search" for potential solutions (Cyert & March, 1963; Greve, 1998, 2011), performance above aspirations is seen as a good enough reason to avoid the complexities inherent to organizational change, triggering a so-called "organizational inertia" (Greve, 2003; Rhee & Kim, 2015). Given that internationalization might serve as a strategic response to the performance feedback (McCormick & Fernhaber, 2018), we extend the BTOF logic to explain internationalization through ISA formation. Further, we posit that firms consider ISA as an important internationalization vehicle and argue that network centrality moderates the effect of performance feedback on ISA formation. Our key insight is to show that networks spanning multiple countries and specifically firm's network centrality alters the effects predicted by BTOF. In our study

we consider cross-national distances among firms, and explore network centrality and its moderating role on firm's ISA activity with partners in distant countries.

We test our assumptions in the global pharmaceutical industry renowned for its ability to span national boundaries, and track the ISA, networks, and performance feedback of 81 firms located in 17 countries over the period of 1991-2012. Our results show that both network centrality and performance feedback have a significant effect on ISA formation. Furthermore, we provide empirical insights on the moderating role of network centrality in the aspiration—ISA formation relationship.

Our study makes two key contributions. Our primary contribution is to the international business research. We theoretically develop and empirically demonstrate that firm's internationalization endeavors embodied by ISAs are conditioned by both network centrality and performance feedback. Importantly, we consider cross-national distances in the ISA research and connect them with network centrality and performance feedback. In this vein, our findings complement prior research on ISA networks (Al-Laham & Souitaris, 2008; Mani & Luo, 2015; Xia, 2011) and add to a scant research on behavioral antecedents of the internationalization process. Second, we also contribute to the alliance research by empirically assessing the conjoint effect of performance feedback and network centrality on ISA formation. Research has long treated social and behavioral perspectives of firm's alliance strategy as separate mechanisms. In this respect, we join limited contributions in the field by highlighting the dual nature (i.e., social and behavioral) of strategic alliance formation (O'Brien & David, 2014; Shipilov, Li, & Greve, 2011).

The remainder of this paper is organized as follows. In the following section, we develop our theoretical framework and summarize its main predictions in various testable hypotheses. Next, we present our sample and how variables were measured. We then report the results of the empirical analyses performed to test our hypotheses. The final section discusses the results.

THEORY AND HYPOTHESES

The Role of ISA

ISA are defined as collaborations of two or more firms involving long-term commitment of resources that would serve strategic goals of partners based in different locations, and where the alliance operates in a different country from the partners' headquarters (Christoffersen, 2013; Culpan, 2009). ISA formation is a common praxis in international market entry since firms face resource limitations, including country-specific knowledge, costs, and risks related to entry barriers as well as exchange rate fluctuations (Li et al., 2013). Extant research has addressed several features of ISA, such as co-evolution with external environments (Ho & Wang, 2015; Koza & Lewin, 1999), firm's choice of partner (Elg, 2000), and the learning asymmetries of international partners (Hamel, 1991).

Firms may use ISA due to the difficulty of operating alone in global markets while concurrently excelling at performing the plethora of inter-organizational business functions (Ho & Wang, 2015; Mehta, Polsa, Mazur, Xiucheng, & Dubinsky, 2006). In this sense, collaborating through ISA may be considered an incentive to bypass distance-related differences between firm's country of origin. Several benefits of ISA over local firm alliances and other international strategies include their ability to draw upon foreign resources and opportunities (Das & Teng, 2000; Lavie & Miller, 2008), mitigate dynamism in hostile environments (Li et al., 2013), and acquire cross-border competitive capabilities (Zahra et al., 2009). Despite such favorable features, it has been argued that ISA often carry complexity elements, including a more challenging learning environment due to the international nature of the involved actors (Lu & Beamish, 2006; Steensma & Lyles, 2000), higher cooperation costs (Wassmer & Dussauge, 2011), and unique risks owing to the potential problems of collaborating with a foreign partner. Risk factors incorporate conflict and dissolution exposures due to cultural differences that create relational ambiguities (Barkema & Vermeulen, 1997), institutional hazards affected by political and economic volatility (Feinberg & Gupta, 2009), and cross-national distance contingencies that increase the difference between organizational and administrative practices, employee expectations, and attitudes towards strategic issues (Park & Ungson, 1997).

Going International: A Social Perspective

ISA and ego-network centrality. Extant research has given mounting evidence of networks' role in the creation of relationship markets that foster learning, trust, and commitment, and those markets that serve as precursors to the internationalization of the firm (Elango & Pattnaik, 2007; Johanson & Vahlne, 2015; Martin, Swaminathan, & Mitchell, 1998). Networks are broadly recognized as influential in the internationalization process as they can increase knowledge of foreign market opportunities, reduce firm competency traps, and stimulate innovation, new solutions and skills (Coviello, 2006; Ellis, 2000; Lavie & Miller, 2008). Additionally, they are successful achievers in circumventing regulatory mechanisms established by local governments (Todeva & Knoke, 2005).

Networks enable firms to alleviate risks associated with partner opportunism, provide windows of learning opportunities (Mani & Luo, 2015), and establish mutual trade dependencies that increase the survivability of cross-border alliances in the host country (Xia, 2011). The learning ensued by networks creates value as the firm gains insights into the international market of choice (Prashantham & Birkinshaw, 2015). Over time, networks evolve into complex relationships where collaboration and competition coexist, and where the network stability is guaranteed by its constant change (Esposito, 2004).

The rationale behind firm's network centrality and subsequent ISA formation can be traced from organizational objectives, management vision for organizational development, and specific strategies necessary to improve firm competitiveness in rapidly changing environments (Cravens, Piercy, & Shipp, 1996). Organizations use position in the network as a competitive tool to increase performance, profits, or control (Cowan, Jonard, & Zimmermann, 2007). Network centrality multiplies firm collaboration benefits through alliance-to-network and network-to-alliance transfers, and is relevant to ISA success by promoting cohesion between cross-border partnering firms and providing clues to partner selection outcomes (Polidoro, Ahuja, & Mitchell, 2011; Swaminathan & Moorman, 2009). Central firms signal trustworthiness, which encourages a favorable evaluation by a potential foreign partner and enables the firm to have a better understanding of the network's structure and its members (Al-Laham & Souitaris, 2008; Meschi & Wassmer, 2013). Such embeddedness would

attract potential foreign partners and high centrality is a sign of social influence and trusted informants that affects ISA formation. Consequently, central firms in the network are better positioned to cope with the uncertainties and difficulties associated with the formation of ISA and to capitalize on their benefits. Thus, based on these arguments, we expect firm's network centrality to increase the likelihood of ISA formation. Formally stated:

Hypothesis 1a: Firms exhibiting high network centrality initiate more ISA.

The effect of cross-national distance. To capture the salience of cross-national activities, international business literature has introduced the concept of distance defined as the difference between countries on selected values (e.g., geographical, cultural, institutional, economical, etc.) (Beugelsdijk, Kostova, Kunst, Spadafora, & van Essen, 2017; Tsang & Yip, 2007). We argue that cross-national distances play an important role in the process of ISA formation. The uncertainties and complexities associated with ISA formation are likely to increase with the cross-national distance between partners reflected in organizational routine differences and heightened coordination problems (Das & Kumar, 2010). Such differences may be antecedents of conflict and the germ of decreased trust and cooperation, increasing information asymmetries and monitoring costs (Beugelsdijk et al., 2017). These potential difficulties create the scenario for higher transaction costs (Chen & Chen, 2003; Morschett, Schramm-Klein, & Swoboda, 2010) and consequently heighten barriers for ISA formation. However, as argued before, a highly central firm in the network can leverage its superior position to access valuable resources, due to the greater proximity to all existing and potential partners for acquiring information and knowledge (Tsai et al., 2015), and manage the complexities and uncertainties involved in distant ISA successfully. Therefore, even though cross-national distances maybe a hindrance for ISA formation (Barkema & Vermeulen, 1997; Das & Kumar, 2010; Feinberg & Gupta, 2009), this effect would be mitigated by the firm's centrality in the network (Tsai et al., 2015). Thus, we expect that:

Hypothesis 1b: Firms exhibiting high network centrality initiate more distant ISA.

Going International: A Behavioral Perspective

Setting organizational aspirations. Partnering selection in alliance collaborations has been associated with organizational aspirations, a concept originally coined in the BTOF formulated by Cyert and March (1963), who consider aspirations as a combination of firm's own performance history (i.e., historical aspiration) with the performance of other firms in the same industry (i.e., social aspiration). According to BTOF, performance below aspirations can trigger a "problemistic search" in an attempt to address potential failures and improve upon loss situations (Baum et al., 2005; Cyert & March, 1963; Greve, 2003). Firms experiencing negative aspiration performance may be more willing to seek new courses of action (Chen & Miller, 2007; O'Brien & David, 2014) or even to implement riskier strategies (Audia & Greve, 2006; Bromiley, 1991; Greve, 2003). In this sense, performance below aspirations induces organizational change and strategic reorientation by encouraging the firm to seek potential problem-solving actions and take risks, such as new market entry (Cyert & March, 1963; Kim, Finkelstein, & Haleblian, 2015; Ref & Shapira, 2017). Although ISA bear some form of idiosyncratic risk, their benefits can potentially address "problemistic" issues. Hence, we expect performance below aspirations to be positively related to ISA formation.

Oppositely, according to BTOF, performance above aspirations indicates the resolution of problems, and typically triggers an "inertia" response where firms are more reluctant to change their successful strategy and avoid taking unnecessary risks (Cyert & March, 1963; Greve, 1998; Rhee & Kim, 2015). This translates into a continuum of status quo and the avoidance of actions induced by "problemistic search" (Shinkle, 2012). Additionally, any slack-related exploratory strategy may have uncertain and sparse effects favoring the exploitation of current risk averse strategies akin to "organizational inertia" (Rhee & Kim, 2015). As positive aspiration performance indicates a good match between firm's resources and the markets where it operates, any alternative resource-market position is likely to be inferior to the existing one due to higher opportunity costs (Ref & Shapira, 2017). Given that engaging in ISA formation bears both a challenging learning environment and collaborative costs that may hinder their expected returns (Ahuja, 2000a; Lu & Beamish, 2006;

Wassmer & Dussauge, 2011), it is reasonable to believe that firms would be reluctant to engage in new ISA formation as they exceed their aspirations.

In sum, we predict that performance below aspirations is positively tied to ISA formation, while the reverse occurs for positive aspiration performance. Hypothesis 2a formally summarizes our performance feedback expectations:

Hypothesis 2a: Firms performing below aspirations exhibit more ISA, while those performing above aspirations exhibit fewer ISA.

Distant ISA and performance feedback. While BTOF literature has been linked to traditional ISA, little is known on the relationship between performance feedback and cross-national distances. On this issue, Lewellyn and Bao (2015), find that outperforming industry peers and national culture are both important for explaining variance in firm-level R&D investment by shaping how performance feedback is interpreted and processed. Additionally, Chun (2016) proposes that the greater the differences in systems and hierarchies of values between cultures, the greater the differences in goals and aspiration levels between these cultures. As stipulated in Hypothesis 2a, firms engage in more ISA for negative aspiration performance but do less so for performance exceeding organizational aspirations. We believe such relationship will be more accentuated due to the ISA differences highlighted by cross-national distances. In fact, investment in distant locations is associated with competitive environments that enable firms to achieve global competitive advantage (Beugelsdijk et al., 2017). Furthermore, global MNEs tend to have sufficiently laxed institutional constraints at home, which enables them to seek out riskier distant ISA (Holburn & Zelner, 2010). This means that riskier strategies encompassed by a "problemistic search" would translate into firms taking increasing steps to address performance-based problems and overturn their fortunes via distant ISA formation.

For performance above aspirations, the increased risks associated with cross-national distance would have an "inertia" effect on distant ISA formation. Simply put, increasing transaction and monitoring costs would further exacerbate firm's intentions to steer clear of distant ISA. Specifically, transaction costs of searching, selecting, and signing contracts increase with the distance between

partners due to asset specificity and behavioral uncertainty (Chen & Chen, 2003). Additionally, monitoring becomes more complex with the distance demanding more effort and, therefore, more resources than with similar transactions involving closer partners (Beugelsdijk et al., 2017). Thus, in accordance with the logic explained in Hypothesis 2a, firm's activity in distant ISA would increase for negative aspiration performance but decrease for positive performance feedback. More formally, we argue that:

> Hypothesis 2b: Firms performing below aspirations exhibit more distant ISA, while those
> performing above aspirations exhibit fewer distant ISA.

Bridging Social and Behavioral Perspectives

Network centrality and organizational aspirations. Network research has provided a socialized account of firm behavior by establishing a direct connection between networks of external relationships and firm's strategic actions, observing the advantages that network structures have on firm's strategy and performance (Granovetter, 1985; Gulati, Nohria, & Zaheer, 2000; Uzzi, 1997; Zaheer & Bell, 2005). This impact is a direct result of the network's ability to offer access to knowledge and cooperation opportunities that an isolated firm may not possess (Burt, 1992; Uzzi, 1997). Networks can be vital sources of information for the participants, a process that enhances both the identity of network members and the structural pattern of the network itself (Gulati, 1999).

Traditionally, BTOF literature has evolved separately from research on social networks, characterized by the view that organizations form and react to their aspirations, irrespective of their social relationship patterns. However, some studies have tried to bridge this gap by providing a direct correlation between firm's network centrality and organizational aspirations, whether partnering with local versus nonlocal partners (Baum et al., 2005), being in a brokerage position (Shipilov et al., 2011), or embedded in a communitarian context (O'Brien & David, 2014). Even so, current research bridging these theories has provided insufficient accounts on the role that network centrality plays in the aspiration—ISA relationship, which we believe is relevant to understand the internationalization process of the firm. In this regard, we argue that network centrality moderates the relationship between

organizational aspirations and ISA formation. In Hypothesis 1a, we hypothesize that network centrality positively affects firm's behavior to engage in ISA; while in Hypothesis 2a and Hypothesis 2b, we explain how firms change ISA formation patterns as performance departs their aspirations. Given the main effects, it is of interest to analyze how network centrality affects the relationship between organizational aspirations and ISA formation.

Network centrality reduces the inherent uncertainties and complexities associated with ISA, in part, because of higher alliance experience and trustworthiness generated over time between the collaborating partners (Elango & Pattnaik, 2007; Rosenkopf & Padula, 2008). Since the network improves firm's access to a multitude of resources (Koka & Prescott, 2008), central firms use strategic alliances to improve their resource endowment and technological uncertainty towards competitors (Hoffmann, 2007). In this light, firms performing below aspirations who are also central in the network would have greater access to ISA due to fewer complexities, resource restrictions, and higher partnering experience and trustworthiness; therefore, firms would be further motivated to engage in ISA.

Moreover, while firms performing above aspirations would be reluctant to enter in more ISA due to increased risks and opportunity costs (Audia & Greve, 2006; Ref & Shapira, 2017), network centrality would serve as a facilitator and promote further ISA engagement. The perception of such behavior would be also supported by the uncertainty and complexity reduction that accompanies experience in ISA formation. In this sense, it has been observed that as performance exceeds aspirations, central firms continue to establish ties with partners of different status (Shipilov et al., 2011). Thus, considering all the above, we posit the following hypotheses:

Hypothesis 3a: The positive relationship between performance below aspirations and ISA will be stronger for firms that experience high network centrality.

Hypothesis 3b: The negative relationship between performance above aspirations and ISA will be weaker for firms that experience high network centrality.

A behavioral interaction among distant ISA. Organizations possess information asymmetry regarding their potential partner capabilities, which raises search costs and uncertainties associated with opportunistic behavior (Baum et al., 2005). As it has been argued, uncertainties and complexities—inherent to ISA formation—magnify with the distance between partners involved in the alliance. According to Hypothesis 1b, firm's network centrality would positively influence distant ISA formation. We believe this effect would be akin to Hypothesis 3a and Hypothesis 3b, in that network centrality promotes ISA engagement due to lesser resource constraints and lower opportunity costs faced by firms when departing from their aspiration level. As cross-national distance increases, so does the risk embedded in distant ISA, including cultural differences, ambiguities (Barkema & Vermeulen, 1997) and coordination problems (Das & Kumar, 2010). In this vein, network centrality would reduce distance-related frictions and enable firms to pursue "problemistic search" for negative performance feedback and "slack search" for positive performance feedback. Consequently, we argue as follows:

Hypothesis 4a: The positive relationship between performance below aspirations and distant ISA will be stronger for firms that experience high network centrality.

Hypothesis 4b: The negative relationship between performance above aspirations and distant ISA will be weaker for firms that experience high network centrality.

METHODS

Data and Sample

We test our hypotheses by examining the global pharmaceutical industry, which is chosen due to its traditionally high economic impact, the extensive collaborations between pharmaceutical firms, and the fact that ISA are considered a norm for this type of medium. To study how firm´s network centrality and aspirations affect ISA formation, we select a sample of 81 organizations by identifying those that have appeared at least once in the top 50 of the Pharmaceutical Executive Magazine yearly editions from the period of 2002-2013, whose ranking selection criteria is based on the firm's total sales (Shijaku, Larraza-Kintana, & Urtasun-Alonso, 2016). Subsequently, we use the Pharma and

Medtech Business Intelligence database to collect all alliances that involve the top 81 firms in question, between January 1, 1991 and December 31, 2012. These collaborations amount to 7,760 alliance collaborations between the top 81 global pharmaceutical firms. From these collaborations, 5,134 are international alliances (i.e., alliances involving partners from different countries), and the rest (i.e., 2,626) are domestic alliances (i.e., alliances involving partners from the same country). We geocode firms based on their corporate headquarters geographic location, resulting in 17 different countries. Figure 1 shows, by country, the percentage of international alliances over total in our sample. For headquarter locations, organizational aspirations, and control variables we use COMPUSTAT and DATASTREAM databases supplied by annual report information whenever data is deemed incomplete. Since financial data concern the top 81 firms from Western Europe, United States, Asia, Africa, and Australia, we convert all local currencies to USD with an exchange rate based on the year the data is retrieved.

Insert Figure 1 about here

Measures

Our dependent variable, *ISA*, is calculated as the logarithm of the total number of international alliances that each of the top 81 firms initiates with any other firm of our sample from 1995 to 2012. This choice is motivated by the fact that ISA (e.g., joint venture, marketing and licensing, intra-biotech deals, reverse licensing, etc.) are the most common type of strategic relationships analyzed by empirical studies involving social network concepts, as seen in Table 1. Moreover, relying on the latest distance measuring standards (i.e., Mahalanobis distance), we build four additional dependent variables to gauge ISAs' cultural, administrative, geographic, and economic distances, as suggested by the CAGE framework (Beugelsdijk et al., 2017; Ghemawat, 2001; Lavie and Miller, 2008).

More specifically, we calculate *ISA-cultural distance* as the weighted sum of international alliances where cross-national cultural distances are used as the weights. Similarly, *ISA-administrative distance*, *ISA-geographic distance*, and *ISA-economic distance* are calculated as weighted sums of international alliances, with cross-national administrative, geographic, and economic distances,

respectively as weights. To maintain consistency among all dependent variables, we also apply the logarithm transformation to distant ISA variables. For cultural, administrative, and economic distant ISA and given the country where sample firms' corporate headquarters are located, we use Berry, Guillén, and Zhou's (2010) cross-national Mahalanobis pooled distances. As for geographic distant ISA, after geocoding sample firms' corporate headquarters, we obtain projected cross-national geographic distances using ArcMap 10.3.1.

Insert Table 1 about here

The primary independent variables of interest relate to network centrality and performance relative to organizational aspirations. To operationalize network centrality, we model each year over the sample period as a separate network, formally characterized as a symmetric (i.e., square matrix that is equal to its transpose so that the main diagonal of the sociomatrix always contains zeroes to avoid firm self-reference ties) N x N "weight" matrix, whose generic entry ($w_{ij} = w_{ji} > 0$) measures the interaction intensity between any two actors (i.e., zero if no link exists between actor i and j). This means that ties between actors are valued according to the actual number of strategic collaboration formations, a procedure seen in the network literature (De Montis, Barthélemy, Chessa, & Vespignani, 2007).

Following this framework, we build 22 symmetric 81 x 81 matrices to capture the network centrality of the firms for the given period. Additionally, we use a five-year moving window period (i.e., 1991-1995, 1992-1996, 1993-1997, etc.) since the traditional lifecycle of alliance is usually five years. Similar moving periods allow to track tie strengths between engaging actors and represent dynamic alliance networks more precisely and reliably (Baum et al., 2005; Zaheer & Soda, 2009). We adopt *degree* as a commonly used measure of network centrality, which determines the number of ties for each actor (i.e., the number of actors that the focal actor is connected to). The original measure (Wasserman & Faust, 1994) has been modified to take into account the sum of weights in each tie (Opsahl, Colizza, Panzarasa, & Ramasco, 2008), formalized by the following expression: $C_D^w(i) = \sum_j^N w_{ij}$, where i is the focal actor, j represents all other actors, N is the total number of actors, w is the

weighted adjacency matrix, in which w_{ij} is greater than 0 if the actor i is connected to actor j, and the value represents the weight of the tie. *Degree* centrality scores for any actor will be higher, the more collaborations the actor has (Landherr, Friedl, & Heidemann, 2010). We interpret *degree* as the actor's centrality in its network. Matrices and yearly *degree* scores are handled via R and UCINET software.

To measure performance relative to aspirations, we first construct measures of both firm performance and aspiration levels, as seen in the current BTOF literature (Greve, 2003). Organizational aspirations are usually defined with respect to a particular dimension of firm performance, which in the current research has generally been associated with return on assets (Greve, 2011). We measure historical aspiration as $HA_t = P'_{t-1}$, where P'_{t-1} is firm's return on assets at time t-1. Social aspiration is operationalized as $SA_t = \frac{\sum P_t - P'_t}{n_t - 1}$ or the mean performance of sample firms (i.e., excluding the focal firm) at time t. Then, we construct our final aspirations' level measure by following Greve (2003), as $AL = 0.6 \times SA + 0.4 \times HA$. Similar to Kim and Rhee (2017), we estimate the weights by examining all parameter values by increments of 0.1 and choose the above-stated values that generated the best model fit. To analyze the relationship between strategic collaboration formation and performance relative to aspirations, we subtract aspirations from performance, and split the results into positive and negative values: *Performance below aspirations* (PBAL) when performance is less than aspirations and *Performance above aspirations* (PAAL) when performance is greater than aspirations. All are continuous variables, but while PBAL takes negative values, PAAL takes positive ones.

In addition to our independent variables, we control for several factors that could potentially impact ISA formation. Specifically, we control for *innovation*, which is defined as the ratio of R&D Expenses to Sales, as R&D Expenses are typically associated with both problem and slack search (Greve, 2003; O'Brien & David, 2014). Additionally, we control for *alliance experience*, which is calculated as the accumulated number of past alliances formed by the firm, as seen in extant research on strategic alliances (Lavie & Miller, 2008; Sampson, 2005). Moreover, we control for several forms of *slack* since, according to BTOF, slack (i.e., resources) is highly dependent on whether a firm's

performance is above or below its aspirations' level. If the firm is performing above aspirations, it will have more slack at disposal, while if performance is below aspirations, slack may be lacking as a result of the firm using resources to improve its performance (O'Brien & David, 2014). Specifically, we control for the following: *unabsorbed slack* measured as cash and marketable securities divided by current liabilities; *absorbed slack* measured as the ratio of selling and administrative expenses to sales; and *potential slack* measured as the ratio of total long-term debt to total assets (Bromiley, 1991; Greve, 2003; O'Brien & David, 2014). We also control for the *age* of the firms operationalized as the foundation year minus the year considered in the 1991-2012 panel analysis; thus, as firm performance declines with age (Loderer & Waelchli, 2010), chances are this will affect the performance-based organizational aspirations. Finally, we control for *size*, which is operationalized as the logarithm of firm's employees.

Model

To identify the most appropriate model, we start by analyzing the pattern structure of our idiosyncratic errors, then assess the potential endogeneity of regressors, and finally compare fixed-effects (FE) versus random-effects (RE) models. Regressors are lagged for one period to better account for causality. Regression disturbances from panel data are likely to exhibit several cross-sectional and temporal dependences (Eberhardt & Teal, 2011; Hoechle, 2007), which affect the consistency of estimates and the validity of the statistical inference. After removing unobserved FE—such as the CEO's managerial ability or the firm's intangible assets—from our residuals by means of a FE model, we check if idiosyncratic errors (i.e., those apart from the FE) satisfy the identically and independently distributed (IID) assumption.

Global shocks, such as the global fiscal crisis from 2007 onwards or the existence of dominant firms or local spill-over effects across firms, are sources of cross-sectional dependence. In recent years, there has been a growing interest to identify and model cross-sectional dependences in panel data (Ditzen, 2016; Moscone & Tosetti, 2009), as ignoring it can lead to inconsistent Ordinary Least Squares (OLS) estimates (Zhou & Zhang, 2016). Based on a spatial weights matrix, containing the

degree of spatial proximity among our sample firms' headquarters, we first test for spatial autocorrelation in our residuals by using the global Moran index (Anselin, 1988; Moran, 1950). The Moran statistical test detected cross-sectional dependence in our idiosyncratic residuals. Our idiosyncratic disturbances could also exhibit patterns of heteroscedasticity and serial correlation within firms and across them. In fact, several versions of Pagan and Hall's (1983) test evidenced heteroscedasticity in our idiosyncratic residuals. Third, and consistently with the five-year moving window period of our centrality measure, we apply the heteroskedastic robust version of the Cumby and Huizinga (1992) test for serial autocorrelation of orders 1-5. As a result, serial independence among idiosyncratic residuals was observed.

Our second step in model identification consists of examining the potential endogeneity of the following suspected regressors: *degree* and the *alliance experience* control variable. The "difference-in-Sargan" statistic supports the fact that these variables can be treated as exogenous and, therefore, do not need to be instrumented.

Finally, as an essential distinction in panel data analysis (Hausman, 2001), we compare the FE and RE models. Specifically, we apply the heteroscedasticity and autocorrelation (HAC) panel-robust Hausman test proposed by Wooldridge (2002) and its extension by Hoechle (2007), which is consistent to cross-sectional error dependence. Both tests strongly support the FE model. Consequently, we estimate a FE model with exogenous regressors and Driscoll and Kraay (1998) standard errors that are consistent to heteroscedasticity, and general forms of spatial and temporal dependence within and across firms. Additionally, the slack variables contain some outliers, so we follow O'Brien and David (2014) and Winsorize their distributions at the top and bottom of the 0.5th percentiles.

Results

Descriptive statistics and Pearson correlations among the variables are provided in Table 2 while main regression results are provided in Table 3. The number of observations varies across variables due to missing items in our panel data. Table 2 also shows that our five alternative dependent

variables are significantly correlated between themselves supporting their consistency. *Degree* shows significant positive correlations with all ISA; whereas, PAAL shows a significant negative correlation with both number and distant ISA. However, PBAL shows no significant correlation with ISA: this preliminary result justifying the inclusion of performance above and below aspirations as separate constructs. Nevertheless, as bivariate indicators with no directed causality, correlations should be interpreted with caution. Additionally, the high mean of *age* variable is a maturity indicator of the top 81 pharmaceutical firms. Elsewhere, *size*, and various control *slacks* introduced into our model are meaningful as significant correlations are observed.

Insert Table 2 and 3 about here

As for the regressions and control variables, it is noteworthy to observe how *age* and *alliance experience* have a negative impact on ISA formation in all models and how *innovation* positively affects the number of ISA (Model 1). The same applies to culturally (Model 2) and administratively (Model 3) distant ISA. On the other hand, *absorbed slack* has a negative impact on the number of ISA showing that engaging in ISA decreases for firms with high degree of operating leverage.

Looking at the main effects in Models 1-5, it is observed that *degree* has a positive and significant effect on the number of ISA—confirming Hypothesis 1a (b = 2.281, p < 0.01 in Model 1)—as well as on geographically distant ISA (b = 2.482, p < 0.1 in Model 4) and economically distant ISA (b = 4.338, p < 0.01 in Model 5). Culturally and administratively distant ISA are not affected. Therefore, Hypothesis 1b obtains moderate support.

Regarding aspirations and the number of ISA, Hypothesis 2a is supported for the firms performing above aspirations (b = -2.073, p < 0.05 in Model 1) but not for firms with negative aspiration performance (b=1.404, p < 0.001 in model 1). Likewise, and regarding distant ISA, Hypothesis 2b is supported for firms with positive aspiration performance in all distances considered, namely, cultural (b = -3.972, p < 0.05 in Model 2), administrative (b = -4.026, p < 0.05 in Model 3), geographic (b = -4.790, p < 0.01 in Model 4), and economic (b = -2.544, p < 0.1 in Model 5) distances. However, Hypothesis 2b is not supported for firms with negative aspiration performance in any of the

distances, namely, cultural (b = 1.695, p < 0.05 in Model 2), administrative (b = 2.159, p < 0.01 in Model 3), geographic (b = 1.489, p < 0.05 in Model 4), or economic (b = 1.811, p < 0.01 in Model 4) distances.

In relation to the two-way interactions between *degree* and aspirations, significantly different results are also obtained for both below and above aspiration performance regarding the role played by firm's network centrality in moderating the aspiration-ISA relationship. For firms performing below aspirations, results show that degree centrality alleviates the negative relation between performance below aspirations and the number of ISA (b = -6.046, p < 0.05 in Model 1) and economically distant ISA (b = -9.473, p < 0.1 in Model 5). As stated in Hypothesis 3a and Hypothesis 4a, this result attributes network centrality a facilitator role when firms perform below their aspirations. On the contrary, for firms performing above aspirations, degree exacerbates the negative relation between performance above and the number of ISA (b = -15.90, p < 0.05 in Model 1), culturally distant (b = -53.72, p < 0.001 in Model 2), administratively distant (b = -32.39, p < 0.05 in Model 3), geographically distant (b = -30.30, p < 0.05 in Model 4), and economically distant (b = -26.31, p < 0.1 in Model 5) ISA. In other words, rejecting Hypothesis 3b and Hypothesis 4b, these results envision a totally unexpected role for network centrality on ISA formation if the firm is performing above aspirations. These findings reinforce the importance of separately examined firms that perform below from firms that perform above their aspirations when studying their internationalization responses and network effects.

Figure 2 illustrates the two-way interactions of Models 1-5. Specifically, each plot shows how ISA formation changes with aspirations for both low and high degree. Two standard deviations below and above the mean are used for low and high values of degree. More specifically, it can be observed how network centrality reverses the observed negative effect of PBAL on ISA formation and on economically distant ISA. Nevertheless, central firms exhibit stronger negative effects of PAAL on ISA formation and specifically on culturally, administratively, geographically, and economically distant ISA formation, than their less central counterparts.

Insert Figure 2 about here

The results of Models 2-5 are robust to alternative proxies for cultural, administrative, geographic and economic ISA distances, such as when removing repeated alliances between pairs of firms in the same year.

DISCUSSION AND CONCLUSIONS

Our overarching goal is to address the disconnection in the international business literature that sees social and behavioral perspectives of firm behavior set on separate paths. We argue that centrality in networks becomes an important aspect when firms set their performance-based aspirations as precursors to ISA engagement. Additionally, we envision that network centrality is equally important when ISA networks span cross-national distances. Our theoretical argument levers on the idea that network centrality is likely to affect firm internationalization through ISA engagement. Recent studies have acknowledged the interplay between networks and organizational aspirations (Kim & Rhee, 2017; O'Brien & David, 2014; Shipilov et al., 2011), and we advance this research area by showing that internationalization steps embodied by ISA formation are influenced by organizational aspirations as well as by firm's centrality in the network.

Our work suggests that social and behavioral perspectives should be considered conjointly when analyzing firm's motivations to enter cross-border strategic collaborations. Extant literature has provided plenty of evidence regarding network effects on firm's internationalization but limited insights as to how organizational aspirations span cross-national contexts. This research skewness hints that cross-national distance in the aspirations and network contexts becomes a relevant area of international business research. Thus, examining globalized network antecedents through organizational aspirations provides a more intricate view that may shed new light into why and how ISAs take place.

From a social perspective, our results show that ISA formation is increased as firms are positioned more centrally in their networks, highlighting the positive effects of structural embeddedness akin to recent literature on the topic (Lavie & Miller, 2008; Yeniyurt & Carnovale,

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2017). Furthermore, geographically and economically distant ISA formation is also increased by firm's network centrality. Given that during internationalization, firms expand to geographically proximal countries and gradually move towards more distant countries (Beugelsdijk et al., 2017), this result shows that network centrality functions as a learning platform that enables firms to bypass difficulties and challenges related to physical distance.

On the other hand, knowing that economic distance reflects differences in factor costs, and in technological capabilities between countries affecting internationalization decisions and performance (Tsang & Yip, 2007), its significance is purposeful in the ISA context. Network centrality does not seem to affect cultural and administrative distant ISA formation, probably due to the high integration of the global pharmaceutical industry. In this sense, future studies may explore ISA activity of less globalized firms. While centrality captures positive social effects on ISA formation, consistent with evidence obtained in studies of repeated alliances (Goerzen, 2007), experience is left with marginal diminishing effects.

From a behavioral perspective, both count and distant ISA formation decrease as firm performance departs its aspirations, implying a symmetrical response for both positive and negative performance feedback. In line with our hypotheses, the decrease in ISA formation for positive aspiration performance would reflect inertial responses due to perceived opportunity costs associated with ISA. Excess slack would not be enough to overcome these cost, and firms could opt to act exploitatively. Opposite to our predictions, firm's performance below aspirations decreases ISA formation (i.e., number and distant). We fathom this behavior since underperforming firms may lack the necessary resources to implement new courses of action (Kuusela, Keil, & Maula, 2017; Ref & Shapira, 2017).

Beyond the main effects of network centrality and organizational aspirations, some combinations of the two, especially when firms exhibit performance below aspirations, enhance the effect of network centrality in promoting risk-taking behavior for negative aspiration performance and status quo for positive performance feedback. This is true for count ISA formation and economic

distant ISA types, hinting at the network core as the place to be if firms want to bypass organizational inertia, and possibly avoid early success traps (Rhee & Kim, 2015).

Another interesting implication of the results is that network centrality seems to enhance "problemistic search" in none other than count ISA formation or economic distant ISA, probably due to the differences observed in developed and emerging economies where firms originate. We believe that traditional risks associated with cultural, administrative and geographical cross-national distances are losing significance, especially in the aspect of coordination problems that arise from country-embedded organizational routines (Das & Kumar, 2010) and, thus, are having a low impact on ISA formation. On the other hand, network centrality increases the reluctance of high performing firms to engage in ISA formation. This result may suggest that expected returns from ISA formation are relatively low for successful firms, in line with the proposal made by Ahuja (2000b), and point to the potential existence of diminishing returns on ISA. Perhaps even more challengingly, the arguments presented jointly for count and distant ISA and the mixed results obtained, show that further research is needed to relate firm's social and behavioral perspective to strategic decision making affected by cross-national distance.

More generally, our arguments and results provide a centrality-based explanation for the aspiration constraints and opportunities that networks create for organizations. Although BTOF arguments provide a framework to understand why performance feedback motivates ISA formation, they have limitations in explaining the underlying mechanisms behind the effects of increasingly low and high aspirations' performance. The plethora of conflicting empirical results on organizational aspirations seen in the extant literature is perhaps the most striking and complex feature regarding the motivations behind organizations' willingness to internationalize via ISA. We address this by suggesting that firm's centrality in networks provides a relevant explanation for how organizations performing below or above their aspirations make ISA decisions. In fact, observing the moderating effect of degree centrality raises a strong case for additional research on how network measures affect the relationship between organizational aspirations and strategic changes for firms that go international.

Another implication of our work relates to how firm's aspirations and networks influence the cross-national distances among international partners. Our study raises the point that highly central, structurally embedded organizations behave similarly for both ISA intensity and distance. We believe this area of research needs to be further explored with respect to network evolution that includes ISA formation and potential termination.

Having said this, it is important to note that our approach is conditioned by several factors. To begin with, further research is needed to tease out mechanisms that affect ISA formation. Additionally, the use of large samples from archival data leaves unexplored processes that go on within organizations and that are at the core of the BTOF, especially concerning how managers think about and pursue changes in strategy. Caution is also warranted when assigning the weights to the aspirations' measure, as these might not reflect actual managers' view regardless of the statistical goodness of fit. Finally, the extrapolation of this study's results to other industries should be carefully motivated as the pharmaceutical industry evolution has historically depended on ISA which might be infrequent and of different strategic nature in other industries.

Nevertheless, our study is an attempt to integrate elements from both social and behavioral perspectives by providing a "centrality" nexus that we hope further bridges these concepts and lays foundations for future research. Specifically, new measures on network evolution could be proposed that help the academia understand the nature of organizational behavior in the network level, providing new insights on network consequences and aspiration antecedents as well as the exploitation of other behavioral concepts (e.g., organizational attention) and their potential role in the aspirations of a centrally networked firm. Additionally, future research could tease out differences between foreign and domestic partner selection mechanisms with respect to their aspiration performance and network alliance evolution.

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Table 1 – ISA by type

- Co-marketing
- Co-promotion
- Disease Management
- Includes Contract
- Includes Equity
- Includes Royalty or Profit Split Information
- Intra-Biotech Deal
- Joint Venture
- Manufacturing or Supply
- Marketing-Licensing
- Product or Technology Swap
- Product Purchase
- R&D and Marketing-Licensing
- Reverse Licensing

Source. Pharma and MedTech Business Intelligence
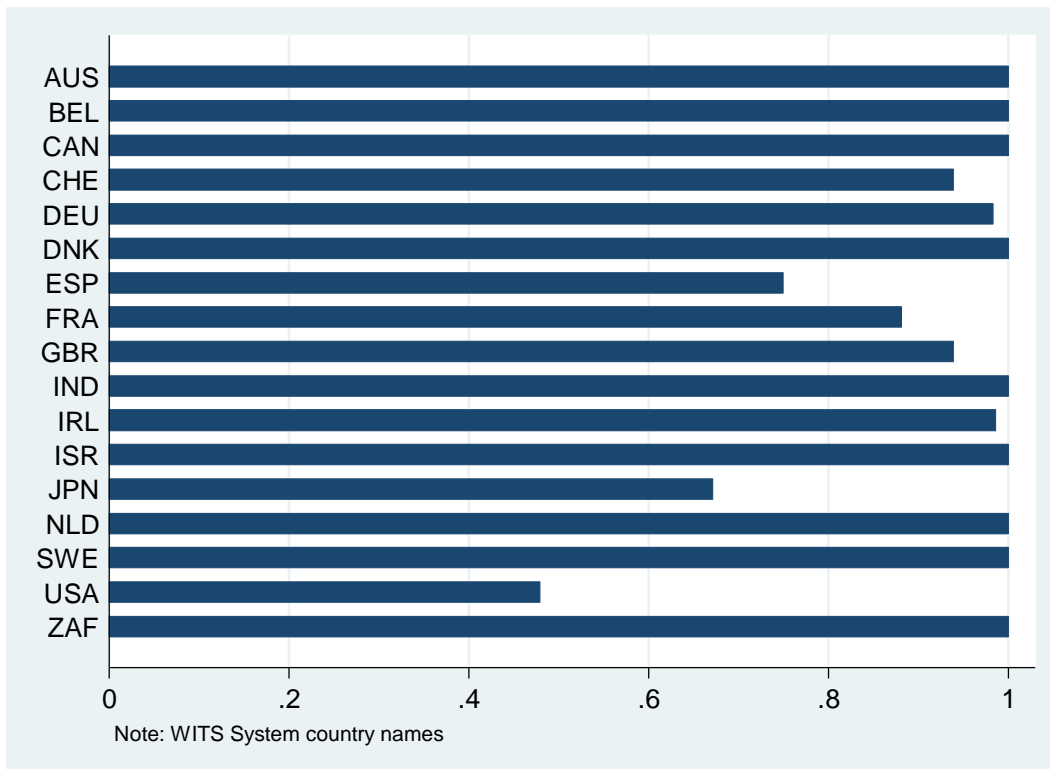
Figure 1 – Percentage of ISA by country

Note: WITS System country names

Table 2 – Means, standard deviations and Pearson correlations

	Variable	Obs.	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	ISA	1153	0.877	0.932														
2	ISA-CD	1153	2.940	1.899	0.83*													
3	ISA-AD	1153	2.439	1.752	0.84*	0.92*												
4	ISA-GD	1153	2.487	1.747	0.82*	0.92*	0.89*											
5	ISA-ED	1153	1.344	1.392	0.81*	0.75*	0.65*	0.67*										
6	Degree	1058	0	0.094	0.64*	0.52*	0.56*	0.53*	0.51*									
7	PBAL	911	0	0.077	-0.01	-0.05	-0.01	-0.04	-0.04	0.06								
8	PAAL	911	0	0.075	-0.07*	-0.05	-0.08*	-0.10*	-0.07*	-0.08*	0.14*							
9	Age	998	76.16	68.35	0.00	0.03	0.03	0.05	0.03	0.07*	0.13*	0.02						
10	Size	997	8.605	1.707	0.21*	0.17*	0.22*	0.20*	0.17*	0.49*	0.22*	-0.21*	0.33*					
11	Innovation	990	0.241	0.730	-0.03	-0.03	-0.02	-0.02	-0.03	-0.08*	-0.53*	-0.02	-0.15*	-0.31*				
12	Experience	1153	0.050	0.069	0.32*	0.27*	0.30*	0.28*	0.27*	0.60*	0.10*	-0.03	0.05	0.57*	-0.05			
13	Absorbed slack	696	0.538	0.662	-0.07	-0.06	-0.03	-0.06	-0.10*	-0.08*	-0.10*	-0.07	0.12*	-0.26*	0.69*	-0.04		
14	Unabsorbed slack	760	1.347	1.978	-0.07	-0.06	-0.08*	-0.05	-0.10*	-0.12*	-0.09*	0.44*	-0.24*	-0.47*	0.36*	-0.11*	0.16*	
15	Potential slack	728	0.224	0.481	-0.14*	-0.14*	-0.12*	-0.14*	-0.15*	-0.17*	-0.03	-0.01	-0.07	-0.28*	-0.02	-0.08*	0.32*	-0.06

Note: coefficients with stars are reported at * $p < 0.05$

Table 3 – Determinants of ISA formations

Model	1	2	3	4	5
Determinants of ISA formation	ISA	ISA-CD	ISA-AD	ISA-GD	ISA-ED
Constant	3.867***	9.415***	8.951***	7.867***	3.778***
Controls					
Age	-0.033***	-0.085***	-0.080***	-0.066**	-0.030*
Size	0.036	0.135+	0.073	0.092	0.101*
Innovation	0.460*	0.609+	0.954**	0.506	0.388
Experience	-2.906***	-2.868***	-1.846***	-2.846***	-3.897***
Absorbed slack	-0.371*	-0.126	-0.317	-0.264	-0.294
Unabsorbed slack	-0.028	-0.000	0.034	0.013	-0.102
Potential slack	-0.074	-0.316	-0.176	-0.523	-0.281
Main effects					
Degree	2.281**	2.124	2.577	2.482+	4.338**
PBAL	1.404***	1.695*	2.159**	1.489*	1.811**
PAAL	-2.073*	-3.972*	-4.026*	-4.790**	-2.544+
Interactions					
Degree x PBAL	-6.046*	-2.203	-6.008	-2.773	-9.473+
Degree x PAAL	-15.90*	-53.72***	-32.39*	-30.30*	-26.31+
Model statistics					
Within – R squared	0.267	0.123	0.137	0.124	0.172
N	558	558	558	558	558

Coefficients reported at + p<0.1, * p<0.05, ** p<0.01, *** p<0.001

Figure 2 – Moderation effects of network centrality on aspirations and ISA formation