Leveraging learning forces in asymmetric alliances: small firms' perceived power imbalance in driving exploration and exploitation

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Abstract: Prior studies on power and interfirm learning in alliances have devoted limited attention to multiplicate influences of diverse power sources on exploration and exploitation and whether such influences on these two strategies are similar or different. This study investigates the joint effects of two types of perceived power—capability-driven power and position-driven power—on exploration versus exploitation in asymmetric alliances. Using a sample of 205 high-technology firms in China, the analyses suggest that each of the two types of perceived power separately has no direct effects on either exploration or exploitation. However, they complement (multiplicative effects) each other in promoting exploitation and exploration. Interestingly, the balanced effect of perceived position-driven power and perceived capability-driven power is positively related to exploration, while no such an impact is found in terms of exploitation. This study provides alternative insights about inter-organizational learning in asymmetric alliances and points out a direction for future research.

Key words: alliance; asymmetric relationship; exploitation; exploration; perceived power; small firm.

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1. Introduction

This study investigates how allying with large partner firms that hold multiple types of power affects small firms' exploration and exploitation. Exploitation relates to the making of incremental improvements to existing products using existing technologies or competencies, whereas exploration concerns the development of new products that depart from existing knowledge or technological trajectories (Levinthal and March, 1993). Scholars have examined small firms' exploration and/or exploitation strategies with their dominant partners in alliance settings (Rothaermel and Deeds, 2004; Velu, 2015; Yang, Zheng, and Zhao, 2014). Such asymmetric alliance relationships entail substantive power imbalance which dominant partners can draw on to force small firms to exploit or explore in a specific knowledge domain (Cheng, 2012). Given the fact that power in alliance settings is a multifaceted concept with diverse types or sources such as advantageous tangible assets, tacit knowledge, or position (e.g., Johnson et al., 1993; Perrons, 2009), small firms may perceive multiplicate influences from different power sources during their learning processes. Then, how do different types of power interact with each other in influencing exploration versus exploitation?

Power imbalance has been recognized to affect alliance firms' social psychological processes (Zeng and Chen, 2003) when coordinating and integrating boundary-spanning resources (Frazier and Rody, 1991). According to Perrons (2009), small firms may be motivated to follow the partners' footsteps and learn in certain areas because of their dependence on large partners' capability or market status. In some situations, small firms may also be forced to exploit specific knowledge even if they do not intend to (Li and Rowley, 2002). Their initiatives to conduct exploration or exploitation are thus determined by motivational forces stemming from their power-dependence alliance relationships. This is verified by Katila, Rosenberg, and Eisenhardt (2008) who examined technology ventures' resource acquisition when they ally with established, powerful firms. As indicated by Cheng (2012), perceived power may lead small firms to timely adjust their efforts and inputs in pursuing exploration versus exploitation. Nevertheless, the mainstream literature all examined the effect of one specific source of power on alliance firm's exploration and/or exploitation, neglecting the multiplicate effects of multiple power sources in an asymmetric alliance. Moreover, exploration and exploitation are

associated with different levels of risks and management challenges (Enkel, Heil, Hengstler, and Wirth, 2017; Gilsing and Duysters, 2008; Yang et al., 2014), yet it is unclear whether perceived power may exert similar or different impacts on exploration versus exploitation.

This study strives to fill the gaps by exploring the joint effects of two types of perceived power—capability-driven power and position-driven power—on exploration versus exploitation in asymmetric alliances. Instead of drawing attention to dominant partners who exercise the power, the focus here is small firms who perceive power imbalance. It also investigates perceived power imbalance instead of real, objective power because a small firm's judgment and strategic decision for learning are based on its perception of power (e.g., Bitektine, 2011). This paper unpacks what has been referred to as positional (Ibarra, 1993) and capability (Kankanhalli, Tan, and Wei, 2005; Mudambi and Navarra, 2004) aspects of intra-dyad power. Position-driven power refers to the ability to evoke a change based on a position with entitlements as being endowed by formal business agreements (Gaski, 1984), and capability-driven power captures such an ability that stems from advantageous capabilities or resources. While both perceived position-driven power and perceived capability-driven power exert influence on a small firm's knowledge-related activities in distinctive ways, they may also interact with each other (cf., Ibarra, 1993). Moreover, existing studies have suggested that a firm may combine different types of power when exerting influence on partners (Elking et al., 2017), which demonstrates an enhanced motivational force driving partners' knowledge-related activities. This study thus devotes attention to the joint effects of positional and capability power. According to Venkatraman (1989), combinations of them can be created in two ways (also see, He and Wong, 2004): First, a combination can be defined as complementarity if the two types of perceived power each obtain high scores; Second, a combination can be defined as balanced if the two types of perceived power exhibit little absolute difference in terms of scores. This paper examines the complementary and balanced effects of perceived position-driven power and capability-driven power on exploration and exploitation, respectively.

As one of the first that integrates different types of perceived power into the examination of exploration/exploitation in alliances, the present study contributes to existing literature in two ways.

First, it adds to the understanding of inter-organizational learning in asymmetric alliances by revealing how learning can be driven when a dominant partner with diverse power sources exerts multiplicate influences. Prior studies have introduced power to explain alliance firms' learning behaviors (Cheng, 2012; Dyer and Nobeoka, 2000; Li and Rowley, 2002), whilst little is known about small firm's strategies of exploration and exploitation when allying with a partner that has diverse sources of power. By differentiating between perceived position-driven power and capability-driven power, this study suggests that small firms' inter-organizational learning can be driven when these two types of power work in combination instead of independently. The findings show that the pursuit of exploratory and exploitative learning may relate to different configurations of perceived position-driven power and capability-driven power (i.e., balanced or complementary).

Second, this study contributes to the literature on resource dependence between alliance partner firms. While Pfeffer and Salancik's (1978) resource dependence theory suggests that interfirm arrangements help manage interdependence and lead to enhanced performance (Drees and Heugens, 2013), recent studies have switched their focus to how partner firms leverage interfirm knowledge and promote learning in the presence of dependence asymmetry (Hillman and Dalziel, 2003; Howard et al., 2016; Katila, Thatchenkery, Christensen, and Zenios, 2017). Nevertheless, they all consider dependence asymmetry a precondition, neglecting its own role in promoting organizational learning in interfirm settings. The present study adds to this line of inquiry by introducing dependence asymmetry as a predictor of inter-organizational learning. Further, while existing bargaining power studies have indicated that different power bases may function either positively or negatively in affecting relationship and performance (e.g., Nyaga, Lynch, Marshall, and Ambrose, 2013; Pulles, Veldman, Schiele, and Sierksma, 2014; Villena and Craighead, 2017), this study moves one step further, suggesting that different power bases interact with each other in driving partner firms' learning-related behaviors. It thus opens a gate to exploring how the benefits of different types of power can be strengthened and the liabilities being weakened through synthesizing different power sources.

2. Theory and hypotheses

2.1 Power in interfirm contexts

A classic definition of power at the individual level offered by Mechanic (1962, p.351) refers to "any force that results in behavior which would not have occurred if the force had not been present", indicating the diversity of power sources residing in interpersonal and intra-organizational contexts. A power holder influences a target through positional bases such as coercion, reward, and legitimacy as well as personal or capability bases, including expert and referent (French and Raven, 1959). According to bargaining power theory (Bacharach and Lawler, 1981), an imbalance of power widely exists between organizations. Due to the stakes of alliance firms and the availability of alternatives, a large firm has the potential to exert influence over its small partners (Luo, 2006; Yan and Gray, 1994). When a small firm's stakes lie in the resources that its dominant partner has, they will form a resource dependence relationship in which the control of critical resources constitutes interfirm power (Pfeffer and Salancik, 1978; Casciaro and Piskorski, 2005). While power imbalance exists between organizations in different forms and with diversified effects (Cheng, 2012; Elking et al., 2017), a full understanding of intra-dyad power could be helpful in improving alliance collaboration.

As conceptualized here, intra-dyad power concerns the extent to which one partner firm enforces decisions over others (Johnson et al., 1993; Perrons, 2009). In order to clearly identify how intra-dyad power influences the functioning of asymmetric relationships, the present study here differentiates between two types of power, namely position-driven power and capability-driven power, to capture formal and informal aspects of power. Scholars have mainly referred to either formal or informal aspect of power bases for imposing decisions over partner firms in alliance contexts (Gaski, 1984; Gawer and Cusumano, 2002; Kankanhalli et al., 2005; Mudamdi and Navarra, 2004). An alliance firm may obtain position-driven power when it reaches formal business agreements and draws on its advantageous position in such a formal relationship to enforce decisions. It may also exert informal influences over its partner firms if it possesses advantageous resources or capabilities. Moreover, the identification of positional and capability dimensions of power falls right into the track of the differentiation between coercive aspects of intra-dyadic power and softer power bases discussed in prior studies (e.g., Doherty and Alexander, 2006; Quinn and Doherty, 2000). The positional aspect of power is suggested to be coercive. In the frame of formal alliance agreements, an advantageous

position is associated with rights to enforce decisions. When an alliance firm takes up a position with entitlements to interfere with partner's alliance activities, the stakes at hand will cause this partner firm to accept any reinforcements (Pulles et al., 2014). In contrast, capability aspect of power is supposed to be softer in influencing partner firms' behaviors (cf. Gawer, 2009). This is because advantageous knowledge or capabilities can be used to guide instead of controlling behavior (Kankanhalli et al., 2005). While power is a concept prevailing in individual-level studies, the differentiation between position-driven power and capability-driven power in alliances is analogous to the conceptualization of individual power that relates to positional (i.e., coercive, reward, and legitimate) and personal bases (i.e., referent and expert) (French and Raven, 1959). As conceptualized here, position-driven power stems from the dominance of an alliance relationship which is endowed by formal business agreements (Gaski, 1984). It is thus associated with rewards and punishments, which is similar to positional power at the individual level. Capability-driven power stems from an alliance firm's advantageous expertise or capabilities, which is analogous to individual's personal bases of power demonstrated by French and Raven (1959).

Specifically, position-driven power demonstrates the potential to enforce decisions by advocating positional advantages endowed by formal business agreements. For example, a platform owner, even an emergent one with low capability, has positional advantages to integrate and distribute resources among other participants on this platform. Position in an alliance relationship describes how the firm is contractually related to other firms (Olsen et al., 2014), referring to attributes such as stakes in the partnership, promised inputs, entitlements, as well as associated rights to offer rewards and punishments. A strategic position, which demonstrates the potential to make promises of reward and to deliver the promised outcomes (Thibaut and Kelley, 1959), represents the privilege of extracting and distributing relationship value and information flow between partners (Sydow and Windeler, 1998). Positional advantages are widely considered as the facilities of rules design and integration in partnerships (e.g., Brusoni and Prencipe, 2006; Ibarra, 1993), which could inevitably affect the ways partners embed into the relationship. By obtaining a strategic position, a firm ensures the control of the reinforcements (e.g., rewards or punishments) that guide its partner firm's behavior (Tedeschi, Schlenker, and Lindskold, 1972). In this sense, a small firm perceiving such power may be forced to

conduct activities its dominant partner indicates. Therefore, perceived position-driven power can be considered as a *pushing* force on small firms' behaviors.

Capability-driven power is associated with advantageous capabilities or resources including tangible resources and intangible assets. For example, Amazon enjoys its leadership on its own online shopping platform, whereas Apple's advantageous technology and brand ensure that the firm holds priority in the relationship with Amazon when selling products on this platform. Because a dominant partner's capability advantages in interfirm contexts can always be helpful in upgrading the small firm's technical or marketing capacity (Lin, Yang, and Arya, 2009), those that constitute distinctive, unique capabilities such as technical know-how, tacit knowledge, and patents result in dependence (Pfeffer and Salancik, 1978), thereby indicating the imbalance of power (Casciaro and Piskorski, 2005). Such asymmetric relationships allow the small firm to learn and grow while entailing a lower extent of coercion and inflexibility than the relationships with position-driven power. It could then motivate the small firm to contribute to joint activities (Zmud, 1984). When perceiving capability-driven power, the small firm may be attracted to spontaneously conduct activities its dominant partner alludes to. Thus perceived capability-driven power can be considered as a *pulling* force that drives the small firm toward conducting strategy-oriented, mutually beneficial behaviors. A comparison between position-driven power and capability-driven power can be seen in Table 1.

Insert Table 1 about here.

2.2 The effects of perceived power on exploitation and exploration

Bargaining power scholars have referred to interfirm learning when facing power imbalance and have relied on power exercise to predict firms' responses in an inter-organizational relationship (e.g., Chae, Choi, and Hur, 2017; Howard, Withers, and Tihanyi, 2016; McEvily, Zaheer, and Kamal, 2017). When a large firm takes up a position with entitlements in an asymmetric relationship, it has the potential to draw on the small firm's stakes at hand to exert influence. Because the power imbalance

in the relationship can be forceful and coercive (e.g., Etgar, 1976), the small firm could be compelled to adopt or develop knowledge that it did not intend to. The influences a large firm holds over the small firm may stem from valuable, critical resources or capabilities (Pfeffer and Salancik, 1978). Dependence on such resources or capabilities could also promote the small firm to conduct learning following the large firm's footsteps even if it is not forced to (Perrons, 2009). When the small firm perceives influences and power imbalance in an asymmetric relationship, it may be motivated to exploit or explore within organizational boundaries (Cheng, 2012). From this perspective, perceived power may influence interfirm knowledge flow, and will also affect the input of integrating, processing, and transforming product knowledge within organizational boundaries.

While perceived power has the potential to drive exploitation and exploration, the functioning of different types can be different. Perceived position-driven power is supposed to push the small firm in the direction the dominant partner suggests. This is because, according to bargaining power theory (Bacharach and Lawler, 1981), a small firm to acquire economic rewards or avoid economic punishments is forced to enhance its commitment and then, its motivation to process existing knowledge or to seek new knowledge (Morgan and Hunt, 1994; Jap, 2001). Processing existing knowledge (exploitation) legitimizes the firm's rent-seeking activities, while seeking and generating new knowledge (exploration) improves its bargaining position when requesting increasing economic rewards. In contrast, perceived capability-driven power helps create an atmosphere in which the small firm inherently desires to bond with the dominant partner to learn and grow (Frazier and Summers, 1984), thereby pulling the small firm toward exploration and exploitation. In essence, small firms normally expect to obtain extensive support (e.g., goal-framing and problem-solving) from their dominant partners (Lindenberg and Foss, 2011) so that the partners' resources or capability might be leveraged to improve their own R&D capacity (Schreiner, Kale, and Corsten, 2009). Such an expectation motivates them to deepen their relationships with their large partners, thus enhancing their willingness to accelerate exploratory and exploitative learning (see, Selnes and Sallis, 2003). Specifically, the desire to create variety in experience and capacity calls for exploratory learning, whereas the desire to create reliability requires exploitative learning (Holmqvist, 2004). To summarize, the 'push-pull' effects imposed by perceived position-driven power and capability-driven power

enhance the small firms' willingness to contribute to interrelated activities (Zmud, 1984), thereby shaping their behaviors toward exploration and exploitation.

However, there exists an opposite tendency through which perceived power brings about detrimental impacts on exploitation and exploration. Specifically, because position-driven power relates to coercion and control, it may incur conflict and distrust (Das and Teng, 1998; Gaski, 1984), and will also result in inflexibility in terms of knowledge searching and development (Benner and Tushman, 2003; Casciaro and Piskorski, 2005). Capability-driven power is supposed to be less coercive than position-driven power and thus, may cause less inflexibility and conflict. Nevertheless, a lack of perceived coercion and economic reinforcements may weaken the interaction between alliance partners and lead to low relationship commitment (Cook and Emerson, 1978), which causes a failure of driving relationship-specific learning activities (cf. Foucault, 1980).

Because perceived position-driven power and capability-driven power have the potential for both positive and detrimental impacts on exploration and exploitation, the present study argues that a combination of these two could provide us with a clearer picture of the impacts in such situations. Using two alternative measures of joint effects adapted from Venkatraman (1989) and He and Wong (2004), complementarity and balance, this paper examines how the two types of power jointly affect exploratory and exploitative learning. Complementarity means that they add value to each other to promote organizational learning, i.e., there is an interaction effect between these two on learning strategies. In contrast, balance refers to a match of these two power types, i.e., an absolute difference (He and Wong, 2004). It is expected that different configurations of perceived position-driven power and capability-driven power influence exploitation and exploration in different ways, as discussed in the following sections.

2.3 The complementary effect of perceived positional and capability power

This study argues that perceived position-driven power and capability-driven power can complement each other in ways that enhance the positive impacts and alleviate the negative impacts in pursuit of knowledge exploration. First, a complementary effect is concerned with enhancing each of their functions (i.e., push and pull) in developing novel conceptions. While perceived

capability-driven power acts as a pulling force that drives the acquisition and development of new knowledge, such a benefit goes beyond knowledge access by leveraging the factors based on perceived positional control. Perceived position-driven power ensures the consistency of decision-making and behaviors between partner firms and brings about a legitimacy effect (Koka and Prescott, 2008). According to Podolny (2001), behavior consistency leads to a situation in which the small firm's learning benefits both itself and the whole relationship, thereby enhancing the dominant partner's willingness to involve itself in the small firm's knowledge-related activities. This could then strengthen the 'pulling' effect of perceived capability-driven power on exploratory learning as both parties could be driven to devote time and energy to the relationship. Further, perceived positional control may lead the small firm to foster common knowledge about working procedures or experiences with its dominant partner (Srikanth and Puranam, 2011), which could be helpful in promoting the process through which perceived capability-driven power drives the exploration of novel technologies. Similarly, while perceived position-driven power promotes exploratory learning by providing economic reinforcements (Frazier and Rody, 1991), such benefit may be enhanced by capability-driven power. Perceived position-driven power relies on economic reinforcements to drive a small firm's exploratory behaviors, while the willingness to take the behaviors is highly dependent on the size of the reinforcements. Within the frame of behavior pulling induced by capability-driven power, the small firm can be further motivated to take risks of exploring in uncertain technological fields or market areas. The rationale is that the small firm normally tends to bond with the dominant partner to enhance its R&D capacity, thus complementing the positional forces which are normally associated with the exchange of information limited by alliance participants' alternatives (Bacharach and Lawler, 1980) and then increasing the chances of successful exploration (Rothaermel and Deeds, 2004). By engaging in a relationship where the two types of perceived power co-exist, the small firm can easily accept and comply with the perceived positional control because it obtains returns exceeding the benefits of economic reinforcements (Perrons, 2009), thereby increasing the possibility that the 'pushing' force drives the development of novel technologies.

Second, such complementarity also refers to the alleviation of negative impacts when developing new knowledge. As mentioned above, position-driven power could lead to resistance that hampers

boundary-spanning learning. Such resistance stems from the tension which may occur if the small firm is unlikely to acquire as much value as is being appropriated by the dominant partner (e.g., Li et al., 2008). Because capability-driven power opens a gate to enhance the small firm's capacity, which reduces the extent of imbalance in relational exchange (i.e., the dominant partner is supposed to gain more benefits than the small firm), a significant transformation of collaboration attitude could then be expected in the direction of deep embeddedness. Meanwhile, the dominant partner that possesses both positional and capability advantages are supposed to be reliable in leading interfirm activities, thus causing little resistance when creating, extracting, and distributing relationship value. Consequently, while position-driven power relies largely on perceived coercion to proceed with the small firm's development of new technologies, capability-driven power could reduce the impression of coercion by transferring the impression of informal influence (Frazier and Rody, 1991; Das and Teng, 1998).

Taken together, although perceived position-driven power and capability-driven power each brings about positive and detrimental effects on knowledge exploration, a combination could lead to positive impacts. This study thus hypothesizes that,

Hypothesis 1: Complementary position-driven power and capability-driven power is positively associated with knowledge exploration.

In a similar vein, this paper posits that the two types of perceived power complement each other in driving exploitation. More specifically, they could enhance each other's functions in promoting the small firm's exploitative learning. The impact of capability-driven power on pulling the small firm toward improving existing technologies could be enhanced by position-driven power because economic reinforcements ensure the consistency of decision-making and behaviors as well as the motivation of internal knowledge processing. The pushing effect of position-driven power on the small firm's exploitative behaviors could also be strengthened by capability-driven power as it increases the small firm's willingness to bond with the dominant partner. Furthermore, the complementarity also relates to the alleviation of each other's negative impacts. The potential conflicts caused by positional attributes can be significantly alleviated by capability advantage because it navigates the relationship toward enhanced mutual dependence and trust (Dekker, 2004). Although perceived positional advantages may relate to the risks of knowledge appropriation (Katila

et al., 2008), such mutual dependence and trust reduces the small firm's feeling of uncertainty in pursuing knowledge exploitation (Rothaermel and Deeds, 2004). Therefore, it is expected that complementarity between the two types of power promotes exploitation by maintaining productivity (Benner and Tushman, 2003) and achieving reliability and organizational renewal (Stettner and Lavie, 2014). This study then hypothesizes,

Hypothesis 2: Complementary position-driven power and capability-driven power is positively associated with knowledge exploitation.

2.4 The balanced effect of perceived positional and capability power

Alternatively, knowledge exploration may be driven by striking a balance between perceived position-driven power and capability-driven power. The balanced effect implies equilibrium between these two. The benefits stemming from them could then be well leveraged, thus leading to a situation in which both forces act as impetuses of exploration.

Successful knowledge exploration requires that the small firm conducts persistent external searching and in-house experimental activities (Lavie and Rosenkopf, 2006). However, an imbalanced state of the two types of perceived power may fail to promote the small firm's exploration. When position-driven power is strong and capability-driven power is weak, the small firm will mostly be motivated by its dominant partner's economic reinforcements. Due to the lack of strong capability-driven power, the small firm's focus will be on the pursuit of short-term interests instead of the exploration of uncertain technological domains. Thereafter, it may not be willing to conduct high investments but rather, prefers in-house experimental activities with low risks and high efficiency, thereby driving out exploratory behaviors. Alternatively, if capability-driven power is strong and position-driven power is weak, the small firm will be motivated to conduct external knowledge searching and exploration but may find it difficult to invest persistently into exploratory behaviors due to the lack of economic rewards. As small firms are normally weak in capability, they will need continuous economic returns to support their operations. Given the situation of weak position-driven power, a small firm may not obtain enough economic incentives from the relationship that sustain its long-term exploration. Even if strong capability-driven power could pull the small firm toward

searching new knowledge, it would not be a sustainable way to drive knowledge exploration. Moreover, because of the limited economic reinforcements in coordinating interfirm strategies and behaviors, the small firm may choose to use the acquired knowledge in ways that benefit itself rather than the alliance relationship (Teece, 2000), thereby leading to ineffectiveness in pursuing boundary-spanning synergy.

Further, a state of imbalance between the two types of power may evoke the detrimental impacts they are likely to exert on exploration. When position-driven power is strong and capability-driven power is weak, the small firm may reduce its exploration due to the concern of conflicts. Specifically, the lack of the pulling effect may increase the possibility of conflicts because too much position-driven power could lead to distrust and low commitment (Frazier and Rody, 1991). In some extreme situations, the small firm may choose backward or forward integration to avoid the ineffectiveness stemming from conflicts, thereby increasing the input along the existing technological trajectory at the expense of investing in knowledge exploration. When position-driven power is weak and capability-driven power is strong, there is a low risk of conflicts but also low relationship commitment, which predicts low exploration in the relationship. In the absence of positional advantages, the detrimental impact of lowered relationship commitment may be expanded because the small firm is not able to obtain enough economic returns from the relationship. This may significantly reduce the small firm's motivation to explore in uncertain technological fields or market areas.

A balanced position-driven power and capability-driven power implies that the pulling and pushing forces have similar strengths, which ensures that both of the two types of perceived power could play their respective roles in promoting the small firm's exploratory learning. The balance in the configuration of power may relate to a stable alliance relationship, thereby facilitating the use of relationship routines for acquiring and experimenting with new knowledge (Stettner and Lavie, 2014). Given a coherent learning environment, the perceived positional control influences the small firm to the extent that is neither too strong to stimulate new knowledge creation nor too weak to preserve an effective exploration routine (McGrath, 2001). Thereafter, the small firm is willing to foster strong and proactive alliance relationships to gain persistent support (Van de Ven and Walker, 1984). Such a matching state could then entail knowledge exploration with low R&D risk because of the

anticipatable investments and controllable behaviors.

Therefore, this study hypothesizes that,

Hypothesis 3: Balanced position-driven power and capability-driven power is positively associated with knowledge exploration.

Similarly, balanced position-driven power and capability-driven power may positively relate to knowledge exploitation. As mentioned above, perceived capability forces help enhance relational exchange that promotes the acquisition of complementary assets, while perceived positional advantages ensure that the small firm focuses on the specific technology area to improve, refine, or commercialize existing products. To strike a balance between the two types of power is to foster an atmosphere in which the benefits of both can be released and the constraints being alleviated, thereby driving the small firm's exploitative behaviors in the direction of value co-creation (Adner and Kapoor, 2010). Thereafter, the small firm could have a positive attitude towards coordinating inter-related activities and is likely to comply in the face of perceived power imbalance. Such an attitude leads the small firm to invest in improving product quality or reducing production cost, with the purpose of making the exchange relationship stronger (Frazier and Rody, 1991). This study then proposes,

Hypothesis 4: Balanced position-driven power and capability-driven power is positively associated with knowledge exploitation.

3. Methodology

3.1 Sample and data collection

The empirical setting is China's high-tech industry. China has become one of the largest economic entities in the world. The development of high-tech industries has been paid enormous attention and is now considered a national strategy for boosting economic growth. Total R&D expenditure in China exceeded $300 billion in 2014, which is more than the sum of the total R&D of 28 European Union member countries (OECD, 2014). In 2013, China filed 21,516 international patent applications, ranked third in terms of total number (World Intellectual Property Organization, 2014). In addition,

China's high-tech industries have witnessed numerous alliances for pursuing collaborative R&D (Gu and Liu, 2014). All these factors indicate that this setting is suited to the present study. The data was collected in the Pearl River Delta, Yangtze River Delta, and Beijing district—the three most developed areas in China, which account for 45.8% of gross domestic production and 69.7% of the country's total high technology output. A sampling frame of 500 high-tech firms from a list compiled by regional Science and Technology Departments in these areas was obtained.

The questionnaire was originally designed in English and then translated into Chinese by two independent translators familiar with management research. The back-translation was conducted with special attention being paid to eliminating misunderstanding. To ensure face and content validity, the authors interviewed 15 senior managers and 6 scholars to refine the question items. The questionnaire was finalized after conducting a pretest with 32 top or senior managers.

While a choice of multiple informants might have been preferable, this study selected one top manager (general manager/president/CEO) or senior manager who was involved in strategic decisions and worked closely with the top manager in each firm as the key informant. Prior studies have demonstrated that senior managers are familiar with interfirm collaboration issues as well as innovation-related knowledge (Li et al., 2010), and provide information as reliable and valid as that from multiple informants (Li and Zhang, 2007; Zahra and Covin, 1993).

Following Rodan and Galunic (2004), this study invited the informants to participate in a computer-based survey. To ensure a high response rate, the authors first contacted local government departments (e.g., Department of Science and Technology, regional Economic and Information Technology Commission or Development and Reform Commission) and asked them for help in coordinating the survey. Government support can be especially helpful in obtaining valid and complete information in emerging economies such as China (cf., Zhao and Chadwick, 2014). The informants who agreed were asked whether their firms had been or were currently involved in alliance relationships in which the partners were significantly more advantageous than themselves in terms of revenue, technological capability, reputation, or position in the value chain. A total of 38 firms claimed no such relationships and were excluded from the sample. Borrowing from Yang et al. (2014) who defined small firms as those with revenue of less than $100 million and large firms as those with

revenue of more than $1 billion, the present study included sample firms that had dominant partners with annual revenue of more than 10 times theirs. This measure clearly demonstrated the comparative advantage a dominant partner might hold over the small firm, thus enabling the investigation of the imbalance of power. After finalizing the sample list, the authors sent each informant a diskette containing a letter explaining the background and instructions. The computer-based questionnaire was then sent by email. The authors also provided the contact information of a research team member so that the informants could make inquiries if necessary. To avoid potential social desirability bias (Podsakoff et al., 2003), the informants were asked to complete the questions as honestly as possible as there were no right or wrong answers, and it was ensured that the informants' responses were anonymous and confidential. After completion, the informants replied via email, attaching the completed questionnaires. Overall, 229 questionnaires were received (a response rate of 45.8%). After excluding uncompleted and unusable responses, the final sample consisted of 205 firms from various high-tech industries (electronic and information technology, 41.5%; new energy and new material, 16.1%; mechanic and electronic equipment, 19.5%; new pharmaceuticals and bioengineering, 10.2%; others such as aerospace and semiconductors, 12.7%). The authors checked the non-response bias by comparing the responding firms and non-responding firms in terms of firm age and size, and found no significant difference.

3.2 Measurement

The questionnaire was developed on the basis of previous studies and theories. This study used existing measures and question items whenever possible. All the perceptual items were rated based on a seven-point Likert scale (1=strongly disagree, 7=strongly agree), and are summarized in the Appendix.

Dependent variables. The measurements of *exploration* and *exploitation* were adapted from He and Wong (2004). Specifically, the scale of *exploration* indicates activities including (1) introduce new generation of products, (2) extend product range, (3) open up new markets, and (4) enter new technology fields. The scale of *exploitation* indicates activities including (1) improve existing product quality, (2) improve production flexibility, (3) reduce production cost, and (4) improve yield or reduce

material consumption.

Independent variables. To measure perceived power, the authors asked the respondents to rate the extent to which they perceive that the dominant partner impose decisions by (1) administrating the distribution of resources, (2) controlling knowledge/information flows, (3) dominating the design of rules, (4) controlling value extraction and distribution, (5) intervening in the development of product technologies, (6) influencing the strategies of market expansion, and (7) deciding on the ways of knowledge integration. This study developed each item of this scale based on a careful review of literature. It highlights the attributes of perceived power for imposing decisions emphasized by Hunt and Nevin (1974) and Frazier and Rody (1991). The first four items capture the positional dimension of intra-dyad power a small firm may perceive. They reflect perceived power that are coercive, and that are dependent on bargaining position and the stakes of a small firm in a given relationship. The last three items concern the capability dimension of intra-dyad power. The influences reflected in these items can be less coercive than that in the first four items, and are less likely related to economic punishments. When developing the items, the literature that specifies positional or capability attributes of intra-dyad power was reviewed (e.g., Dhanaraj and Parkhe, 2006; Henderson and Clark, 1990; Perrons, 2009). The authors first extracted elements from the literature that may reflect the meaning of perceived position-driven power or capability-driven power. Specifically, the review of literature suggests that there are at least four behaviors associated with position-driven power: resource allocating (Emerson, 1962; Johnson et al., 1993; Olsen et al., 2014), rules designing (Brusoni and Prencipe, 2006; Olsen et al., 2014), value extracting and distributing (Agarwal, Croson, and Mahoney, 2010; Jap, 2001), and knowledge flow administrating (Dhanaraj and Parkhe, 2006; Mudambi and Navarra, 2004). Resource allocating refers to the influence on allocating valuable resources. Rules designing is related to the domination of coordination rules that the small firms should obey when interacting with their dominant partners. Value extracting and distributing concerns the power to extract and distribute collaboration interests among partner firms. Knowledge flow administrating shows the aspect of power that can be leveraged in dominating the flow of knowledge. Each of these behaviors is based on dominant firms' positional advantages, and has been identified as an important element of power exercise process. Similarly, the authors identified three behaviors relating to

capability attributes of power, namely, intervening in product development (Gawer and Cusumano, 2002; Perrons, 2009), influencing market expansion (Dyer and Nobeoka, 2000; Gawer, 2009), and coordinating knowledge integration (Patel and Pavitt, 1997). Intervening in product development is associated with a dominant partner's capability advantage that can be leveraged for promoting the small firm's product development. Influencing market expansion concerns a dominant partner's role in guiding the small firm's market expansion behaviors. Coordinating knowledge integration refers to a dominant partner's capability advantage which helps promote the small firm's knowledge integration and absorption. Face-to-face interviews with managers and scholars were conducted, inquiring if there were other behaviors that should be included or some of the seven behaviors that should be removed. The authors then conducted a pilot study to explore the factor structure of intra-dyad power, and finalized the item pool. Collectively, it is expected that these items capture some essence of intra-dyad power. Following Venkatraman (1989) and He and Wong (2004), this study operationalized the *complementary* effect by creating the interaction term and mean-centered the two power variables prior to it; the authors operationalized the *balanced* effect by calculating the deviation score between the two variables (i.e., |perceived position-driven power－perceived capability-driven power|) and subtracting the deviation score from 7. The measure was reversed so that a higher value indicated a higher level of balance.

Control variables. This study controlled for variables that had been found to affect knowledge exploration, and variables that could be related to alliance relationship (Adner and Kapoor, 2010; Yang et al., 2014; Zhou and Li, 2012). At the firm level, the control variables that this study used included *firm size* (i.e., the natural log of the number of employees), *firm age* (the number of years since founding), *ownership* (1=state-owned, 0=otherwise), and *type of industry* (0=electronic and information technology, 1=otherwise). This paper also controlled for *R&D competence* with three items adapted from Yam and colleagues (2011) reflecting the quality, speed, and effectiveness of transferring and applying knowledge among manufacturing, design, and development. At the interfirm level, this study controlled for *duration* (the number of years of collaboration), *equity* (1=yes, 0=no), and *relationship substitutability*, which indicated the possibility of the firm finding a new

relationship to replace the original one. Following Zhou and Li (2012), the present study controlled for environmental variables, including *competitive intensity* and *technological dynamism. Competitive intensity* was measured using three items: promotion wars, competitive responses, and the extent of intensity. *Technological dynamism* was measured using two items indicating the speed and the provided opportunities of the technological change.

3.3 Construct validity

This study used exploratory factor analysis to reduce the seven items of intra-dyad power into two variables that could be explained as perceived position-driven power and perceived capability-driven power (Table 2). Confirmatory factor analysis was then conducted to test the construct validity. The fit indexes of the two-factor model indicated that the overall model fit the data well (CMIN/DF=2.059, GFI=0.973, CFI=0.985, IFI=0.985, RMSEA=0.072). The standardized factor loadings were above 0.7, with all items loaded significantly on the corresponding latent constructs (p=0.000), thus showing convergent validity. A chi-square difference test between a one-factor model and a two-factor model showed good discriminant validity (p=0.000). The 95 percent confidential interval around the correlation estimates between perceived position-driven power and perceived capability-driven power did not include a value of one, again indicating discriminant validity (Anderson and Gerbing, 1988). To assess the scales' internal consistency and reliabilities, this study computed Cronbach's alpha, and observed that both were well above the recommended threshold of 0.7 (0.882 for perceived position-driven power and 0.821 for perceived capability-driven power).

Insert Table 2 about here.

In the same way as described above, this study estimated separate first-order measurement models for the remaining multi-item variables (exploitation, exploration, R&D competence, competitive intensity, and technological dynamism) to assess construct validity and reliability (overall model fit indexes: CMIN/DF=1.806, GFI=0.912, CFI=0.941, IFI=0.943, RMSEA=0.063). The authors ran a

series of chi-square difference tests in pairs for all constructs including perceived position-driven power and perceived capability-driven power to compare the one-factor model with the two-factor model, and checked if the 95 percent confidential interval around the correlation estimates included a value of one. Both showed discriminant validity. Cronbach's alpha was tested to assess the reliability. All scales except competitive intensity had reliability greater than 0.7. The Cronbach's alpha of competitive intensity was 0.672, which is acceptable for questionnaire scales (Zhang and Li, 2010). Given the strong factor loadings and face validity, it is reasonable to consider it as a control variable (cf., Zhang and Li, 2010).

3.4 Measures to control for common method biases

Because the questionnaires were filled by the same informants, this study took special care of controlling common method biases. Procedurally, the present study included interactions (perceived position-driven power×perceived capability-driven power) in the models, which are less likely to be influenced by common method bias (Siemsen, Roth, and oliveira, 2010). To reduce the concern of social desirability bias, the authors ensured that the informants' responses were anonymous and confidential, and asked the informants to complete the questions based on their exact situations (Podsakoff et al., 2003).

Statistically, Harman's one-factor test was used to check for the presence of common method bias (Podsakoff and Organ, 1986). The authors subjected all measure items to a factor analysis. The results indicated a solution representing 64.95% of total variance, with the first factor only accounting for 21.79%, suggesting that common method bias was not a major concern. Exploratory factor analysis was also conducted by fixing the number of factors to be one. The result suggested that the variance explained by this factor was 22.7%, well below the 50% threshold. Single-factor test was then conducted using Confirmatory Factor Analysis (CFA) suggested by Malhotra, Kim, and Patil (2006). The lack of fit of the single-factor measurement model again indicated that common method bias was not a major issue (CMIN/DF=6.436; GFI=0.572, CFI=0.364, IFI=0.371, RMSEA=0.164). Further, following Podsakoff et al.'s (2003) recommendation, an artificial common method variable was added

into the measurement model, with all items loaded on this variable and on the seven multi-item variables simultaneously. The fit indices were slightly better than that of the seven-factor model (CMIN/DF=1.745; GFI=0.871, CFI=0.921, IFI=0.923, RMSEA=0.061). While the chi-square significantly decreased ($\Delta\chi^2$=30.197, Δdf=1, p<0.01), the variance extracted by the common method factor was 0.26, well below the threshold of 0.5. This study then introduced a marker variable to further check the common method variance (Lindell and Whitney, 2001; Richardson, Simmering, and Sturman, 2009). The authors selected technological modularity, which refers to 'the intentional decoupling of interoperating subsystems of a larger system' (Tiwana, 2008, p.770), as the marker variable, loading the measurement items of all variables (including technological modularity) on themselves and on the common method variable simultaneously. The result showed that the variance extracted by the common method factor was 0.24, again denying the presence of common method biases.

In addition, to alleviate the concern of a single informant, this study further contacted and collected information of intra-dyad power from 35 dominant partners (questionnaires completed by senior managers of these firms), and compared this information with that collected from the small firms (35 pairs of large-small alliances). The means of true value of position-driven power and capability-driven power collected from dominant partners were 4.257 (compared to 4.100 of that of the corresponding small firms) and 5.191 (compared to 5.419 of that of the corresponding small firms), both of which were close to the perceived value by the small firms. Two independent sample T-tests for perceived position-driven power and perceived capability-driven power, respectively, showed that the information from the dominant partners was not significantly different from that of the small firms (t=0.449 for perceived position-driven power and -1.368 for perceived capability-driven power). These results indicate that having a single informant would not have a significant impact on the analysis. All these measures indicate that common method biases were not a major issue.

4. Results

This study report regression results with robust standard errors, which can be helpful in eliminating

the concern of heteroskedasticity. To check for potential problems of multicollinearity, the authors assessed the variance inflation factors (VIFs) associated with each of the predictors in the models. The value of VIFs ranges from 1.087 to 1.694, well below the 10.0 threshold, indicating multicollinearity was not an issue. The variables perceived position-driven power and perceived capability-driven power were mean-centered before creating the interaction term to reduce possible collinearity between main and interaction effects.

Insert Table 3 about here.

Insert Table 4 about here.

The means, standard deviations, and correlations among the constructs are summarized in Table 3. Table 4 presents the results of the regression models. Exploitation is the dependent variable in Models 1 to 4, while in Models 5 to 8 exploration is the dependent variable. Models 1 and 5 only introduced control variables. Models 2 and 6 added the main effects of perceived position-driven power and capability-driven power. Models 3 and 7 added the effect of the complementary term, while Models 4 and 8 added the effect of the balanced term.

Models 2 and 6 show that neither perceived position-driven power nor capability-driven power have any direct impact on either exploitation or exploration, implying that the dominant partner is unable to stimulate the small firm's learning behaviors using merely one type of intra-dyad power.

In Hypothesis 1, the present study proposed that perceived position-driven power and capability-driven power complement each other in driving exploitation. As shown in Model 3, the complementary effect of the two types of power is significant for exploitation ($b=0.068$, $p<0.05$), in support of Hypothesis 1. Hypothesis 2 proposed that a complementary position-driven power and capability-driven power positively relates to exploration. The results in Model 7 suggest that the

complementary effect is positive and significant (b=0.058, p＜0.1), thus supporting Hypothesis 2.

In Hypothesis 3, this study posited that a balanced position-driven power and capability-driven power would have a positive impact on exploration. As shown in Model 8, the balanced term is positive and significant (b=0.165, p＜0.05), thus confirming Hypothesis 3. With Hypothesis 4, the present study considered whether a balanced effect existed for driving exploitation. The results in Model 4 indicate that the balanced term is positive and not significant (b=0.048, p＞0.1). Hypothesis 4 is thus not supported.

5. Discussion

The purpose of this study was to examine the joint effects of perceived position-driven power and capability-driven power in driving exploration versus exploitation. Using survey data from 205 high-technology firms from China, the present study found that complementary position-driven power and capability-driven power was associated with both exploration and exploitation. These findings provide evidence that perceived power imbalance in alliances can be an impetus of organizational learning if exercised properly. The complementary effect of the two types of power implies a way to integrate diverse interfirm forces for driving exploration and exploitation, which otherwise would not be achievable if focusing solely on either of them.

The analysis also revealed that a balanced position-driven power and capability-driven power is positively related to exploration, while no such an effect is found in terms of exploitation. This counterintuitive result deserves further attention, which can be explained as follows. Compared to exploitation, exploration is associated with higher risks in terms of knowledge appropriation and innovation failure (Katila et al., 2008). As discussed above, the balanced effect of these two types of perceived power can be helpful in reducing these risks because of the anticipatable investments and controllable behaviors. The higher the R&D risks, the higher the need for a balanced state of perceived positional and capability-driven power. Therefore, the balanced effect should be more crucial to exploration than to exploitation. Regarding the specific result of exploitation, the insignificant relationship can also be understood. In most situations, exploitation acts as a strategy to

obtain economic reinforcements in interfirm relationships. As long as the small firm perceive the exercise of the power by the dominant partner (not necessarily balanced), it will be stimulated to pursue a reasonable return from exploitation activities.

5.1 Implications to theory

This paper has potentially important theoretical implications. Prior studies on small firms' organizational learning when allying with large, dominant firms center on how one certain source of power affects the small firms' knowledge acquisition (Dyer and Nobeoka, 2000; Li and Rowley, 2002). This study, however, implies that the examination of inter-organizational learning in asymmetric alliances requires a switch of focus from a single power source to a holistic view on how different power sources can be combined to avoid their negative effects. This is important because small firms conducting inter-organizational learning normally hold more than one disadvantage over their dominant partners which jointly predict their learning strategies. By focusing on the multiplicate influences of diverse power sources on exploration and exploitation, this study bridges the literature on the exploration/exploitation paradigm (Holmqvist , 2004; Stettner and Lavie, 2014) and the studies on power-dependence relations between alliance firms (e.g., Cheng, 2012). Interestingly, the findings show that the combination of position-driven and capability-driven power can be positive when affecting small firms' learning. This challenges the wisdom that large partners' power could be harmful to small firms' motivation to explore in novel knowledge areas (e.g., Katila et al., 2008). It implies that small firms aiming at exploration/exploitation may choose dominant partners that hold both positional and capability advantages. Indeed, intra-dyad power relates not only to dominant partners' decision enforcement but also to how small firms react to such enforcement behaviors. In this regard, a power-dependence relation can be a motivational force driving organizational learning.

In examining two different configurations of position-driven power and capability-driven power, namely complementarity and balance, the present study shows that a balanced position-driven power and capability-driven power has different impacts on exploration versus exploitation whereas a complementary position-driven power and capability-driven power has similar impacts. This finding adds to the understanding of power-learning relationship by unveiling how power may affect

exploration and exploitation in different ways (e.g., Perrons, 2009), indicating that the configuration of power sources matters when conducting different learning strategies. Such a finding also contrasts to Yang et al. (2014) who assert that small firms allying with large partners create more value from exploitation than from exploration. More importantly, it implies that the relative strength of different types of power (as shown by the balanced effect) determines how these power sources interact with each other in affecting organizational learning. This is intriguing given that existing literature on both bargaining power and resource dependence has only referred to the strength of one certain type of power (Johnson et al., 1993; Casciaro and Piskorski, 2005). It is then necessary to take into consideration both functions and strengths of different types of power when they work in combination. The strategy of power configuration is thus crucial for understanding small firm's inter-organizational learning in asymmetric alliance and could be a direction for future research. Moreover, while this study does not investigate risk in exploration and exploitation, the significant effect that a balanced position-driven power and capability-driven power has on exploration and its insignificant effect on exploitation shows the possibility that the configuration of different types of power could be a pushing force that motivates small firms to take risks in knowledge learning. In this sense, the orchestration of an asymmetric relationship refers to the intervention of small firms risk-taking initiatives.

Further, extending existing studies that examine either the exercise of power between organizations (e.g., Gaski, 1984; Olsen et al., 2014) or the existence of dependence that may damage collaboration in an alliance (Elking et al., 2017), this paper shows that the perception of power imbalance will lead to actions being taken to leverage the relationship. This is an important step because it implies that small firms will respond to power imbalance before being enforced decisions. It also implies that small firms can develop a proactive approach to managing dependence asymmetry such that the liabilities of power imbalance such as conflicts or cost (Villena and Craighead, 2017) can be reduced. As suggested by Reimann et al. (2017), a dominant partner firm cannot simply neutralize power imbalance by not consciously using its power. The focus on perceived power could thus help understand a chain reaction through which the small firm perceives power imbalance, takes corresponding actions, and consequently stimulates the dominant partner's power exercise. Compared to studies that rely on coercive nature of power to explain organizational learning (e.g., Cheng, 2012),

the delineation of perceived power clearly indicates a social-psychological process through which a small firm in an asymmetric alliance can be stimulated to conduct learning. By connecting power perception and exploration and exploitation strategies, this study provides with alternative insights into how small firms manage their alliances with dominant partners.

5.2 Implications to practice

One obvious practical implication is the need for managers of small firms to understand how to leverage the relationships with large firms and to drive learning. While power is exercised to appropriate value from the alliance relationship, it also leaves space for small firms to acquire resources that might be crucial for their growth. Managers of small firms need to better understand the benefits of exercising power rather than stubbornly considering how to escape dependence. They should also proactively recognize the potential power their dominant partners have and design corresponding mechanisms through which they can interact with those partners. For example, if the managers of small firms perceive exercise of position-driven power and capability-driven power simultaneously, they should positively respond to the power and devote energy to developing new knowledge.

Another implication from this study is the need for managers of the small firms to reasonably choose their strategies of exploration versus exploitation when encountering power imbalance. As suggested in the present study, different configurations of perceived position-driven power and capability-driven power (i.e., complementarity and balance) lead the small firms to adopt different learning strategies (exploration versus exploitation). The adoption of a specific strategy depends largely on the small firms' perception of power imbalance. If the two types of perceived power have similar strengths, managers of the small firms should adopt exploration rather than exploitation strategy; if they complement each other in coordinating interfirm activities, managers of the small firms can introduce either exploration or exploitation.

5.3 Limitations and directions for future research

This study is subject to several limitations, which provide directions for future research. First, the

authors only collected data from the small firms of the alliance relationships. Consequently, this study was unable to identify the factors from the dominant partner side that might affect the model. While the independent and dependent variables are all about small firms, which alleviates this concern, future research might benefit from replicating the model with data that includes information from both sides of the asymmetric relationships. Moreover, small firm's perception of power and dominant partner's power exercise may jointly demonstrate a dynamic, iterative process in which one side responds to the other's behaviors and adjusts its own during their interactions. Such a process may change the small firm's initiative in conducting exploration versus exploitation. A study on this issue can be promising.

Second, the conceptualization of this study is primarily based on the power-dependence approach, which raises the concern that it might have overlooked other factors identified in previous studies. Future research will have to overcome this limitation and enhance the understanding of strategic phenomena by integrating different theoretical perspectives (e.g., embeddedness, reciprocity, institutional theory, etc.), focusing on their interaction effects on exploitation and exploration. For example, the process through which a dominant partner exercises power may relate to the shape and reshape of small firm's cognition of the relationship, and the cognitive changes may help to explain the small firm's learning behaviors. A longitudinal study on this issue can enrich the understanding of exploration and exploitation strategies in asymmetric alliances.

Finally, the combination of perceived position-driven power and capability-driven power may vary significantly across different industries, and the treatment of setting an industry dummy may fail to reflect such variance. For example, a small firm of an emerging industry might perceive less power imbalance than that of a mature industry; small firms in high technology industries may have different attitudes toward power imbalance from those in traditional manufacturing industries. Due to sample size limitations, the present study was only able to use an aggregated industry dummy as a control variable. Future research could assemble a larger sample size with the potential to statistically examine the effects of perceived positional and capability power in different industries, and configure these two to stimulate exploration and exploitation. This can be done by exploring the impacts of industry competition, market or technology uncertainty in the industries, stage of industry lifecycle,

technology intensity in the industries, etc.

6. Conclusion

While organizational learning theory has referred to power-dependence relationships in alliances, it is still unclear how the interaction of different types of power might affect exploration and exploitation in asymmetric alliances. This study takes an initial step, examining joint effects of different types of perceived power imbalance on exploration and exploitation with a sample of Chinese high-tech firms. By differentiating between perceived position-driven power and capability-driven power, the findings show that these two exert influence in combination rather than independently. This study shows a complementary effect between them for driving both exploitation and exploration. It is also suggested that they have a balanced effect for promoting exploration. However, the present study fails to find evidence that the balanced effect exists for exploitation. These results suggest that despite the concern of potential conflict caused by power (Gaski, 1984), a combination of perceived power can be helpful in stimulating small firms' initiatives to launch exploitative and exploratory learning. The findings could help to improve the understanding of power-dependence relationships that widely exist in alliances, and stimulate further discussion on the mechanisms in which power can be used to encourage collaboration and to drive learning and knowledge creation.

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TABLES:

Table 1 Comparison between position-driven power and capability-driven power

	Position-driven power	Capability-driven power
Description	*The potential to enforce decisions by advocating positional advantages*	*The use of advantageous capabilities or resources to influence partner firms*
Source of power	*Positional advantages*	*Capability advantages*
The nature of influence exerted	*Rewards and punishments*	*Guidance on upgrading technical or marketing capacity*
Coerciveness	*Coercive*	*Soft*
Force direction when affecting partners	*Pushing*	*Pulling*

Table 2 Factor analysis for intra-dyad power

Question items	Position-driven power	capability-driven power
1. administrating the distribution of resources	**.825**	.155
2. controlling knowledge/information flow	**.834**	.093
3. dominating the design of rules	**.857**	.189
4. controlling value extraction and distribution	**.873**	.166
5. intervening in the development of product technologies	.207	**.821**
6. influencing the strategies of market expansion	.048	**.885**
7. deciding on the ways of knowledge integration	.204	**.826**

Notes: Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. Explained variance: 74.23%

Table 3 Descriptive statistics and correlations

	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1. Firm age	2.863	1.015												
2. Firm size	2.668	0.817	.528											
3. Type of industry	0.590	0.494	.102	.098										
4. Duration	2.605	1.096	.440	.351	.022									
5. Equity	0.230	0.421	.085	-.131	-.059	.049								
6. Relationship substitutability	4.171	1.762	.123	.016	.144	.144	.125							
7. Technological dynamism	5.154	1.277	-.126	-.030	-.167	-.018	.016	-.096						
8. Competitive intensity	4.320	1.194	.019	.017	.041	-.061	.006	.119	.196					
9. R&D competence	5.098	1.077	-.115	.161	-.007	-.018	-.172	.000	.247	-.078				
10.Position-driven power	4.476	1.344	.018	-.060	.033	.116	.032	.205	.228	.067	.001			
11.Capability-driven power	4.852	1.178	-.092	-.187	-.106	.087	.046	.108	.243	.077	-.050	.347		
12. Exploration	5.366	0.869	-.161	.014	-.050	.015	-.100	-.155	.317	-.082	.414	.069	.009	
13. Exploitation	5.515	0.937	-.102	.110	-.019	.083	-.058	-.027	.191	-.072	.541	.094	.080	.571

Note: Correlations equal to or greater than ｜0.116｜are significant at 0.10 level.

Table 4 Hierarchical regression results with robust standard errors in parentheses

	Exploitation				Exploration			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Firm age	-0.113	-0.111	-0.114	-0.113	-0.097	-0.100	-0.103	-0.106
	(0.077)	(0.076)	(0.077)	(0.077)	(0.075)	(0.076)	(0.076)	(0.078)
Firm size	0.063	0.090	0.073	0.083	-0.008	-0.011	-0.026	-0.033
	(0.090)	(0.092)	(0.093)	(0.092)	(0.079)	(0.083)	(0.082)	(0.083)
Type of industry	0.012	0.016	-0.001	0.014	0.035	0.024	0.010	0.018
	(0.118)	(0.115)	(0.116)	(0.115)	(0.115)	(0.114)	(0.114)	(0.112)
Duration	0.109*	0.091	0.099	0.096	0.073	0.073	0.080	0.088
	(0.065)	(0.065)	(0.064)	(0.066)	(0.063)	(0.064)	(0.063)	(0.063)
Equity relationship	0.100	0.107	0.103	0.121	-0.049	-0.049	-0.052	-0.050
	(0.146)	(0.146)	(0.144)	(0.144)	(0.136)	(0.137)	(0.137)	(0.137)
Relationship	-0.015	-0.028	-0.027	-0.031	-0.061*	-0.064*	-0.062*	-0.073**
substitutability	(0.031)	(0.032)	(0.032)	(0.033)	(0.032)	(0.034)	(0.033)	(0.035)
Technological	0.042	0.013	0.008	0.015	0.155***	0.153***	0.148***	0.158***
dynamism	(0.049)	(0.050)	(0.050)	(0.049)	(0.047)	(0.049)	(0.049)	(0.047)
Competitive intensity	-0.025	-0.026	-0.016	-0.022	-0.057	-0.056	-0.048	-0.044
	(0.051)	(0.050)	(0.049)	(0.051)	(0.047)	(0.046)	(0.046)	(0.044)
R&D competence	0.445***	0.454***	0.436***	0.453***	0.273***	0.272***	0.256***	0.269***
	(0.055)	(0.054)	(0.056)	(0.054)	(0.062)	(0.062)	(0.065)	(0.062)
Position-driven power		0.047	0.022	0.027		0.036	0.014	-0.032
		(0.050)	(0.049)	(0.064)		(0.048)	(0.045)	(0.054)
Capability-driven power		0.064	0.115*	0.075		-0.034	0.010	0.003
		(0.056)	(0.063)	(0.061)		(0.059)	(0.067)	(0.059)
Complementarity			0.068**				0.058*	
			(0.033)				(0.035)	
Balance				0.048				0.165**
				(0.080)				(0.072)
F value	12.47***	11.10***	10.12***	10.09***	7.28***	5.87***	5.84***	5.40***
Adjusted R^2	0.285	0.291	0.305	0.289	0.225	0.220	0.231	0.241

Notes: The variance inflation factors range from 1.087 to 1.694.

*** p＜0.01. ** p＜0.05. * p＜0.1 (sample size=205)

Appendix Measurement items [a]

Items description	Standardized loading
Position-driven power (newly developed) Cronbach's alpha=0.882	
Rate the extent to which the dominant partner influences the decision-making of your firm by,	
1. administrating the distribution of resources	0.850
2. controlling knowledge/information flow	0.701
3. dominating the design of rules	0.911
4. controlling value extraction and distribution	0.868
Capability-driven power (newly developed) Cronbach's alpha=0.821	
Rate the extent to which the dominant partner influences the decision-making of your firm by,	
1. intervening in the development of product technologies	0.769
2. influencing the strategies of market expansion	0.789
3. deciding on the ways of knowledge integration	0.777
Model fit:	
CMIN/DF=2.059, GFI=0.973, CFI=0.985, IFI=0.985, RMSEA=0.072	
Knowledge exploitation (He and Wong, 2004) Cronbach's alpha=0.814	
Our innovation:	
1. improve existing product quality	0.606
2. improve production flexibility	0.700
3. reduce production cost	0.671
4. improve yield or reduce material consumption	0.754
Knowledge exploration (He and Wong, 2004) Cronbach's alpha=0.769	
Our innovation:	
1. introduce new generation of products	0.649
2. extend product range	0.700
3. open up new markets	0.772
4. enter new technology fields	0.584
R&D competence (Yam et al., 2011) Cronbach's alpha=0.759	
1. high quality and quick feedbacks from manufacturing to design and R&D	0.848
2. the great extent of market and customer feedback into technological innovation process	0.883
3. the good mechanisms for transferring technology from research to product development	0.476
Technological dynamism (Jaworski and Kohli, 1993) Cronbach's alpha=0.757	
1. the technology in our market is changing rapidly	0.798
2. technological changes provide big opportunities in our industry	0.786
Competitive intensity (Jaworski and Kohli, 1993) Cronbach's alpha=0.674	
1. competition in our market is cutthroat.	0.721
2. there are many "promotion wars" in our market.	0.683
3. anything that one competitor can offer, others can match readily.	0.515
Model fit:	
CMIN/DF=1.806, GFI=0.912, CFI=0.941, IFI=0.943, RMSEA=0.063	

a. we also subjected all multi-item variables into the same model and the results suggested that the overall model fit the data well (CMIN/DF=1.882, GFI=0.860, CFI=0.906, IFI=0.908, RMSEA=0.066).