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When New Partners Crowd Out Incumbent Partners: The Moderating Role of Network Chasm

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Abstract

Both the entry and withdrawal of partners have received considerable attention in the venture capital (VC) literature. However, they have been viewed as more or less isolated dynamic choices. This study filled this research gap by analyzing the relationship between new partner addition and incumbent partner withdrawal in VC syndicates. Although the literature on VC partner selection suggests that adding partners can improve the performance of VC syndicates by emphasizing the expected contribution of VCs, the expected development will not occur or may even be reversed if the VC syndicate also experiences the withdrawal of the incumbent partner. We proposed that the VC withdrawal decision is a risk-benefit trade-off. The syndicate's portfolio similarity with new partners promotes competition between them. This risk of knowledge leakage through the relationship with the new partner jeopardizes the incumbent partner's competitive advantage. In the meantime, the syndicate's portfolio similarity with new partners measures the extent to which the knowledge contributed by the new partner matches the needs of the syndicate and can be absorbed by the syndicate, which will enhance the common benefits. Thus, there is a U-shaped relationship between the syndicate's portfolio similarity with new partners and its incumbent partners' withdrawal possibility. Furthermore, we considered the negative moderating role of partner network characteristics, namely, the relational and structural chasm. Our research not only suggested the dependence of network dynamics to complete the theory of network evolution but also provided advice on partner selection and syndicate governance. We tested our hypotheses using the dataset of VC investment in the United States between 1985 and 2016, based on Thomson Reuter's VentureXpert Database and ORBIS Database.

Keywords

venture capital syndication; knowledge leakage; network dynamics; faultlines

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1. Introduction

The expected contribution of venture capital (VC) partners is a crucial motivation for partner selection (Du, 2016; Manigart *et al*., 2006; Meuleman *et al*., 2010; Plagmann and Lutz, 2019), implicitly and indirectly suggesting a syndicate can improve its performance by adding new partners. However, this literature ignored whether the syndicate would encounter adverse changes due to these additions, leading to a failure of predicted achievements. This paper proposes one, that is, the withdrawals of incumbent partners. We think it is fully possible when the new partner exposes some incumbent partners to more significant personal risks. Furthermore, we regard VC's withdrawal decision as a trade-off of risk and benefit to promote the research. This is more comprehensive and realistic than the previous literature which studies VC behavior and only focuses on one of them.

Knowledge leakage through partnerships (Devarakonda and Reuer, 2018; Ritala *et al*., 2015; Shin *et al*., 2016) jeopardizes a firm's sustainable competitive advantage (Frishammar *et al*., 2015; Hernandez *et al*., 2015; Oxley and Sampson, 2004). Although partner selection is a collective decision (Wright and Lockett, 2003), some incumbent partners' opposition to these undesirable new partners may be invalid (Zhang and Guler, 2019). At this time, focal partners need to share knowledge to pursue common benefits (Dyer and Singh, 1998; Gnyawali and Park, 2011) while protecting their proprietary knowledge from competitors. This dilemma intensifies internal tension causing alliance instability (Das and Teng, 2000; Fernandez and Chiambaretto, 2016; Tidström, 2014) and even partner defection (Bruyaka *et al*., 2018). Thus, varying personal risks lead to incumbent partners' diverse attitudes toward the new partner, and unlike the others, incumbent partners who are aware of pressing personal risks may decide to withdraw from the partnership. Then we argue that the syndicate's competitive strength due to the entry of the new partner is positively correlated with personal risks.

The syndicate aims to select partners who could contribute expertise to portfolio companies' post-management to maximize the investment return (Jääskeläinen, 2012). Similarly, from the perspective of knowledge, whether it matches the needs of the syndicate and whether it can be effectively used by the syndicate are the key factors to promote the improvement of the common benefits of the whole syndicate. Knowledge matching indicates whether knowledge can help to achieve the common goal (Mitsuhashi and Greve, 2009). The absorptive capacity theory suggests that the syndicate should possess prior knowledge to identify and utilize this external knowledge efficiently (Cohen and Levinthal, 1990; Mitsuhashi and Greve, 2009). We capture the knowledge matching and absorption using the syndicate's portfolio similarity with the new partner and accordingly argue that it is positively correlated with common benefits, but the marginal effect diminishes due to the limitation of the knowledge depth and redundancy. This positive link also explains why the new partner can be welcomed by most incumbent members to join the syndicate.

Competition between two VC firms arises while investing in different start-ups in the same market (Makarevich, 2018a). VC firms' capital providers, also known as limited partners (Heidl *et al*., 2014), will diversify their assets to reduce risks (Zhelyazkov, 2017). Due to this, these enterprises with high portfolio

[1] "The withdrawal of VCs": VCs will no longer participate in all subsequent investment rounds. Leagally, it is free for VCs to terminate their investments at any round. At this time, the equity held by the withdrawn VC may not be sold to other partners, but it will be continuously diluted.

[2] The knowledge mentioned here includes not only the technical knowledge, but also the knowledge of industry observation, internal operation, channel connection and other fields.

similarity compete for the same part of LPs' assets. Accordingly, the portfolio similarity promotes competition among VC firms and is positively related to personal risks. We maintain that the increases in the VC firms' portfolio similarity facilitate the incumbent partner's perceived common benefits. However, partner withdrawal is a risk-benefit trade-off. As the risk of knowledge leakage continues to escalate and reaches a threshold at which the personal risk reverses the incumbent partner's expected share of common benefits (hereafter, "private benefits"), the incumbent partner leaves the syndicate. We accordingly propose that the portfolio similarity demonstrates a U-shaped relationship with the incumbent partner's withdrawal possibility.

We further argue that the risk-benefit trade-off of withdrawal is affected by partner network characteristics. First, we consider tie heterogeneity among VC firms, such as tie strength. The group faultlines marked by the variation in tie strength form subgroups (Lau and Murnighan, 1998) and limit cohesion outside the subgroup, deepening the "relational chasm," causing invalid communication and conflicts among subgroups (Choi and Sy, 2010; Pearsall *et al*., 2008; Thatcher and Patel, 2012). By contrast, each subgroup's members may unite based on the trust generated by past interactions and share reserved knowledge to realize their consensus goal. This practice limits the syndicate's overall absorptive capacity, possibly leading to a lower forecast of common benefits. Second, we focus on node heterogeneity, namely, VC firms network position. The knowledge advantage gained through its network position helps a VC bargain with other partners on common benefits distribution (Ozmel *et al*., 2017; Pfeffer and Salancik, 2003). When the network position inequity creates a gap in partners' absorptive capacities, the "structural chasm" deepens, and other partners may succumb to the gatekeeper in common benefits distribution. Moreover, the gatekeeper may seek to enjoy the benefits alone by controlling knowledge sharing. Therefore, both network chasms enhance the crowding-out effect of new partners on incumbent partners by decreasing the private benefits.

We seek to make the following contributions to the literature. First, this study is among the first to explore the effect of tie formation on tie dissolution, which can deepen our understanding of network evolution. More importantly, there are questions about the accuracy of empirically analyzing partners' entry and exit without controlling the effects on the other partners. It is necessary to evaluate whether new partners crowd out incumbent partners, yet the alliance literature generally discusses partners' entry (Meuleman *et al*., 2017; Ryu *et al*., 2020; Wang, 2020) and exit (Bruyaka *et al*., 2018; Guler, 2007; Rajan and Dhir, 2020) separately. Second, we simultaneously consider the multilevel network genesis: dyadic tie risk and group common benefits. Third, we integrate the economic and sociological approach and treat the VC withdrawal decision as a risk-benefit trade-off applied to different dynamic situations. Fourth, we study the boundary conditions of this U-shaped relationship under the relational and structural chasm of the partner network, completing the role of group dynamics in inter-organizational collaboration. Lastly, the conclusions provide VC firms with advice on partner selection and syndicate governance and recommendations for start-ups in VC portfolio management.

Based on the theoretical research, we empirically test the entry and exit of VC syndicate partners using VC investments data from 1985 to 2016, based on the VentureXpert Database and ORBIS Database. The rest of this paper is arranged as follows. Section 2 presents the theory and research framework and explains the new partner's crowding-out effect on the incumbent partners and the moderating roles of group faultlines and position inequity. Section 3 presents the data, variables, and model. Section 4 presents the results and robustness tests. Section 5 concludes.

2. Theory and Hypotheses

2.1. The personal risk of knowledge leakage

Knowledge is an important asset of VC. VC funds start-up companies in exchange for equity and earn returns through successful exits, such as going public or being acquired (Bygrave and Timmons, 1992). In other words, the success or failure of a new venture determines whether a VC can obtain a return and how much it returns. VCs can seek high profits in two ways: one is to become a better scout and identify brighter goals; the other is to become a better coach and grow targets' value (Sapienza, 1992), through sharing insights in marketing, strategy (Gerasymenko and Arthurs, 2014; Gorman and Sahlman, 1989), and providing connection to external parties (Lindsey, 2008). Both scouts and coaches require VCs to have a wealth of unique knowledge reserves (Baum and Silverman, 2004). Therefore, VC not only needs to accumulate knowledge but, more importantly, it must protect knowledge.

The VC syndicate exposes partners to the risk of knowledge leakage. Drawing on previous research, in this study, we define knowledge leakage as uncontrolled or harmful disclosure of personal knowledge transferred to alliance partners. Past studies have proved that multi-partner alliances may result in knowledge leakage (Devarakonda and Reuer, 2018; Meier, 2011; Ritala *et al*., 2018; Yuan *et al*., 2020). The same is true of VC syndicates. Besides, VC firms also act as advisors, coaches, or monitors to support portfolio companies (Baum and Silverman, 2004; Dimov and Shepherd, 2005; Gompers and Lerner, 2001; Lerner, 1995; Sapienza, 1992). These actions require the disclosure of personal knowledge within the VC syndicate. Although VC firms can preemptively limit the information and advice provided to the syndicate (Makarevich, 2018a), this practice is sometimes prohibited. For example, to prove their strength or provide partners with the confidence to cooperate among themselves, VC firms may be required by syndicates to disclose their capital reserves. Moreover, partners' pursuit of private interests may inspire them to take opportunistic actions (Das. and Teng, 2001; Williamson, 1985), including intentionally misappropriating a partner's knowledge. Furthermore, in the frequent communication between VC firms' employees in the syndicate, some proprietary knowledge may be inadvertently leaked (Jiang *et al*., 2013; Ritala *et al*., 2015).

The incumbent partner perceives more serious competitive risk when the new partner is its competitor. The leakage of knowledge to competitors seriously damages a company's competitive advantage (Baum *et al*., 2000; Hernandez *et al*., 2015; Oxley and Sampson, 2004; Park and Russo, 1996). In the VC industry, competitors may speculate on the VC firm's strategy based on the misappropriated knowledge and guide their ventures to compete in the same domain. In the incumbent partner's eyes, competitors are more motivated to adopt opportunistic behavior within the syndicate. Therefore, the incumbent partner realizes that it may bear higher risk costs staying in the syndicate after its competitors join and subsequently withdraw from the VC syndicate. The relationship between the incumbent partner's perceived competitive risk and its portfolio similarity with the new partner is positive, as shown in Fig. 1(a).

2.2. The private benefits

The common benefit of VC syndicate, that is, return on investment, depends on the invested companies' performance. And each partner of the syndicate possesses its share of the common benefits, also known as private benefits. As we stated in the first paragraph of section 2.1, a VC can seek higher returns if it is a better "talent scout" or "coach" (Baum and Silverman, 2004). A VC syndicate has already anchored the

investment target in the follow-on rounds, so it preferred a coach. VC mainly relies on the application of knowledge resources to guide portfolio companies. From the syndicate standpoint, whether the new partner's knowledge can meet its needs and be utilized will affect the common benefits. Also, the knowledge structure (breadth, depth) is an element that cannot be ignored, directly determining its value. This paper first concretes external knowledge contribution to the syndicate based on the two theories of knowledge matching and absorptive capacity. It then divides VC's investment behavior to get more detailed information about the knowledge structure of the new partner to explore the change of common benefits.

First, the new partner with higher portfolio similarity with the syndicate can provide more matching knowledge resources. Resource matching refers to the resources that partners have to achieve each other's cooperation objectives (Mitsuhashi and Greve, 2009). Although firms are more willing to cooperate with organizations with more resources (Ahuja, 2000; Eisenhardt and Schoonhoven, 1996), a partner with more resources may be less useful than one with more matching resources because redundant resources cannot create value. VCs can accumulate the understanding of the industry through each investment, enriching their own "knowledge bases". VCs can also create social capital by shape advantageous network links, so as to obtain unique knowledge (Inkpen and Tsang, 2005; Stuart and Sorenson, 2007). When there is a high degree of portfolio similarity between new partners and the syndicate, the investment interest of both the new partner and the syndicate is closer so that the new partner may accumulate more knowledge that could meet the needs of the syndicate.

Second, the syndicate has a stronger absorptive capacity for new partners' external knowledge if the syndicate's portfolio similarity with the new partner is higher. The definition of absorptive capacity is a firm's ability to recognize, assimilate, and utilize external knowledge to create more value (Cohen and Levinthal, 1990). Although the concept of absorptive capacity is usually discussed in the field of R&D (Knott, 2008; Skilton *et al*., 2020), it can be applied to the contexts in which companies absorb external knowledge (Cohen and Levinthal, 1990), including the VC industry (Dal Zotto, 2003; Sullivan and Tang, 2012). Moreover, as VC firms usually develop their knowledge bases from their portfolio, the syndicate possesses some amount of prior knowledge basic to external knowledge when it has a high portfolio similarity with the new partner. Prior knowledge relevant to new external knowledge facilitates understanding (Cohen and Levinthal, 1990) so that the syndicate can better identify and evaluate the new partner's knowledge. A firm's absorptive capacity mainly depends on its knowledge level in a specific field (Cohen and Levinthal, 1990; Mowery *et al*., 1996). The proper utilization of external knowledge can contribute to a firm's performance (Cohen and Levinthal, 1989). Therefore, we expect that when the syndicate has corresponding and excellent absorptive capacity, through discussions that take place in financing meetings and other occasions, the incumbent partner realizes that the common benefits will increase if a new partner with higher portfolio similarity joins the syndicate.

Third, the unbalanced knowledge structure restricts the marginal growth effect of common benefits. VCs can accumulate expertise in the industry field of the invested companies. Based on the diversified investment level of a VC, we describe its knowledge structure from two dimensions: the depth of knowledge, meaning the specialized knowledge of a new partner in one or a few industries, and the breadth of knowledge, presenting the diversified knowledge of a new partner in multiple industries. When the new partner's portfolio is like the syndicate, the new partner may develop its portfolio in two ways. First, the new partner is a generalist investing in many industries, then develops diverse knowledge. The high breadth of knowledge enables VCs to use their experience in multiple industry sectors to design numerous solutions when facing difficulties (Makarevich, 2018b), and increase potential

new knowledge combinations (Matusik and Fitza, 2012), to contribute more novel ideas to the syndicate. But the generalist strategy means a lack of specialized knowledge in any industry sector (Hannan *et al*., 2007). This low depth limits the value of knowledge to a certain extent. Another way is that both the new partner and the syndicate are specialists and only conduct business in a few industries. The specialization strategy enables the new partner to understand specific industries, including policies, regulations, competitive landscape, product trends, etc. However, high overlap and limited target industries lead to knowledge homogenization between them. Knowledge redundancy reduces internal efficiency, thereby decreasing the marginal benefit of knowledge acquisition.

All in all, we assume that the portfolio similarity between the new and incumbent partners has a positive impact on common benefits. However, due to the limitation of the knowledge depth and redundancy, the common benefits increase at a decreasing rate. Because the incumbent partner's private benefits are the distribution of common benefits in the syndicate, they follow the same trend, as shown in Fig. 1(b).

The portfolio similarity intensifies competition among VC firms, encourages the new partner to adopt opportunistic behavior, such as knowledge leakage, and drives up the incumbent partner's perceived risk costs apart from the common benefits improvement. Besides, the incumbent partner weighs the private benefits and risk costs to decide whether to withdraw from the VC syndicate or not. Haans *et al*. (2016) proposed that a positive linear function minus a positive curvilinear function with diminishing marginal contributions would create a U-shaped function. Therefore, this study posits Hypothesis 1, as Fig. 1(c) indicates.

H1: There is a U-shaped relationship between the syndicate's portfolio similarity with the new partner and its incumbent partners' withdrawal possibility.

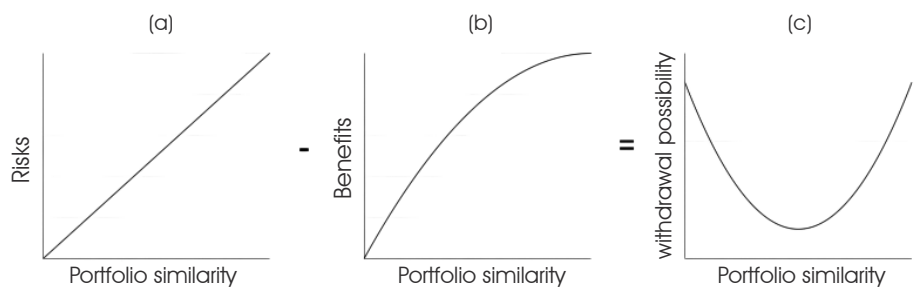

Fig. 1 Predicted effects of the syndicate's portfolio similarity with the new partner on the incumbent partner's withdrawal possibility

2.3. Relational chasm: group faultlines within the syndicate

Faultlines are hypothetical dividing lines that can split a group into multiple subgroups based on their members' shared attributes, such as age, gender, sex, and race (Bezrukova *et al*., 2009; Lau and Murnighan, 1998, 2005). Past research has proposed self-categorization, social identification, and similarity attraction to explain the formation mechanisms of faultlines and subgroups (Lau and Murnighan, 1998). In addition to demographic attributes, Heidl *et al*. (2014) argued that the tie strength dispersion based on prior interactions could also mark the multi-partner alliance's faultlines.

The syndicate's overall absorption capacity is likely to be lowered by the group faultlines, and in turn, reduce the perceived common benefits. Every partner hopes that the syndicate's decisions will maximize its benefits. However, the partners' goals might not overlap completely. In each subgroup, partners have

built close relationships and developed trust through past repeated interactions (Gulati, 1995; Ring and Van de Ven, 1994; Uzzi, 1997; Zaheer and Venkatraman, 1995). Such interconnection may lead to an effective communication mechanism and shared behavior norms (Dyer and Singh, 1998; Uzzi, 1996, 1997). Members of each subgroup experience pleasant interactions (Stevenson *et al*., 1985), and in turn, formulate a consistent goal easily. Moreover, strong group faultlines limit the cohesion beyond the subgroup, resulting in distrust and conflicts across subgroups (Choi and Sy, 2010; Jehn and Bezrukova, 2010; Lau and Murnighan, 2005; Thatcher and Patel, 2012).

With strong faultlines marked in the syndicate, the subgroups have a reduced motivation to contribute to a group as a whole (Wit and Kerr, 2002). Subsequently, they promote their aims instead of common group goals and try to manipulate the joint decision to advance their private interests. However, the syndicate's absorptive capacity depends on the knowledge integration of all partners. In various discussions about the new financing round, subgroups may deliberately provide selective knowledge, which can induce the syndicate to interpret the new partner's external knowledge in a most beneficial direction. This approach might not maximize the common benefits, thereby reducing the perceived private benefits of partners. If the new partner's external knowledge is not valuable enough, the subgroup might not make much effort to manipulate the syndicate decisions. When the expected value of external knowledge is greater, the struggle between subgroups intensifies, resulting in more loss of benefits. In summary, the group faultlines weaken the private benefit mechanism's curvilinearity, as Fig. 2(b) shows. Combining the unchanged risks mechanism, the U-shaped relationship between the syndicate's portfolio similarity with the new partner and its incumbent partners' withdrawal possibility flattens.

H2: As the group faultlines become greater, the U-shaped relationship between the syndicate's portfolio similarity with the new partner and its incumbent partners' withdrawal possibility weakens.

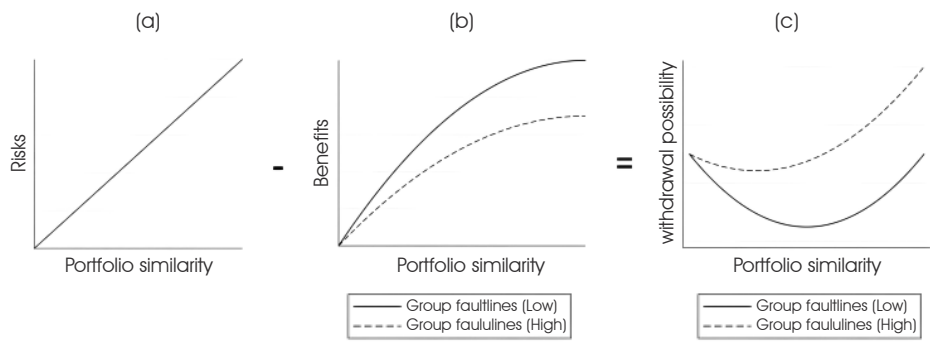

Fig. 2 Predicted moderating effects of group faultlines

2.4. Structural chasm: position inequity within the syndicate

Most VC syndicates are team decisions, not dictatorships (Wright and Lockett, 2003), but partners with more power are more influential in the decision-making process (Anderson and Brion, 2014; Anderson and Brown, 2010; Magee and Galinsky, 2008). As a result, the quality of decision-making will depend in part on the opinions of those powerholders.

Generally speaking, the power embodies the asymmetric control of valuable resources, and hierarchy is conceptualized as power inequality among group members (Bunderson *et al*., 2015). Knowledge is important for VCs, and both acquiring and protecting knowledge is a crucial goal of them. In the interfirm network, the central enterprise has a relatively stronger ability to access and control information and

knowledge flow (Freeman, 1978). From the resource dependence perspective, the difference in network centrality will create asymmetric resource control capabilities among partners, reflecting the syndicate's power hierarchy. We call it the structural chasm in this article.

As the strengthening of the structural chasm, other partners are more aware of the gap between themselves and powerholders, and their dependence on powerholders has increased. Such internal dynamics will be detrimental to the creation of common benefits in the following two ways. On the one hand, over-reliance on powerholders can lead to dysfunction (Anderson and Brion, 2014). The syndicate believes that the powerholders are more competent than other partners and can make better decisions (Anderson and Brion, 2014; Berger *et al*., 1980), so the syndicate may attach more importance to the powerholders' opinions. However, those in power may not be correct or optimal, so the quality of decision-making is reduced, thereby not conducive to creating the common benefits. On the other hand, powerholders may deliberately harm common benefits. This study considers a situation in which the powerholder may also invest in a competitor of the portfolio company (*e.g*. Rao, 2009). Venture capital is a profit-driven enterprise. When the powerholder judges that the competitor is more promising, it may not only disclose information to the competitor but also deliberately conceal or partially disclose knowledge to mislead the syndicate's decision.

The syndicate's over-reliance on some partners will also affect the distribution of common benefits. Thanks to the extensive information channels created by the central network position, the central VC can obtain various valuable knowledge in time. The syndicate will give higher ranks to members with outstanding abilities (Driskell and Mullen, 1990) and rely on them to guide decision-making. In this case, powerholders may leverage their positions to bargain for a larger share of the common benefits (Ozmel *et al*., 2017; Pfeffer and Salancik, 2003). Then the private benefits of other partners will reduce.

Both bargaining and cheating poison gatekeepers' reputation and relationship with other partners, making them hesitate to adopt this behavior. The powerholder may avoid such risky actions when the value of the new partner's external knowledge is not attractive enough, and the likelihood of action increases as the potential value increases. Based on this illustration, we expect position inequity to flatten the private benefits curvilinearity, as Fig. 3(b) shows, where the U-shaped relationship between the syndicate's portfolio similarity with the new partner and its incumbent partners' withdrawal possibility weakens by combining the constant linear risks mechanism, as shown in Fig. 3(c).

H3: As position inequity becomes greater, the U-shaped relationship between the syndicate's portfolio similarity with the new partner and its incumbent partners' withdrawal possibility weakens.

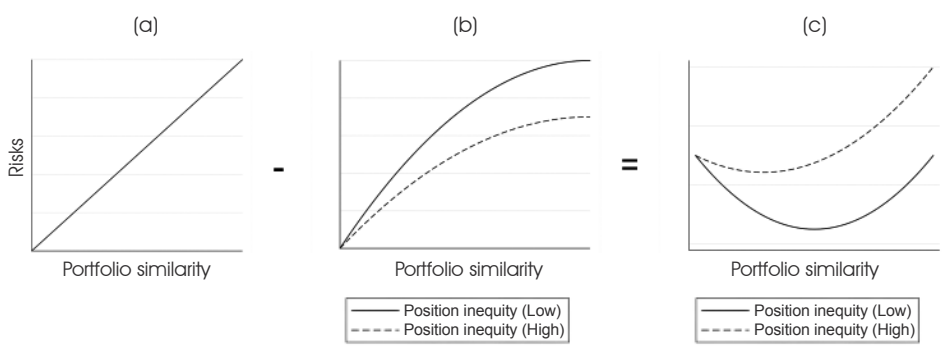

Fig. 3 Predicted moderating effects of position inequity

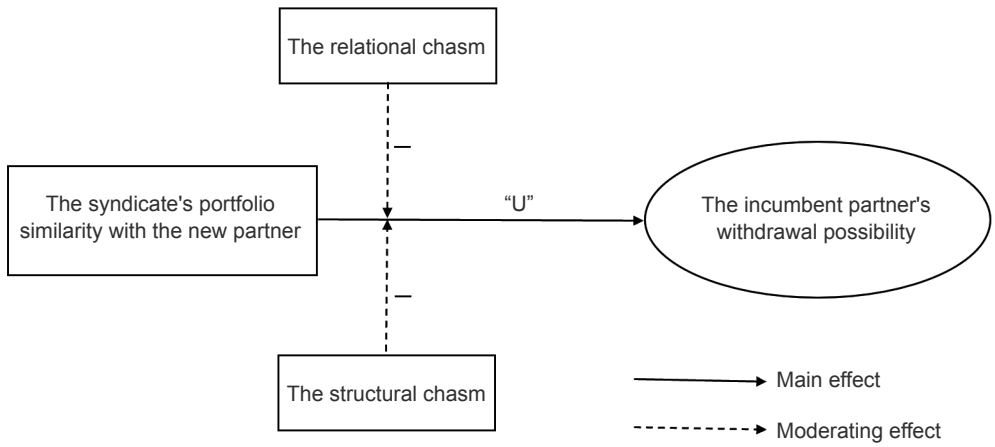

Fig. 4 Framework (shows an overview of all the hypotheses)

3. Methods and Results

3.1. Data

The definition of important objects in this research needs to be clarified. The new partner refers to the VC firms that invest in the focal venture for the first time, while the VC firm that participated in the last financing round before adding new partners is considered the incumbent partner. We defined the withdrawal as a VC's permanent disappearance from the target venture's co-investor group (Townsend, 2015; Zhelyazkov and Gulati, 2016). The successful exit through an IPO or acquisition was excluded. Another exception is the financing round without any incumbent partners' participation (Zhelyazkov and Gulati, 2016).

This study used VC syndication investment from Thompson Reuters' VentureXpert database which is widely used in financial and sociological research (Hochberg *et al*., 2010; Podolny, 2001; Sorenson and Stuart, 2008). Because the reliability of early data provided by VentureXpert database has been questioned by scholars (Podolny, 2001), we only used data after 1985 (*e.g*., Zhang and Guler, 2019). Because we could not predict whether the withdrawal partner on recent financial rounds would be back in the syndicate again or not. So, we assumed that the incumbent partner who disappeared in the next two rounds had permanently withdrawn from the focal syndicate. The data show that the average time interval between two consecutive financing rounds from 1985 to 2020 is nearly two years, so we excluded the data from 2017 to 2020. Following previous work, we used a five-year rolling window for all network variables, and additionally tested the robustness of the three-year and seven-year rolling windows. For example, we used data from 1987 to 1991 (1989 to 1991, 1985 to 1991) to create the network for 1992. Thus, we tested our hypotheses for data in which at least one new VC entered a syndicate on a follow-on financing round between 1992 and 2016. To supplement missing values of the independent variable "portfolio similarity", we collected the missing ventures' Standard Industrial Classification (SIC) codes from the Orbis database and Google. Subsequently, the miss rate dropped to about 3%.

To construct the sample, we performed a series of data cleaning. First, we only focused on the U.S. VC firms and their deals in U.S. ventures to avoid inconsistency in international VC firms' behavior (Zhang and Guler, 2019). Second, we combined two or more consecutive financing rounds with a time interval of no more than 90 days into one round (Guler, 2007) because a single round's capital injections on different

dates may be misrecorded as multiple rounds (Gompers and Lerner, 2004; Lerner, 1995). Third, we excluded all rounds with undisclosed investors and their subsequent rounds (Zhang and Guler, 2019). Fourth, we excluded rounds with fewer than three partners because our research is about the entry and exit dynamics of partners at the group level instead of the dyadic level.

Importantly, this study aims to discuss the impact of each new partner's entry on the withdrawal of incumbent partners. For a financing round that added more than one new partner, we matched each new partner's portfolio similarity to the syndicate with the withdrawal possibility of the incumbent partners in the focal round, thereby forming multiple samples, the number of which is equal to the number of new partners. After these procedures, the final sample has 2,590 observations, including 1,495 financing rounds.

3.2. Measures

3.2.1. Dependent variable

VC withdrawal is the percentage of incumbent partners who did not participate in the new partner's focal round and subsequent rounds (Townsend, 2015; Zhang and Guler, 2019).

3.2.2. Independent variable

Portfolio similarity is the degree of investment industry overlap between every new partner and the incumbent partners over the prior five years. The SIC codes of all ventures that raised capital between 1985 and 2016 were mainly obtained from the VentureXpert database. The Orbis database and Google supplemented missing values. Because a venture generally has multiple primary SIC codes (four digits), the SIC core code (three digits) was used to calculate the portfolio similarity in this study. We produced each VC firm's investment industry portfolio and computed its industry distribution vectors' correlation across SIC industry classifications (Guan and Yan, 2016; Guellec and de la Potterie, 2001; Jaffe, 1986). We calculated the portfolio similarity between each new partner and the syndicate using Eq. (1), where $f_i=(f_i^1,f_i^2,...,f_i^N)$ and f_i^N indicates the investment proportion in industry N of VC_i over the past five years. Subsequently, the portfolio similarity ranges from 0 to 1. We take the financing round as the counting unit, not the company. For example, when a VC participated in three financing rounds of one company in the past five years, the VC has invested three times instead of once in its industry.

$$Portfolio\ similarity_i = (1/j) \times \sum_j [f_j f_j^{'} / \sqrt{(f_i f_i^{'})(f_j f_j^{'})}] \tag{1}$$

3.2.3. Moderating variables

Following prior research, we measured group faultlines as the standard deviation of the cooperation number for the past five years between each dyad of incumbent partners in the syndicate (Heidl *et al*., 2014; Zhang *et al*., 2017) using Eqs. (2) and (3). t_{kij} measures the joint investment time over the past five years between VC_i and VC_j in syndicate k, and the total number of incumbent partners in syndicate k is n. $t_k^{'}$ is the average joint investment time between any two incumbent partners in syndicate k.

$$t_k^{'} = (\sum_i \sum_j t_{kij}) / [n \times (n-1)] \tag{2}$$

$$group\ faultlines_k = [\sum_i \sum_j (t_{kij} - t_k^{'})^2] / [n \times (n-1)] \tag{3}$$

To measure position inequity, we first create the VC collaboration network using the joint investment

information over the past five years before the focal round. Next, we measure position inequity as the standard deviation of each incumbent partner's betweenness centrality (BC) within the syndicate using Eq. (4). As mentioned in Section 2, position inequity refers to the gap in absorptive capacity among partners. The BC provides the node with faster access to non-redundant information and controls information flow (Burt, 1992). It is a good measure of absorptive capacity in information acquisition and control (Cantner and Rake, 2014; Gilsing *et al*., 2016; Lyu *et al*., 2020; Peterman *et al*., 2014). Therefore, it is reasonable to use betweenness centrality to calculate position inequity within a VC syndicate. BC_V is the betweenness centrality of firm v, σ_{st} is the number of geodesics from firm s to t, and $\sigma_{st}(v)$ is the number of geodesics from firm s to t passing through firm v.

$$BC_v = \sum_{s \neq v \neq t} [\sigma_{st}(v) / \sigma_{st}] \tag{4}$$

3.2.4. Control variables

Apart from the main effect, we controlled several potentially endogenous factors, possibly causing incumbent partners' withdrawals. The incumbent partners' past cooperation experience can reflect their acceptance of the new partner. To capture such *cooperation experience – incumbent*, we added the average number of VC firms co-invested with incumbent partners over the proceeding five years. As corporate venture capital (CVC) firms pursue many strategic returns as financial returns (Chesbrough, 2002; Sykes, 1990), the incumbent partner's withdrawal sometimes may be driven by the parent company instead of new partners. Thus, we controlled for *CVC proportion* measuring the proportion of CVC firms in incumbent partners. To ensure the lack of capital does not drive the withdrawal, we controlled the incumbent partner's capital constraint, measured by the most recent fund's age (Zhelyazkov and Gulati, 2016).

We also incorporated many variables that reflect incumbent partners' views of the new partner and affect withdrawal. First, we controlled for *new partner size* using the ratio of the number of new partners to the number of incumbent partners. We captured the new partner's investment experience with *investment experience – new* measuring the number of ventures invested by the new partner over the proceeding five years. Moreover, the new partner's investment performance affects the incumbent partner's willingness to cooperate. To address this concern, we included the investment performance of new partners (*new partner performance*). To construct this variable, we first obtained the list of ventures the new partner had invested in over the proceeding five years. Next, we counted the success rate (an IPO or acquisition of the portfolio company) and the failure rate (the portfolio company's bankruptcy). New partner performance equals the success rate minus the failure rate. Because we could not obtain the exact bankruptcy time, IPO time, and acquisition time of portfolio companies, we dealt with this problem, as Zhelyazkov (2017) did. We looked only at portfolio companies with their final financing round at least a year and as much as five years before the focal year. The outcome of these portfolio companies would be apparent to all VC firms by then. Likewise, past joint investment results shape a VC's perception of another VC's ability and reliability (Zhelyazkov, 2017), deciding its willingness to cooperate again (Li and Rowley, 2002). Consequently, we controlled the *collaboration outcome-new* between the new and incumbent partners, which is the difference between the average number of successful and failed ventures in which the partners are co-invested. Furthermore, since different VC types may have different investment intentions and return demands, it is easier for VC firms of the same type to reach cooperation agreements. We controlled the proportion of the incumbent partners of different types from the new partner (*type*

dissimilarity-new) based on the VC firm type classification provided in the VentureXpert database. We also control the average of the above four variables of other new partners in the same round (*investment experience – other new, other new partner performance, collaboration outcome-other new, type dissimilarity-other new*) to consider their influence in the model.

We also added the *time interval* between the last and focal financing rounds. The incumbent partner's investment plans and strategies may have changed over time, which affects their willingness to participate in subsequent financing rounds.

3.3. Estimation

Because the dependent variable is continuous and the data are cross-sectional, the core analyses were conducted using an ordinary-least-squares (OLS) model. Before generating the two-way interaction terms of portfolio similarity, group faultlines, and position inequity to test Hypotheses 2 and 3, we mean-centered the variables to avoid multicollinearity issues.

3.4. Results

Table 1 and 2 shows the overall descriptive statistics and the correlation matrix. Although, as stated, we exclude the round if none of the incumbent partners participates in the next round, the maximum value of VC withdrawal (1) is not a data-cleaning error. As mentioned earlier, we focus only on the U.S. VC firms, so that a VC withdrawal of one means that all U.S. incumbent partners have withdrawn, but some other foreign partners have entered the next financing round.

Table 1 Descriptive statistics

Variable	Mean	SD	Min	Max
VC withdrawal	0.152	0.204	0	1
Portfolio similarity	0.656	0.312	0	1
Group faultlines	3.111	4.807	0	69.768
Position inequity	0.006	0.008	0.000	0.055
Cooperation experience-incumbent (logged)	1.998	0.296	0.368	2.839
CVC proportion	0.070	0.138	0	1
Capital constraint	2.316	1.976	0	15.667
New partner size	0.665	0.551	0.071	3.667
Investment experience-new (logged)	1.318	0.666	0	2.870
Investment experience-other new (logged)	0.855	0.747	0	2.828
New partner performance	0.136	0.137	-0.667	0.667
Other new partner performance	0.085	0.108	-0.667	0.647
Collaboration outcome-new	0.141	0.335	-1.250	3.667
Collaboration outcome-other new	0.084	0.236	-1.250	3.667
Type dissimilarity-new	0.400	0.405	0	1
Type dissimilarity-other new	0.279	0.340	0	1
Time interval (logged)	2.588	0.255	1.959	3.532

Table 2 Correlation matrix

Variable	**1**	**2**	**3**	**4**	**5**	**6**
1. VC withdrawal	1					
2. Portfolio similarity	-0.033	1				
3. Group faultlines	0.019	0.077*	1			
4. Position inequity	0.037	0.013	0.188*	1		
5. Cooperation experience-incumbent (logged)	-0.046*	0.234*	0.276*	0.433*	1	
6. CVC proportion	0.093*	0.019	-0.080*	0.107*	0.011	1
7. Capital constraint	0.137*	-0.094*	-0.114*	-0.126*	-0.250*	0.169*
8. New partner size	0.020	-0.064*	0.109*	-0.001	0.004	-0.071*
9. Investment experience-new (logged)	-0.045*	0.614*	0.050*	-0.022	0.114*	-0.025
10. Investment experience-other new (logged)	0.111*	0.002	0.087*	0.048*	0.044*	0.001
11. New partner performance	-0.044*	0.343*	0.020	-0.032	0.062*	-0.001
12. Other new partner performance	0.055*	0.028	0.061*	0.017	0.053*	0.006
13. Collaboration outcome-new	-0.055*	0.268*	0.139*	0.074*	0.201*	-0.004
14. Collaboration outcome-other new	-0.008	0.106*	0.162*	0.094*	0.168*	0.000
15. Type dissimilarity-new	0.062*	-0.082*	0.036	0.086*	-0.016	0.171*
16. Type dissimilarity-other new	0.130*	-0.086*	0.075*	0.112*	-0.008	0.144*
17. Time interval (logged)	0.048*	0.063*	-0.030	-0.071*	0.093*	-0.039*
Variable	7	8	9	10	11	12
7. Capital constraint	1					
8. New partner size	-0.083*	1				
9. Investment experience-new (logged)	-0.055*	-0.084*	1			
10. Investment experience-other new (logged)	-0.048*	0.367*	0.002	1		
11. New partner performance	-0.004	-0.074*	0.385*	-0.038	1	
12. Other new partner performance	-0.032	0.245*	0.008	0.633*	0.013	1
13. Collaboration outcome-new	-0.092*	-0.026	0.357*	0.009	0.202*	0.035
14. Collaboration outcome-other new	-0.094*	0.130*	0.071*	0.401*	0.053*	0.290*
15. Type dissimilarity-new	0.050*	0.083*	-0.131*	0.004	-0.047*	0.006
16. Type dissimilarity-other new	0.014	0.359*	-0.109*	0.390*	-0.081*	0.288*
17. Time interval (logged)	0.015	-0.023	0.040*	0.014	0.030	0.012
Variable	13	14	15	16	17	
13. Collaboration outcome-new	1					
14. Collaboration outcome-other new	0.147*	1				
15. Type dissimilarity-new	-0.089*	0.018	1			
16. Type dissimilarity-other new	-0.034	0.071*	0.193*	1		
17. Time interval (logged)	0.017	0.013	-0.063*	-0.058*	1	
* p<.05						

Table 3 presents the main analysis. Model 1 only includes the control variables. We added the independent variable to Model 2 to verify Hypothesis 1. The coefficients for the portfolio similarity linear term (b=-0.125 and P<.001 in Model 2, Table 3) and squared term (b=-0.212 and P<.001 in Model 2, Table 3) are negative and positive, suggesting a U-shaped relationship. Moreover, it is necessary to implement a three-step method proposed by Lind, and Mehlum (2010) and to use the method of Fieller (1954) to set a confidence interval in the third step to verify the U-shaped relationship (Haans *et al*., 2016). In Table 4, the U-shaped inspection passed (P<.001), and the extreme point 0.506 and its confidence interval [0.413, 0.592] are also within the value range. Thus, these tests support Hypothesis 1.

Table 3 Hypothesis testing using OLS regressions (N=2,590)

DV: VC withdrawal	**Model 1**	**Model 2**	**Model 3**	**Model 4**	**Model 5**
Cooperation experience-incumbent (logged)	-0.008	-0.013	-0.021	-0.036*	-0.041*
	(0.015)	(0.016)	(0.016)	(0.017)	(0.018)
CVC proportion	0.080**	0.072*	0.078*	0.071*	0.077*
	(0.031)	(0.031)	(0.031)	(0.031)	(0.031)
Capital constraint	0.012***	0.013***	0.013***	0.013***	0.013***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
New partner size	-0.014*	-0.015*	-0.015*	-0.013†	-0.013†
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Investment experience-new (logged)	-0.002	0.007	0.008	0.008	0.009
	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)
Investment experience-other new (logged)	0.035***	0.038***	0.038***	0.037***	0.038***
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
New partner performance	-0.035	-0.038	-0.037	-0.030	-0.030
	(0.030)	(0.030)	(0.030)	(0.030)	(0.030)
Other new partner performance	-0.051	-0.062	-0.063	-0.054	-0.055
	(0.048)	(0.048)	(0.047)	(0.048)	(0.047)
Collaboration outcome-new	-0.016	-0.025*	-0.026*	-0.024*	-0.025*
	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
Collaboration outcome-other new	-0.031†	-0.037*	-0.038*	-0.037*	-0.038*
	(0.017)	(0.017)	(0.017)	(0.018)	(0.018)
Type dissimilarity-new	0.016†	0.017†	0.016	0.015	0.014
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Type dissimilarity-other new	0.053***	0.052***	0.050***	0.050**	0.048**
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Time interval (logged)	0.045**	0.046**	0.047**	0.048**	0.049**
	(0.017)	(0.016)	(0.017)	(0.016)	(0.016)
Portfolio similarity (PS)		-0.215***	-0.213***	-0.218***	-0.216***
		(0.056)	(0.055)	(0.055)	(0.055)
PS squared		0.212***	0.210***	0.217***	0.215***

(continued)

Table 3. (continued)

DV: VC withdrawal	Model 1	Model 2	Model 3	Model 4	Model 5
		(0.051)	(0.051)	(0.051)	(0.050)
Group faultlines (GF)			0.001*		0.001*
			(0.001)		(0.001)
PSXGF			0.032***		0.027**
			(0.009)		(0.010)
PS SquaredXGF			-0.032***		-0.026**
			(0.009)		(0.009)
Position inequity (PI)				1.699**	1.607**
				(0.535)	(0.533)
PSXPI				17.213**	13.885*
				(6.013)	(6.065)
PS SquaredXPI				-20.310***	-17.087**
				(5.675)	(5.727)
_cons	-0.007	0.018	0.025	0.045	0.049
	(0.053)	(0.053)	(0.054)	(0.054)	(0.054)
R-squared	0.053	0.060	0.065	0.068	0.072
Adjusted R-squared	0.048	0.054	0.058	0.062	0.064
F - value	9.727***	9.596***	9.784***	9.576***	9.360***
*** p<.001, ** p<.01, * p<.05, † p<.1; Robust standard errors in parentheses.					

Table 4 U-shaped three-step test

	Lower bound	Upper bound
Interval	0	1
Slope	-0.215	0.210
t-value	-3.870	4.040
P>|t|	0.000	0.000
Overall test of presence of a U shape: t-value=3.870 P>|t|=.000		
Extreme point: 0.506 95% Fieller interval for extreme point: [0.413; 0.592]		

Model 3 and 5 show that the interaction term between portfolio similarity squared and group faultlines are significant and negative (b=-0.032 and p<.001 in Model 3, b=-0.026 and p<.01 in Model 5). To interpret Model 3, Fig. 2 shows the statistically significant effects of portfolio similarity and its squared term on the withdrawal rate at three values of group faultlines, PI1=0, PI2=μ, PI3=μ+σ, where μ and σ are the mean and standard deviation of the group faultlines. As Fig. 5 shows, there is a U-shaped relationship between the incumbent partner's withdrawal possibility and the new partner's portfolio similarity with the incumbent partner, consistent with Hypothesis 1. Moreover, stronger group faultlines weaken this U-shaped relationship, supporting Hypothesis 2.

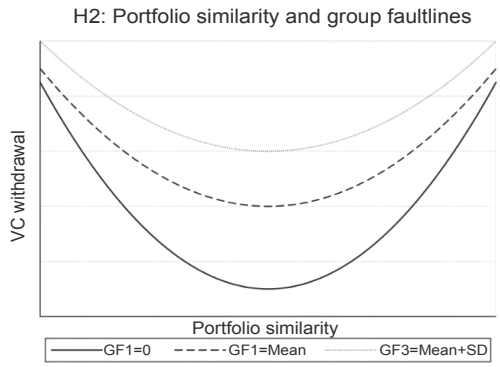

Fig. 5 The moderation of group faultlines

Hypothesis 3 proposes that stronger position inequity within a syndicate weakens the U-shaped relationship between the incumbent partner's withdrawal possibility and the new partner's portfolio similarity with the incumbent partner. As Table 3 shows, the interaction terms between portfolio similarity squared and position inequity are both significant and negative (b=-20.310 and p<0.001 in Model 4, b=-17.087 and p<0.01 in Model 5). We find support for Hypothesis 3 (see also Fig. 6).

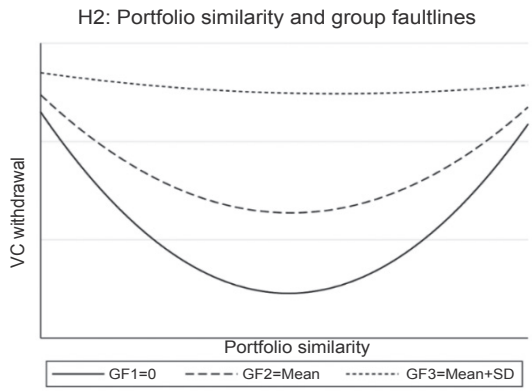

Fig. 6 The moderation effect of position inequity

3.5. Robustness tests

We conducted several analyses to test the robustness of these findings. First, we turned VC withdrawal into a dummy variable, coded as 1 if more than zero incumbent partner leave the syndicate permanently and 0 otherwise. Then we performed a Probit model to test the hypotheses. From Models 6 and 7, Table 5, we can conclude that the results stay robust. Second, we used primary SIC codes (four digits) provided by VentureXpert database to measure the portfolio similarity. As shown in Model 8 and 9, Table 5, the results stay stable. Third, we ran the two-stage least squares (2SLS) model[3] to eliminate endogeneity confirmed by a Durbin–Wu–Hausman test. We used the new partner's investment specialization (investment strategy–new), which was measured by the standard deviation of the new partner's investment proportion in different industries as the instrumental variable. Maintaining a high degree of specialization can help VCs gain access to information, resources, investment opportunities, and networks from other VC investors (Bygrave, 1987, 1988). This knowledge sharing directly affects the benefits of portfolio similarity to the incumbent partner, but there is no expectation that the relationship

[3] The first stage model of 2SLS is shown in Appendix A.

between the new partner and external VC investors will affect the incumbent partner's withdrawal possibility. Next, we use both its linear and squared terms to instrument portfolio similarity and its squared term (Angrist and Pischke, 2008). The Kleibergen–Paap rk LM statistic was 26.999, passing the under-identification test. Moreover, the Kleibergen–Paap Wald F statistic of 23.018 supported that they were not weak instruments. In the first-stage regression of 2SLS, the instrumental variable and its square term are significant. The specific results are shown in Appendix A. Table 5, Model 10 displays the regression model results with instrumental variables. The coefficient for the portfolio similarity linear term (b=-1.183 and p<.05 in Model 10, Table 5) is negative, while the squared term is positive (b=1.150 and p<.05 in Model 10, Table 5). Combined with the U-shaped three-step test results shown in Table 6, a U-shaped relationship exists between the incumbent partner's withdrawal possibility and the new partner's portfolio similarity with the incumbent partner; thus, Hypothesis 1 is supported. Forth, to avoid the effects of extreme values, we winsorized the dependent variable "VC withdrawal" at 1% and 2% levels, and the results stay robust[4]. We also verified the robustness for 3- and 7-year rolling windows[5].

Table 5 Robustness tests (N=2,590)

DV: VC withdrawal	**Probit Model**		**SIC (4 digits)**		**2SLS**
	Model 6	**Model 7**	**Model 8**	**Model 9**	**Model 10**
Cooperation experience-incumbent (logged)	0.019	-0.196†	-0.011	-0.038*	-0.033
	(0.093)	(0.105)	(0.016)	(0.018)	(0.022)
CVC proportion	0.791***	0.852***	0.076*	0.080*	0.036
	(0.194)	(0.196)	(0.031)	(0.031)	(0.039)
Capital constraint	0.071***	0.073***	0.012***	0.013***	0.016***
	(0.014)	(0.014)	(0.002)	(0.002)	(0.003)
New partner size	-0.031	-0.027	-0.015*	-0.014†	-0.019*
	(0.050)	(0.050)	(0.007)	(0.007)	(0.008)
Investment experience-new (logged)	0.013	0.027	0.005	0.007	0.049*
	(0.054)	(0.054)	(0.009)	(0.009)	(0.022)
Investment experience-other new (logged)	0.201***	0.200***	0.037***	0.037***	0.053***
	(0.049)	(0.049)	(0.008)	(0.008)	(0.012)
New partner performance	-0.133	-0.088	-0.034	-0.028	-0.042
	(0.203)	(0.206)	(0.030)	(0.030)	(0.035)
Other new partner performance	-0.328	-0.279	-0.059	-0.050	-0.110*
	(0.303)	(0.304)	(0.048)	(0.048)	(0.056)
Collaboration outcome-new	-0.133	-0.143†	-0.025*	-0.026*	-0.067**
	(0.085)	(0.087)	(0.012)	(0.012)	(0.025)
Collaboration outcome-other new	-0.288*	-0.315*	-0.036*	-0.039*	-0.067**
	(0.121)	(0.124)	(0.017)	(0.017)	(0.024)
Type dissimilarity-new	0.107†	0.093	0.017†	0.015	0.018†

(continued)

[4] The regression results of winsorization can be provided if required.
[5] The regression results of 3- and 7-year rolling windows can be provided if required.

Table 5. (continued)

DV: VC withdrawal	Probit Model		SIC (4 digits)		2SLS
	Model 6	Model 7	Model 8	Model 9	Model 10
	(0.065)	(0.065)	(0.010)	(0.010)	(0.011)
Type dissimilarity-other new	0.304***	0.279**	0.053***	0.048**	0.048**
	(0.086)	(0.087)	(0.015)	(0.015)	(0.016)
Time interval (logged)	0.333***	0.366***	0.045**	0.049**	0.052**
	(0.100)	(0.102)	(0.017)	(0.017)	(0.017)
Portfolio similarity (PS)	-0.839*	-0.866*	-0.190***	-0.195***	-1.183*
	(0.352)	(0.356)	(0.055)	(0.055)	(0.487)
PS squared	0.742*	0.773*	0.210***	0.219***	1.150*
	(0.321)	(0.324)	(0.055)	(0.055)	(0.485)
Group faultlines		0.019***		0.002*	
		(0.006)		(0.001)	
		0.169*		0.019*	
		(0.077)		(0.009)	
		-0.175*		-0.021*	
		(0.073)		(0.010)	
Position inequity (PI)		10.145**		1.434**	
		(3.614)		(0.537)	
		79.002†		10.259†	
		(41.720)		(5.960)	
		-95.565*		-14.422*	
		(40.315)		(6.190)	
_cons	-1.354***	-1.142***	0.014	0.040	0.125
	(0.316)	(0.320)	(0.053)	(0.054)	(0.081)
Model chi2	133.029	172.530			
Pseudo R2	0.041	0.051			
R-squared			0.058	0.067	
Adjusted R-squared			0.053	0.059	
F - value			9.430***	8.590***	7.875***
Root MSE					0.212
*** p<.001, ** p<.01, * p<.05, † p<.1; Robust standard errors in parentheses.					

Table 6 Robustness tests: U-shaped three-step test

	Lower bound	Upper bound
Interval	0	1
Slope	-1.183	1.117
t-value	-2.428	2.299
P>|t|	0.008	0 .011
Overall test of presence of a U shape: t-value=2.300 P>|t|=.011		
Extreme point: 0.514 95% Fieller interval for extreme point: [0.470; 0.618]		

4. Conclusion and Discussion

4.1. Research findings

Does the new partner cause the incumbent partner to withdraw from the VC syndicate? This study confirmed this crowding-out effect. Based on the literature on knowledge acquisition and protection, we argued that the competitive risk of knowledge leakage would tend the incumbent partner to withdraw from the syndicate. The incumbent partner might weigh the cost of exiting and staying so that the withdrawal would occur when the risk cost rises to reverse its private benefits. To test this underlying mechanism, we used the U.S. VC syndication data from 1985 to 2016 and conducted an empirical study with portfolio similarity between new and incumbent partners as the independent variable. The result indicated that new partners' portfolio similarity with incumbent partners was associated with the incumbent partner's withdrawal, showing a U-shaped relationship. This finding proves that the incumbent partner would withdraw following a new partner's addition, with the withdrawal decision following a risk-benefit analysis. Moreover, this study found that the group faultlines and position inequity within the syndicate would weaken this U-shaped relationship by negatively affecting the creation and distribution of the common benefits.

4.2. Theoretical implications

This study makes several theoretical contributions to the existing literature. First, this study sheds new light on the dynamics of organizational networks. The ties between nodes can be created or dissolved (Ahuja *et al*., 2011), and extensive past literature examined these two network dynamics, for instance, partnership formation (Shipilov *et al*., 2010; Zhang and Guler, 2019) and alliance dissolution (Heidl *et al*., 2014; Polidoro *et al*., 2011). However, most studies are concerned only with one of these two dynamics, and the few that include both dynamics fail to consider their link (Fassin and Drover, 2017; Guan *et al*., 2017; Ucbasaran *et al*., 2003). Our study's highlight is that we propose and prove the possibility of the new tie breaking the incumbent one. This finding first challenges the estimation accuracy of some studies examining tie formation or dissolution without controlling another dynamic effect. For example, research on the valuation of portfolio companies shows that VC firms could act as an endorsement signaling the portfolio company's value (Lee *et al*., 2011; Stuart *et al*., 1999), while the withdrawal would be viewed as a negative signal and decrease the valuation (Shafi *et al*., 2020). Therefore, ignoring the crowding-out effect of new partners on incumbent partners would lead to an incorrect estimation of the VC entry valuation–exit valuation relationship. Furthermore, this result suggests the dependence of network dynamics, showing one form of network evolution: change drives change. This insight presents a significant opportunity for future research.

Second, we extended research on tie dissolution from one level to multilevel. Traditionally, tie dissolution is examined only at one level. The downside of dyad ties leads to partnership termination (Beckman and Haunschild, 2002; Gulati and Sytch, 2008). Some group dynamics also damage alliance stability (Heidl *et al*., 2014). However, this study focused on the partner's departure from the syndicate and proposed a multilevel mechanism to explain it. Specifically, the syndicate's competitive tie with the new partner exposes the incumbent partner to the competitive risk of knowledge leakage. Still, the private benefits allocated by the syndicate tempt it to take this risk. The incumbent partner subsequently withdraws from the syndicate on realizing that the private benefits are not enough to cover the risk costs. This study revealed the combined influence of dynamics at the two levels of dyadic and group.

Third, we integrated the economic and sociological logic to explore the VC withdrawal decision and its boundary. Pure economic logic treats the withdrawal as giving up possible investment returns. According to this view, the negative expectations of returns trigger VC withdrawals. The sociological view holds that partnerships of knowledge leakage risk break down. The present study regarded the risk as cost and considered the withdrawal decision as a risk-benefit trade-off. The relational and structural chasms are shaped by the heterogeneity of the tie and node of the partner network, respectively. This study emphasized the role of relational and structural chasms in common benefits creation and distribution by linking the relevant theories of internal dynamics.

Fourth, this study provided a decision-making mechanism for VC withdrawal. The relatively limited literature on VC withdrawal has confirmed that the motivations included various factors other than the syndicate's underperformance (Bernstein *et al*., 2016; Guler, 2007; Shafi *et al*., 2020; Townsend, 2015). However, the current literature has not developed a general and practical analysis framework to explain VC withdrawal in different situations. Our study is among the first to do so. Apart from the addition of the new partner, the risk-benefit analysis proposed in this study could also be applied to a wide range of dynamic scenarios, offering a basis for future research.

4.3. Practical implications

Integrating the viewpoint of partner selection and syndicate stability has some practical implications. This study proved a U-shaped relationship between the incumbent partner's withdrawal possibility and the new partner's portfolio similarity with the incumbent partner. In addition to the loss of resources and reputation, the syndicate would also face the "free-riding" behavior of incumbent partners, as they might restrict knowledge sharing if they were to stay (Makarevich, 2018a). Therefore, the venture should actively intervene in the VC syndicate's partner composition change, not just focusing on financial support. The neutral partner also needs to evaluate these potential losses before standing up for one side when dealing with the partner selection dispute.

Additionally, our study joined the literature on inter-organizational collaboration and group dynamics, examining network chasms' moderating role at the relational and structural level: group faultlines and position inequity. These findings provide managerial advice for syndicate governance. The conclusion on group faultlines shows that syndicates should mediate partnerships to prevent group splits and private collusion of partners. For example, the syndicate could introduce boundary spanners to promote cooperation among subgroups (Zhang and Guler, 2019) or encourage the hub firm to actively play the coordinator's role (Heidl *et al*., 2014). According to the resource view, cooperation with resource-rich VC syndicates could create more common benefits. However, position inequity has led to the opposite conclusion from the perspective of group dynamics: outstanding firms might not be good partner choices. Therefore, portfolio companies should focus on the power balance in syndicate composition, such as accepting multiple powerful VC firms. Alternatively, portfolio companies could provide the gatekeeper a large share of common benefits to limit its opportunistic behavior in another way. Small VC firms should ensure that the syndicate has internal unity or power balance.

4.4. Limitations

This study has the following limitations. First, the link between tie formation and dissolution deserves more attention and exploration. The destruction of incumbent ties by new ties is only one part of the story. Future research could consider other factors besides portfolio similarities, such as other characteristics of

the new partner or its different relationship with the incumbent partner. Second, there is a broad room to further investigate the change after adding new partners, as we have focused only on the incumbent partner withdrawal in this study. Future research could discuss the subsequent impact on VC partners or the portfolio company, including the positive effect. Third, future research could check whether our risk-benefit analysis framework can be generalized to other settings. Our study was conducted in the context of VC syndicates, and it remains to be proved whether the same mechanism could explain other multi-partner collaborations. Fourth, although we performed some robustness tests, the problem of selection bias remains, as we used only the U.S. VC investment data. When sufficient international data become available, future studies could address this issue.

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Appendix A: The first stage of 2SLS

DV:	Portfolio similarity (PS)	PS squared
Cooperation experience-incumbent (logged)	0.117***	0.144***
	(0.017)	(0.019)
CVC proportion	0.093**	0.134***
	(0.035)	(0.039)
Capital constraint	-0.008***	-0.011***
	(0.002)	(0.003)
New partner size	0.017†	0.020*
	(0.009)	(0.010)
Investment experience-new (logged)	0.324***	0.287***
	(0.007)	(0.008)
Investment experience-other new (logged)	-0.006	-0.022*
	(0.008)	(0.009)
New partner performance	0.131**	0.145**
	(0.043)	(0.045)
Other new partner performance	-0.037	0.013
	(0.053)	(0.058)

(continued)

Appendix A. (continued)

DV:	Portfolio similarity (PS)	PS squared
Collaboration outcome-new	0.024*	0.068***
	(0.010)	(0.013)
Collaboration outcome-other new	0.053**	0.085***
	(0.017)	(0.020)
Type dissimilarity-new	-0.005	-0.007
	(0.012)	(0.013)
Type dissimilarity-other new	0.010	0.014
	(0.015)	(0.017)
Time interval (logged)	-0.010	-0.016
	(0.017)	(0.020)
Investment strategy – new (ISN)	0.001***	0.001***
	(0.000)	(0.000)
ISN squared	-0.000***	-0.000***
	(0.000)	(0.000)
_cons	-0.088	-0.204***
	(0.056)	(0.061)
R-squared	0.529	0.454
Adjusted R-squared	0.526	0.451
F - value	304.988***	293.241***
*** p<.001, ** p<.01, * p<.05, † p<.1; Robust standard errors in parentheses.		