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RESEARCH ARTICLE

Does the same investment team create value? Evidence from venture capital syndication

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Abstract We study the effect of repeated venture capital (VC) syndication on VC investment performance. We posit that repeated syndication is positively associated with stagnant investment returns but negatively associated with high investment returns. Using a large dataset from 1985 through 2017, we find support for our intuition. Additionally, our results show that periods of recession accentuate the positive (negative) relationship between repeated syndication and stagnant (high) investment returns. These findings are robust after addressing sample selection and endogeneity concerns. Our study provides nuanced insights into the performance implications of having the same investment teams in the context of VC syndications.

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Plain English Summary There is substantial evidence supporting the benefits of syndicating venture capital (VC) investments, where VCs co-invest in a portfolio company. However, what happens when the same VCs frequently partner with each other? This study examines the dual effects of repeated VC syndication using a comprehensive sample of investments from 1985 to 2017. VCs that consistently collaborate with the same partners are less likely to achieve high returns but are more likely to secure stable outcomes. Additionally, during recessions, which introduce significant uncertainty, these main effects became even stronger. Our study has important implications for VCs who regularly syndicate with the same teams.

Keywords Recession · Repeated collaboration · Syndication · Venture capital

JEL Classification G11 · G24 · G01

1 Introduction

Venture capital (VC) syndication involves decisions of repeated collaboration of VC firms, often investing in a common set of innovative ventures (i.e., portfolio companies) (Bellavitis et al., 2019; Cumming et al., 2023; Dimov & Milanov, 2010; Hochberg et al., 2007; Lerner, 1994; Wright & Lockett, 2003). It is well established that successful collaborations frequently pave the way for subsequent cooperative

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ventures, underscoring the importance of evaluating the value and trust accrued through repeated collaboration over time (Skilton & Dooley, 2010). While the selection hypothesis (Lerner, 1994) emphasizes the importance of pooling resources to minimize risk and identify optimal investment opportunities, the value-added hypothesis (Brander et al., 2002; Kaplan & Strömberg, 2003) highlights the benefits of VC monitoring and nurturing for the growth of portfolio companies.

Following the value-added hypothesis, studies that adopt a resource-based view suggest that repeated collaboration enables organizations to build trust and coordinate effectively (Das et al., 2011; Lockett & Wright, 2001; Ter Wal et al., 2016). As such, an important characteristic of such repeated collaborations is the emerging trust that compels partners to maintain loyalty, supporting coordination and shared goals (Gulati, 1995). In contrast, studies taking an inter-organizational perspective argue that repeated collaboration can create competitive tensions and structural inertia, which negatively impact the collaboration process between VCs and portfolio companies, thereby hindering value addition and performance (Casamatta & Haritchabalet, 2007; Das & Teng, 2000; De Clercq et al., 2008; Guler, 2007).

Integrating these perspectives, recent studies on VC syndications have proposed and showed an inverted U-shaped relationship between repeated syndications and VC exits from their portfolio companies through Initial Public Offering (IPOs) or Merger and Acquisition (M&A) (Bellavitis et al., 2019; De Clercq & Dimov, 2008; Wang et al., 2022). While these studies provide valuable insights into the effect of repeated syndications on performance, these studies focus on VC exit choices and timing. Yet, the value generated or diminished by decisions to repeat syndication can only be estimated reliably with exit valuations instead of exit choices or timing. Indeed, metrics like IRR or PME are critical when assessing the implications of repeated syndications on performance. Utilizing proprietary data that includes these performance indicators, our study seeks to expand upon prior research by quantifying the effects of repeated syndication on distinct VC outcomes.

Specifically, we study the effects of repeated syndication on low (stagnant) and high VC investment returns, respectively.[1] The attainment of *high VC investment returns* necessitates syndicated members to facilitate experimentation and discovery, whereas optimizing a specific project by refining and extending existing competences leads to *stagnant VC investment returns* (Laureiro-Martínez et al., 2015). Such distinction is theoretically valuable for the syndication literature in that VCs often syndicate but do not necessarily collaborate repeatedly to achieve high-performance outcomes (De Clercq & Dimov, 2008; Gompers et al., 2016; Jääskeläinen, 2012). For instance, through recurring collaborations, syndicates can become closed networks with capacity constraints and structural inertia (Li & Rowley, 2002; Sen & Puranam, 2022). Through recurring syndication, trust and cohesions benefits build up and can potentially result in stagnant investment returns (Hochberg et al., 2015; Uzzi, 1997). Hence, VCs might dedicate less attention to portfolio firms. To this end, we posit that the repeated syndication decision is likely to generate stagnant investment returns and could be detrimental for achieving high returns. Next, we consider the moderating role of recession periods in determining repeated syndications' risk tolerance (Conti et al., 2019; Gompers et al., 2008; Ning et al., 2015). A mega event such as the 2008 global financial crisis introduces uncertainties, constraining VCs abilities to secure essential funding and challenging their capacity to support innovative ventures.

For our analysis, we use an exhaustive dataset on global VC investments between 1985 and 2017, provided by the Centre of Private Equity Research (CEPRES). Our results show that repeated

[1] We define repeated syndication as the decision to collaborate between two distinct VCs over separate deals across time. Syndications among VC firms have received a significant attention in the literature (see Lerner, 1994; Lockett & Wright, 2001; Hochberg et al., 2015), but not repeated syndication between VCs with limited empirical evidence (see Guler, 2007; De Clercq & Dimov, 2008; Bellavitis et al., 2019). We modify repeated collaboration measures proposed in previous studies (see De Clercq & Dimov, 2004; Dahlander & McFarland, 2013; Bellavitis et al., 2019; Seo et al., 2020) in the context of repeated VC syndication. In doing so, we track VCs over time from the first syndication to the subsequent co-investment in a different portfolio company. Follow-on investments between VCs in the same portfolio company are not considered as a repeated syndication.

syndication decreases the prospect of achieving high performance but increases the chances of low investment returns. We find that recession accentuates the positive (negative) relationship between repeated syndication and stagnant (high) investment returns. Our results are robust using Heckman two-stage estimation, entropy balancing matching method and two-stage IV model to address the potential selection bias and endogeneity concerns.

Our study contributes to the entrepreneurial finance and VC syndication literature by investigating the duality of repeated collaboration (see for instance Sorenson & Stuart, 2001; Casamatta & Haritchabalet, 2007; Cumming et al., 2023; Jääskeläinen, 2012; Hochberg et al., 2015; Gompers et al., 2016; Meuleman et al., 2017; Bellavitis et al., 2019). We find that repeated syndication is negatively associated with high investment returns but is positively associated with stagnant investment returns. We show that recession accentuates the positive (negative) relationship between repeated syndication and stagnant (high) investment returns. These effects remain consistent when the analysis is extended to the post-crisis period following the global financial crisis in 2008. Overall, this study offers valuable insights to the VC firms and entrepreneurial start-ups on the performance implications of recurring VC syndications.

2 Theoretical background

2.1 VC syndication

To navigate the complex landscape of VC investments, the literature on syndication, particularly from a risk-sharing perspective (Lockett & Wright, 2001), underscores the critical role that syndication plays in addressing information asymmetry and mitigating adverse selection challenges (Jääskeläinen, 2012; Lerner, 1994). In this context, Lerner's selection hypothesis (1994) proposes that syndication occurs because VCs collaborate with other investors to reduce risk by selecting the most promising investment opportunities. According to this view, VCs pool their financial resources and expertise to mitigate the inherent uncertainties and risks associated with high-stakes investments, thereby increasing the likelihood of identifying high-potential ventures. The primary motivation here is risk-sharing, where the collaboration with other experienced VCs helps ensure that the investment decisions are based on high-quality, well-vetted opportunities, reducing the chances of adverse outcomes.

In contrast, the value-added hypothesis (Brander et al., 2002; Kaplan & Strömberg, 2003) shifts the focus from risk reduction to the strategic enhancement of portfolio companies. This perspective asserts that syndication enables VCs to leverage complementary expertise, diverse resources, and extensive networks, all of which can contribute to the growth and success of the portfolio company (Braune et al., 2021; Ferrary, 2010; Keil et al., 2010). Here, syndication is viewed not just as a means of sharing financial risk but as an opportunity to create significant value through the collective strengths of multiple VCs. Rather than relying solely on financial capital, syndicates bring together a wide range of skills, industry knowledge, operational experience, and investor networks that can provide critical support to start-ups, aiding them in scaling, improving operational efficiencies, and accessing new markets or follow-on funding opportunities (Brander et al., 2002; Verwaal et al., 2010).

Combining these insights, we delve into the rationale behind predicting high and stagnant VC investment returns, respectively.

2.2 VC performance

In the pursuit of maximizing VC investment returns, VC syndicate members often find themselves compelled to adopt growth strategies even in the face of higher uncertainty (Das et al., 2011). This uncertainty arises from the lack of financial track records and other pertinent information for many portfolio companies (Jääskeläinen, 2012; Lockett & Wright, 2001). VC syndicated members diversify their portfolio and invest in portfolio companies operating within high-growth industries. Simultaneously, they optimize their monitoring by actively involving themselves with these portfolio companies throughout the holding period, frequently securing board seats to ensure more effective oversight (De Clercq et al., 2008; Jääskeläinen et al., 2006). This proactive approach allows VC syndication to achieve high returns.

However, the factors sustaining stagnant growth are likely to be distinct from those propelling high returns. For instance, when syndicated members lack pro-activeness and exhibit a greater interest in maintaining the status quo, the efficacy of strategies oriented towards investing in well-established and familiar industries becomes particularly pronounced (Bellavitis et al., 2019; Wright & Lockett, 2003). Due to inherent familiarity with these investment opportunities, VC syndicates are inclined to allocate comparatively less time and attention to the ongoing monitoring (Casamatta & Haritchabalet, 2007). Given that VC decisions to syndicate are comprised of individuals with bounded rationality and cognitive limitations, the familiarity hinders them from making optimal resource allocation decisions, resulting in *stagnant returns*.

With this distinction in mind, we argue in the following section that trust and cohesion, fostered through repeated syndication, play a pivotal role in ensuring the stability of syndication teams and, in turn, achieving *stagnant investment returns* (Uzzi, 1997). As such, trust and cohesion concern expectations about "the reliability of other parties'behavior is a risky exchange situation" (see Wright & Lockett, 2003, p. 2078). Trust and cohesion are viewed as complementary to formal contracts, as they help build confidence in situations of asymmetric information and uncertainty (Beamish & Banks, 1987). However, they often result in convergent thinking and structural inertia, which are salient in repeated syndication teams (Casamatta & Haritchabalet, 2007; De Clercq & Dimov, 2008; Sen & Puranam, 2022; Skilton & Dooley, 2010). Convergent thinking may constrain creative problem-solving and limit the pursuit of ambitious opportunities. Furthermore, structural inertia reduces flexibility, collectively hindering syndication teams'ability to adapt, innovate, and achieve *superior performance*.

3 Hypotheses development

3.1 Repeated syndication and stagnant returns

In syndication networks, differences in investment philosophies among VCs often lead to inter-organizational tensions (Casamatta & Haritchabalet, 2007). Repeated collaborations, however, offer several advantages for these networks. They facilitate the resolution of inter-organizational tensions and help address challenges that may arise during the investment holding period (Das & Teng, 2000; De Clercq & Dimov, 2008). For instance, trust and established routines developed from prior co-investments play a pivotal role in mitigating conflicts and expediting the decision-making process. Nonetheless, repeated syndication can result in a slowdown in the venture selection process and make the resources of co-investors progressively less valuable (Bellavitis et al., 2019). This occurs because VCs tend to shift their focus from closely monitoring each other to placing excessive reliance on trust (Li & Rowley, 2002). Therefore, as inter-organizational relationships mature through repeated syndications, individual members cultivate mutual trust and tend to opt for safer investment opportunities to maintain the status quo (Granovetter, 1973; Uzzi, 1997).

Further, VC syndicates share and exchange skills, values, and behavioral patterns through ongoing interactions (Argote, 2013; Eftekhari & Timmermans, 2022). Private information is exchanged, and information asymmetries are reduced. This recurring collaboration serves the purpose of preventing competition among VCs following the disclosure of investment opportunities by aligning the interests of their members (Casamatta & Haritchabalet, 2007). However, the act of repeatedly co-investing leads to a convergence of VCs'industry expertise and contacts over time. This convergence, in turn, curtails VCs'willingness to explore new directions that may hold promise, particularly when such opportunities bear little resemblance to their previous investments or involve radically new ideas (Dushnitsky & Lavie, 2010). In essence, repeated syndication promotes stability and fosters team identity, ultimately resulting in stagnant investment returns (Brinster & Tykvová, 2021; Hochberg et al., 2007, 2015). In sum, trust and cohesion in repeated syndication influences teams to achieve *stagnant investment returns*. Formally:

> **Hypothesis 1a:** Repeated syndication has a positive effect on stagnant investment returns.

3.2 Repeated syndication and high returns

Despite the trust and cohesion effects of repeated syndication on stagnant returns, repeated syndication

is detrimental for its members to take risks to yield high returns. For example, frequent interactions may lead syndications to evolve into closed networks, where members often refrain from collectively challenging prevailing beliefs, becoming ensnared in their established patterns (Casamatta & Haritchabalet, 2007; Gargiulo & Benassi, 2000; Gompers et al., 2016; Guler, 2007; Ter Wal et al., 2016; Uzzi, 1997). As such, syndications involving recurrent collaborators are less likely to take risks by incorporating new knowledge into their problem-solving processes (Bellavitis et al., 2019; Seo et al., 2020). By implication, frequent collaborators might become risk-averse by converging too rapidly on familiar solutions from the past, instead of thoroughly exploring diverse alternatives before reaching a conclusion (Sen & Puranam, 2022; Skilton & Dooley, 2010).

Relatedly, repeated syndication often results in structural inertia among VCs, causing them to be hesitant about engaging with new partners (Li & Rowley, 2002; Sen & Puranam, 2022). This hesitancy can be attributed to the deep sense of attachment that develops from shared experiences and investments in ongoing relationships (Dahlander & McFarland, 2013; Gompers et al., 2016). As such, the structures, routines, processes, and competencies within VC syndicates may be constrained by the historical inertia created through recurring syndication partnerships (De Clercq & Dimov, 2008). This inertia could present challenges for VCs in efficiently deploying their financial and human capital to seize entrepreneurial opportunities in a timely manner (Sen & Puranam, 2022; Wright & Lockett, 2003). Consequently, this capacity constraint may lead to VC firms missing out on jackpot opportunities to generate high returns (Cumming & Dai, 2011; Jääskeläinen et al., 2006). In sum, convergent thinking, capacity constraint and structural inertia can impede repeated syndication teams from taking risks to yield high returns. Based on this reasoning, we propose the following hypothesis:

Hypothesis 1b: Repeated syndication has a negative effect on high investment returns.

3.3 Periods of recession and repeated syndication

While we anticipate that the trust benefits and convergence pitfalls resulting from repeated syndication will serve as the primary mechanisms, we also argue that during recessions this mechanism is moderated. New uncertainties emerge, primarily related to fundraising capabilities, exit opportunities, deal selection, and the structuring of transactions for VCs during recessions (Bernstein et al., 2019; Gompers et al., 2008; Ning et al., 2015). With significant reductions in capital inflow into the VC market and diminished opportunities to exit successfully from startups, VC syndicated members must reassess their investment strategy (Conti et al., 2019; Sen & Puranam, 2022).

Naturally, periods of recession influence VC syndicates to adopt a more risk-averse approach and reallocate resources to their core competencies (Ning et al., 2015). More specifically, we expect that periods of recession elevate the prevalence of repeated syndications as these economic shocks tend to steer repeated syndications towards favoring risk-averse choices. As such, VC syndicates are encouraged to prioritize stability and teamwork over the pursuit of new investment opportunities during recessions (Conti et al., 2019; Sen & Puranam, 2022). This is because VCs could be seeking to maintain their stagnant investment returns to compensate for the additional losses incurred in exceptionally higher deal returns during recessions. This strategic shift allows them to focus on maintaining the status quo or minimizing the effect of the economic shock. As such, trust and cohesion benefits of repeated syndications become more salient in times of recession. Based on this rationale, we formally predict:

Hypothesis 2a: Periods of recession accentuate the positive relationship between repeated syndication and stagnant investment returns.

As argued earlier, a recession enables repeated syndicates to sustain stagnant investment returns by strengthening the benefits of trust and cohesion. However, such shocks could also divert the syndicates' focus from expanding their portfolio through improved selection processes for new investments and securing future deal flow (Conti et al., 2019; Ning et al., 2015). Instead of actively seeking high-reward opportunities that could yield substantial investment returns, their primary concern becomes maintaining the status quo and ensuring the survival of their existing portfolio companies (Bernstein et al.,

2019). In essence, the challenges associated with structural inertia and convergent thinking become more pronounced for repeated syndications during recessions. Based on this rationale, we expect high investment returns to decrease for repeated syndications during recessions such as the global financial crisis for instance. Formally:

Hypothesis 2b: Periods of recession accentuate the negative relationship between repeated syndication and high investment returns.

4 Methods

4.1 Data and sample

We obtain our data on worldwide VC syndications from CEPRES spanning the years from 1985 to 2017. Inclusion in the CEPRES database mandates that all General Partners (GPs) report the complete history of past deals, a critical requirement in our context. This minimizes the risk of over- or understating repeated syndication due to potential gaps in data coverage. The database provides detailed information on individual VC investments, essential for computing our variables of interest. The database offers comprehensive insights into cash flows at the level of each VC investment, crucial for calculating the internal rate of return (IRR) and public market equivalent (PME) at the individual deal level. VC syndicates frequently invest in a specific portfolio company (deal) using multiple funds, making it challenging to calculate repeated syndication at a fund level. In contrast, deal-level data enable us to observe each VC in the syndicated deal, facilitating an accurate estimation of our measure of repeated syndication. Additionally, we account for the possibility of new VCs entering and others exiting the sample during our sample period.

Our initial sample comprises 5,484 syndicated VC deals from January 1985 to December 2017. As we examine the effect of repeated syndication, we exclude 1,575 deals in which the specific VC firm pairs only syndicated once. After this filtration, we are left with a final sample of 3,909 deals with repeated VC syndicated members. We divide our sample into three geographical regions: (i) North America, (ii) Europe excluding the UK, and (iii) the UK. Our sample includes 2,288 observations for North America, 1,187 for the UK, and 434 for the rest of Europe. Another benefit of the CEPRES database is that all investment data are anonymized based on VC confidential data requirements. Therefore, the likelihood of overstating the performance when providing the data is very low, minimizing bias in reporting. In other words, self-reporting bias is mitigated when using the CEPRES database. The database has been utilized by VC-related studies (Buchner et al., 2018; Franzoni et al., 2012).[2]

4.2 Variables

4.2.1 Dependent variables

We use two measures of performance on exited deals. The first is the IRR, which is calculated at the *deal* level. The IRR is computed as the discount rate, which equates the present value of the net cash flow to zero. The CEPRES database provides information on the cash flows invested from entry to exit, including dividend repayments and proceeds from exit. The second measure is PME which is computed by discounting the VC investment's cash inflow and outflow relative to a public benchmark (Buchner et al., 2018). Our high returns are measured through top quartile performance, and stagnant returns through bottom quartile performance.

4.2.2 Independent and moderating variables

We concentrate on deals where at least two distinct VCs co-invest together within the same year. We categorize these deals as syndications, aligning with previous studies (Buchner et al., 2018; Jääskeläinen, 2012). We opt for a one-year timeframe due to potential delays in VCs reporting their investments to CEPRES. Following the methodology of earlier studies (Bellavitis et al., 2019; Dahlander & McFarland, 2013; De Clercq & Dimov, 2004, 2008; Seo et al., 2020), we calculate our repeated

[2] While the CEPRES database has rich information on deal-level performance, unfortunately, the database has limited information related to the portfolio companies Given the data limitation, we were able to approximate the size of the portfolio company using the number of rounds in addition to the stage of financing to proxy for the portfolio company's size.

syndication measure using the cumulative number of prior collaborations on different deals over a five-year period (as suggested by Hochberg et al., 2007). This enables us to identify repeated syndication of any VC pair within five years before a specific deal at the deal level, excluding follow-on rounds. We choose a five-year period since VCs typically make investments within the first five years and plan their exits beyond that timeframe (Gompers et al., 2008). This duration allows us to capture potential collaborations among VC pairs. Our identification approach ensures the inclusion of actual syndication formations, tracking unique VC pairs on a rolling basis throughout our sample. Consequently, our repeated syndication variable is a time-variant measure.

We exclude follow-on investments, which refer to subsequent investments by the same VC pair in the same portfolio company later. Consequently, our measure of repeated syndication focuses solely on subsequent co-investments by the specific VC pair in different portfolio companies. This approach ensures that we do not give undue weight to multi-financing rounds in our measure. The computation of repeated syndication is as follows:

$$RepeatedSyndication_i = \sum_{k=1}^{K} Tie_{ik} - 1$$

where Tie_{ik} is the number of prior events of syndication on previous deals in which we accumulate the number of collaborations of Tie_k on deals i minus 1 to correct for the first syndication formation. We are following previous literature (Hochberg et al., 2007; Seo et al., 2020) and adapt the measure by subtracting one to account for the first syndication. Tie_k here includes all possible pairs of VCs. For each syndicated deal, we identify all possible pairs of which each pair is identified as a distinct VC pair.

In our sample, we identify 3,909 repeated syndications. Among these, there are 611 VC pairs that continue to collaborate after the initial syndication formation. Our findings reveal that VCs engage in repeated syndication, with instances ranging from at least twice to, in some cases, up to 49 times.

Figure 1 visually presents the identification process described across five different points in time. For instance, consider two distinct VCs (VC *a* and VC *b*) co-investing in portfolio company α in 2013 (t = 0). We can identify a VC pair syndication formation

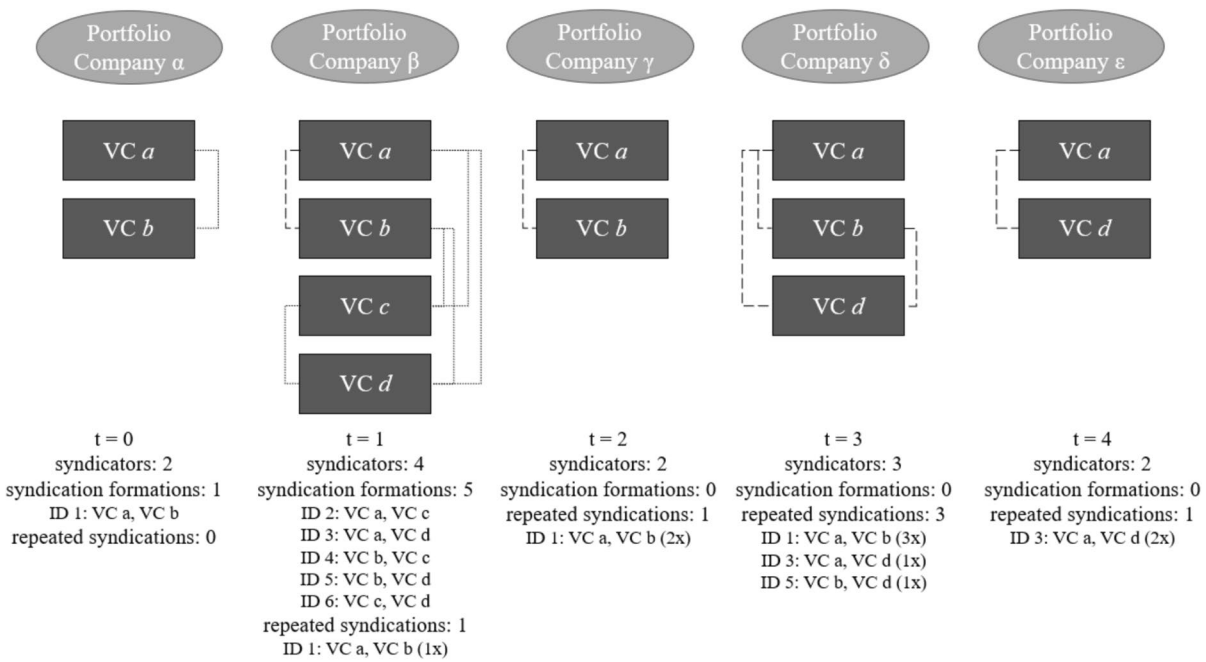

Fig. 1 Identification process of syndication formation and repeated syndication

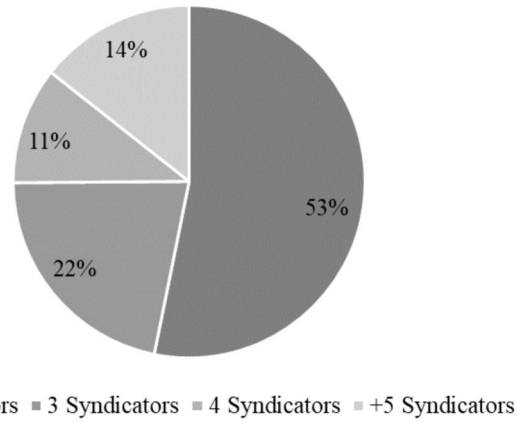

Fig. 2 Proportion of syndicate size per deal in the sample

(*a*-*b*) and assign it the syndication ID 1. Assume that in 2014 (t = 1), four distinct VCs co-invest in a different portfolio company *β*. In this case, since VC *a* and VC *b* have previously collaborated (syndication ID 1), they are not considered to have formed a new tie. Therefore, this subsequent syndication by the same VCs in a different portfolio company is classified as a repeated syndication. Additionally, five new ties are formed, each assigned a unique syndication ID (ID 2: *a*-*c*, ID 3: *a*-*d*, ID 4: *b*-*c*, ID5: *b*-*d*, ID 6: *c*-*d*). A year later (t = 2), two distinct VCs syndicate on portfolio company *γ*. Since this pair had already formed a syndication previously (syndication ID 1), we count this syndication as a second repeated syndication for the specific VC pair. At t = 3, three distinct VCs co-invest in portfolio company *δ*. All these VC pairs (IDs 1, 3, 5) have formed before; hence, they are all defined as repeated syndications. Finally, at t = 4, two distinct VCs syndicate in portfolio company *ε*. As these syndicators have worked together previously (syndication ID 3), we classify this subsequent syndication by the same VC pair as a repeated syndication. Irrespective of the syndicate size and types of syndication networks, we assign a specific syndication ID to two distinct VCs and meticulously follow the VC syndicated deals from the first syndication formation to the last repeated syndicated deal. It is crucial to note that our measure of repeated syndication is not linked to the reason for syndication but rather follows the decisions for VCs to syndicate in subsequent deals.

In certain instances, syndicates involve two or more VCs (three syndicators, four syndicators, etc.). Figure 2 presents the proportions for various syndicate sizes. The figure unmistakably illustrates that most deals in our sample (53%) are syndicated between a pair of two distinct VCs, followed by three syndicators (22%) and four syndicators (11%). This observation highlights the scarcity of different portfolio companies receiving funding from the same set of VC syndication networks. It also affirms that repeated syndications predominantly occur among a pair of VCs.

To test hypotheses 2a and 2b, we use the OECD based measure of the Federal Reserve Economic Data.[3] The recession dummy identification is based on the interpretation of peaks and troughs by the Federal Reserve in St. Louis of the OECD composite leading indicator index (CLI).[4] The CLI includes short-term economic indicators and hence provides interpretations about turning points in business cycles and economic activities of the countries in the sample. The recession dummy takes a value of one if the member countries are in a recession and zero if there is a peak period of economic growth. Furthermore, we also use another measure that captures the post-crisis effect (Conti et al., 2019). The post-crisis dummy takes the value of one if the VC investment was between 2009Q4-2011Q4, and zero otherwise.

4.2.3 Control variables

We include several control variables that are reported in previous studies (see Buchner et al., 2018) to influence the performance of VC investments. To capture market conditions, we include the CBOE VIX, which

[3] https://fred.stlouisfed.org/series/MSCRECDM
[4] https://www.oecd.org/en/data/indicators/composite-leading-indicator-cli.html

is a market-based approximation of future volatility (Fernandes et al., 2014). We expect a lower investment return in times of unfavorable markets. Typically, bigger portfolio companies are likely to receive more financing rounds compared with smaller portfolio companies. The use of number of rounds as a proxy for the size is consistent with previous studies (see Ragozzino & Blevins, 2016; Amor & Kooli, 2020; Yao & O'Neill, 2022). We also include pair-specific variables computed as the absolute difference between two VCs in a specific syndication pair. This approach allows us to capture the status inconsistency (experience diversity) across specific syndication pairs. Plagmann and Lutz (2019) highlight different measures that approximate VC reputation. We use three measures of VC reputation in line with previous studies. First, we include VC firm age as this indicates the length of time a VC firm survived in the market (Plagmann & Lutz, 2019). Second, we use VC industry experience approximated by VC investment activity in a specific industry (Hochberg et al., 2007; Plagmann & Lutz, 2019). Finally, we use the proportion of IPO exits as a measure of performance. Nahata (2008) documents that experienced VC firms are more likely to exit their portfolio companies through IPO than trade sale. Other control variables include fund age and fund size differences (Meuleman et al., 2017; Sorenson & Stuart, 2001), and the difference of each VC's equity investment in the specific syndication pair (Jia & Wang, 2017). Accordingly, we expect performance to increase when syndicate members' characteristics are different (De Clercq et al., 2008). Finally, we include financing stage, industry and country fixed effects in all our analyses.

4.3 Econometric model

Using the OLS regression, we first regress VC performance as measured by IRR or PME on our variable of interest *"repeated syndication"*. To test hypothesis 1a and 1b, we use quantile regression to estimate the effect of repeated syndication, on stagnant and high VC performance as measured by IRR and PME. Specifically, we use two dependent variables mainly top and bottom quartile of the performance. We define the top quartile as high returns and the bottom quartile as stagnant returns. We use several dummy variables to control for financing stage, the country and industry of the portfolio companies. The variance inflation factors (VIF) are reported in Table 10 and no evidence of possible multicollinearity.[5]

To account for possible sample selection due to realized and unrealized deals, we use a two-stage Heckman model. We use entropy balancing to account for possible observable endogeneity and two stage IV model to control for un-observable endogeneity. Section 4.3 below provides detailed discussions of the Heckman, entropy balancing and two stage IV model.

5 Results

We explore the effects of our variable of interest on investment performance and report the results for IRR (Models I-III) and PME (Models IV-VI) in Table 1. Interestingly, we find that VC repeated syndication has a negative effect on the performance as measured by IRR (Model I: $\beta = -0.0918$, p-val $= 0.000$). These findings are robust using PME instead of IRR (Model IV: $\beta = -0.0893$, p-val $= 0.003$). High market volatility has a negative effect on performance as measured by both, IRR (Model I: $\beta = -0.0416$, p-val $= 0.001$) and PME (Model IV: $\beta = -0.0573$, p-val $= 0.007$). These findings suggest that VC performance is adversely affected by volatile market conditions and periods of recession, although the latter is not statistically significant. In line with previous evidence on VC reputation (Nahata, 2008; Plagmann & Lutz, 2019), we find positive coefficients of industry experience and IPO proportion. Finally, similar to the relationship between fund age (Model I: $\beta = 0.0900$, p-val $= 0.001$) and VC performance, we find that fund size (Model I: $\beta = 0.0451$, p-val $= 0.033$) has a positive and significant impact on performance as measured by IRR and PME.

5.1 Tests of hypotheses

To test hypotheses 1a and 1b, we report results in Table 1 using quantile regressions to disentangle

[5] All variables are defined in the Appendix Table 7.

Table 1 Multivariate analysis examining the effect of repeated syndication on the top/bottom quartile of VC performance

	Dependent Variable: IRR			*Dependent Variable: PME*		
	General IRR	Top quartile	Bottom quartile	General PME	Top quartile	Bottom quartile
Variables	Model I	Model II	Model III	Model IV	Model V	Model VI
Repeated Syndication	−0.0918***	−0.1886***	0.0506**	−0.0893***	−0.1795***	0.0475**
	(0.000)	(0.000)	(0.027)	(0.003)	(0.000)	(0.035)
Recession Dummy	−0.051	−0.0726*	−0.0353	−0.0167	−0.0729*	−0.0531
	(0.118)	(0.081)	(0.243)	(0.753)	(0.091)	(0.128)
Volatility Index	−0.0416***	−0.0581***	−0.0370***	−0.0573***	−0.0517**	−0.0453**
	(0.001)	(0.000)	(0.016)	(0.007)	(0.016)	(0.014)
Ln(1 + Firm Age)	−0.0051	−0.0099	−0.0082	−0.0116	−0.0069	−0.0055
	(0.452)	(0.537)	(0.441)	(0.324)	(0.728)	(0.682)
Fund Size	0.0451**	0.0542**	0.0429**	0.0462**	0.0534**	0.0426**
	(0.033)	(0.026)	(0.029)	(0.029)	(0.032)	(0.023)
Ln(1 + Fund Age)	0.0900***	0.1251**	0.0821**	0.2002***	0.1546**	0.1367**
	(0.001)	(0.017)	(0.011)	(0.000)	(0.020)	(0.017)
Number of Rounds	0.0064	0.0053	0.0058	0.0051	0.0043	0.0042
	(0.436)	(0.365)	(0.440)	(0.636)	(0.395)	(0.449)
Industry Experience	0.0077***	0.0104***	0.0071***	0.0083**	0.0127***	0.0107***
	(0.000)	(0.000)	(0.000)	(0.023)	(0.000)	(0.000)
IPO Proportion	0.0073**	0.0082**	0.0063**	0.0081**	0.0083**	0.0070**
	(0.031)	(0.022)	(0.027)	(0.033)	(0.022)	(0.029)
Contribution	−0.0013*	−0.0021**	−0.0011**	−0.0023*	−0.0024*	−0.0018*
	(0.071)	(0.045)	(0.037)	(0.076)	(0.091)	(0.089)
FE—Industry	Yes	Yes	Yes	Yes	Yes	Yes
FE—Stage Finance	Yes	Yes	Yes	Yes	Yes	Yes
FE—Country	Yes	Yes	Yes	Yes	Yes	Yes
Adj-R-sq. (Pseudo R-sq.)	0.233	(0.191)	(0.202)	0.173	(0.194)	(0.194)
N	3,909	3,909	3,909	3,909	3,909	3,909

This table considers the effect of the variables of interest on the general, top and bottom quartile of VC performance. We use the general VC performance as measured by IRR and PME in Model I and IV, respectively. Model I & IV report the OLS regressions results, while Models II, III, V and VI report the results of the Quartile regressions. The coefficients represent the effect of a unit change on the IRR or PME, respectively, given that all other variables are held constant. We use quantile regression for Models II-III and V-VI. The dependent variable for Models II and V represents the top and bottom quartile of deal performance as measured by IRR, respectively. Similarly, the dependent variable for Models III and VI identifies the top and bottom quartile of the performance as measured by PME, respectively. We report the corresponding p-values in parentheses

the effect of repeated syndication on top and bottom performance quartiles as measured by both IRR (Models II-III) and PME (Models V-VI). For Models II and V, the dependent variable is the top quartile (i.e., high returns) IRR and PME, respectively. We find that repeated syndication has a negative effect on the top quartile VC performance (Model II: −0.1886, p-val = 0.000). Our results are in line with the idea that structural inertia and capacity constraints through recurring syndications present a challenge for VCs in efficiently deploying their financial and human capital to seize entrepreneurial opportunities and generate exceptional returns. Yet, repeated syndication increases the stagnant performance (bottom quartile, Model III: 0.0506, p-val = 0.027). This suggests that through repeated syndications VC can achieve stagnant investment returns. In fact, the performance of high investment is a

negative 16.4% using IRR and 14.08% using PME. By contrast, the performance is positive 2.87% and 2.75% for stagnant investments using IRR and PME respectively. Taken together, hypotheses 1a and 1b are supported. The effects of other control variables are in line with our expectations.

Next, we examine the hypotheses 2a and 2b to offer a more granular understanding of the relationship between repeated syndication and VC performance. Typically, during recessions, the level of uncertainty is high and potentially affects VCs' abilities to raise capital and exit their portfolio companies (Bernstein et al., 2019; Gompers et al., 2008; Ning et al., 2015). Instead of actively seeking high-reward opportunities that could yield substantial investment returns, VCs' primary concern could be maintaining the status quo and ensuring the survival of their existing portfolio companies (Conti et al., 2019; Ning et al., 2015). In Table 2, we examine the effect of repeated syndications on high or stagnant performance during recessions. Models I and II report the results for the IRR, and Models III and IV show the results using PME. Consistent with hypothesis 2a, it is evident from the results that repeated syndication accentuates the negative effect of repeated syndication on high returns. For the stagnant returns, repeated syndication significantly increases the stagnant returns during recessions, which is in line with hypothesis 2b. In fact, a unit increase in the repeated syndication decreases the top quartile performance during recessions by 19%, compared to 3.7% increase in the bottom quartile performance. Although the 3.7% increase might appear marginal, the overall effect is 22.7% based on a shift from negative 19% to positive 3.7%. Finally, we investigate the interaction effect between repeated syndication and periods of recession on the performance of top and bottom quartile VC members as shown in Fig. 3a and b. The results reported in Fig. 3a reveal that repeated syndication members in the top quartile experience negative returns during recessions. In contrast, as shown in Fig. 3b, syndicated members in the bottom quartile earn positive returns during the same periods. This finding remains robust when using PME as an alternative performance measure.

5.2 Post-hoc analytical extensions

We report several additional contingency factors that may influence the core relationship between repeated syndication and performance. First, in Table 3 we explore the frequency of repeated syndication. We aim to approximate pairs that collaborate frequently (top quartile) compared to less frequently collaborated pairs (bottom quartile). The results show that infrequent repeated syndication negatively affects the performance as measured by IRR (Model I: $\beta = -0.0342$, p-val $= 0.096$) and PME (Model III: $\beta = -0.0433$, p-val $= 0.063$). In contrast, when a specific VC pair collaborates repeatedly and frequently (Repeated Syndication x Top Quartile), the performance of VC investments is enhanced significantly (Model II: $\beta = 0.1872$, p-val $= 0.037$; Model IV: $\beta = 0.2734$, p-val $= 0.009$).

Following Bellavitis et al., (2019), we explore the different roles of VCs within a syndication and the extent of their experience. In Panel A of Table 4, we use the age of VC as a proxy for experience consistent with Gompers (1996). It shows that the performance is negative when the experience as measured by the age of the two VCs is similar (Repeated Syndication x Bottom Quartile Age) (Model I: $\beta = -0.0935$, p-val $= 0.074$; Model III: $\beta = -0.0645$, p-val $= 0.066$). By contrast, when the difference in age between the two VCs is significant (Repeated Syndication x Top Quartile Age), the performance of the investments is enhanced significantly. Stated differently, the performance of VC investments is positive when syndications include old and young VCs (Model II: $\beta = 0.1334$, p-val $= 0.036$; Model IV: $\beta = 0.2347$, p-val $= 0.022$).

In Panel B of Table 4, we use industry and stage experience difference as a proxy for VC experience. Models I and II show the results for the IRR, and Models III and IV show the results for the PME. It is evident that repeated collaboration among the VCs has a positive effect on the performance when the VCs are highly experienced as measured by the top quartile of stage experience (Model I: $\beta = 0.1135$, p-val $= 0.023$; Model III: $\beta = 0.1246$, p-val $= 0.037$) and industry experience difference (Model II: $\beta = 0.1551$, p-val $= 0.021$; Model IV: $\beta = 0.2012$, p-val $= 0.031$). These results hold for both IRR and PME performance measures. It is clear from the results in Table 4 (Panels A and B) that highly experienced VCs mitigate the negative effect of repeated collaboration on performance. Overall, the results suggest that diversity in experience among the syndicated members attenuates the negative relationship between repeated syndication and VC performance. For a unit

Table 2 Multivariate analysis examining the moderating effect of the crisis periods on the relationship between repeated syndication and the top/bottom quartile of VC performance

	Dependent Variable: IRR		*Dependent Variable: PME*	
	Top quartile	Bottom quartile	Top quartile	Bottom quartile
Variables	Model I	Model II	Model III	Model IV
Repeated Syndication x Crisis	−0.1941**	0.0371**	−0.1764**	0.0288**
	(0.018)	(0.032)	(0.032)	(0.031)
Repeated Syndication	−0.1646***	0.0287**	−0.1408**	0.0275**
	(0.000)	(0.022)	(0.000)	(0.032)
Recession Dummy	−0.0418*	−0.0263	−0.0314	−0.0217
	(0.081)	(0.201)	(0.181)	(0.244)
Volatility Index	−0.0673***	−0.0662**	−0.0746**	−0.0655**
	(0.000)	(0.023)	(0.018)	(0.019)
Ln(1 + Firm Age)	−0.0101	−0.0083	−0.0091	−0.0074
	(0.682)	(0.571)	(0.688)	(0.633)
Fund Size	0.0411**	0.0324**	0.0417**	0.0317**
	(0.022)	(0.041)	(0.031)	(0.035)
Ln(1 + Fund Age)	0.0681**	0.0594**	0.0664**	0.0587**
	(0.020)	(0.019)	(0.032)	(0.038)
Number of Rounds	0.1117**	0.0975**	0.1089	0.0963**
	(0.017)	(0.011)	(0.015)	(0.012)
Industry Experience	0.0064	0.0053	0.0058	0.0047
	(0.436)	(0.365)	(0.440)	(0.405)
IPO Proportion	0.0147***	0.0114***	0.0148***	0.0125***
	(0.000)	(0.000)	(0.000)	(0.000)
Contribution	0.0089**	0.0069**	0.0090**	0.0076**
	(0.022)	(0.027)	(0.022)	(0.029)
FE—Industry	Yes	Yes	Yes	Yes
FE—Stage Finance	Yes	Yes	Yes	Yes
FE—Country	Yes	Yes	Yes	Yes
Pseudo R-sq	0.201	0.214	0.196	0.197
N	3,909	3,909	3,909	3,909

We use Quantile regression, where the dependent variable is the top quartile performance (Models I and II) or bottom quartile performance (Models III and IV) using IRR and PME as performance measures. Other control variables are defined in the appendix Table 7. We report the corresponding p-values in parentheses

increase in the repeated syndication, the performance increases by more than 10%.

5.3 Sample selection and endogeneity

Our measure of performance includes fully and partially realized investments. It is likely that the effect of repeated syndication on performance as measured by IRR and PME is over- or under-stated by the fact that some of the investments are not exited by the end of the sample period. We use the two-step Heckman model to correct for possible sample selections bias. In stage I, we estimate the probability of investments being fully realized using all control variables, and IPO and M&A activities in the markets as additional key determinants of the probability of exits. In stage II, we focus only on fully realized investments and include an inverse Mills ratio estimated from stage I to control for possible sample selection. Provided that the sample selection is a concern, the inverse Mills ratio would be significant in stage II. Table 5, Panel A, Models I and II show the stage II results of the Heckman model. The coefficients of the inverse Mills are not significant at any conventional levels in both models. This indicates that our results are not biased because some of the investments are not fully realized by the end of 2017.

Further, we can identify two major sources of endogeneity that might influence our results. First,

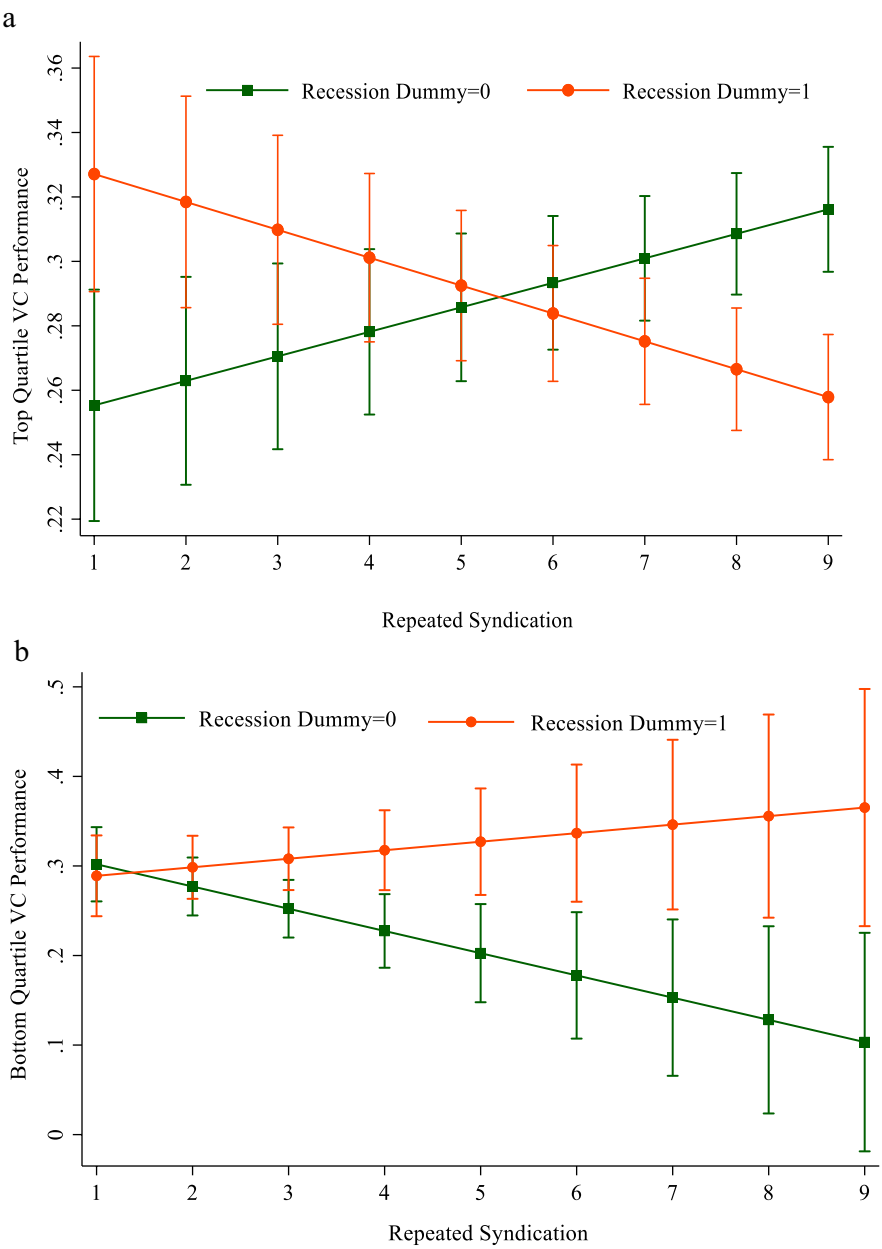

Fig. 3 **a** Interaction term of repeated syndication and recession dummy on top quartile VC performance. **b** Interaction term of repeated syndication and recession dummy on bottom quartile VC performance

our results may be driven by observable investment characteristics. We use a matched sample approach to address this concern. Second, our measure of repeated syndication is endogenous, as repeated syndication is more likely to occur with better experience of past performance. We address this concern using an instrumental variable approach. We use the entropy balancing matching method. We match repeated and one-off syndication by firm age, fund age, industry experience, contribution and volatility index. The matching results are reported in Table 5, Panel B. The differences in the matched variables are not statistically significant at any conventional levels. The results of the matched sample are reported in Models III and IV of Table 5. The coefficients of the repeated syndications are negative and significant, suggesting that repeated syndication has a negative effect on

Table 3 Multivariate analysis examining the joint effect of repeated syndication and collaboration frequency on VC performance (top/bottom quartile repeated syndication)

	Dependent Variable: IRR		*Dependent Variable: PME*	
Variables	Model I	Model II	Model III	Model IV
Top Quartile Repeated Syndication		0.0295		0.0444
		(0.552)		(0.349)
Repeated Syndication x Top Quartile		0.1872**		0.2734***
		(0.037)		(0.009)
Bottom Quartile Repeated Syndication	0.0173		0.0303	
	(0.304)		(0.232)	
Repeated Syndication x Bottom Quartile	−0.0342*		−0.0433*	
	(0.096)		(0.063)	
Repeated Syndication	−0.0861***	−0.0609***	−0.0715**	−0.0644***
	(0.000)	(0.006)	(0.022)	(0.001)
Recession Dummy	−0.0117	−0.1667***	−0.0228	−0.0226
	(0.436)	(0.006)	(0.6742	(0.705)
Volatility Index	−0.0195	−0.0421*	−0.0126	−0.0568***
	(0.111)	(0.065)	(0.514)	(0.008)
Ln(1 + Firm Age)	−0.0037	−0.0037	−0.0023	−0.0127
	(0.587)	(0.768)	(0.828)	(0.284)
Fund Size	0.0415**	0.0425**	0.0428**	0.0416**
	(0.029)	(0.042)	(0.034)	(0.031)
Ln(1 + Fund Age)	0.0733***	0.1330**	0.2048***	0.1976***
	(0.008)	(0.010)	(0.000)	(0.000)
Number of Rounds	0.0061	0.0025	0.0051	0.0041
	(0.326)	(0.435)	(0.444)	(0.416)
Industry Experience	0.0148***	0.0117***	0.0146***	0.0128***
	(0.000)	(0.000)	(0.000)	(0.000)
IPO Proportion	0.0067***	0.005	0.0087***	0.0089**
	(0.001)	(0.203)	(0.009)	(0.016)
Contribution	−0.0012*	−0.0037***	−0.0008	−0.0022*
	(0.094)	(0.006)	(0.475)	(0.086)
FE—Industry	Yes	Yes	Yes	Yes
FE—Stage Finance	Yes	Yes	Yes	Yes
FE—Country	Yes	Yes	Yes	Yes
Adj-R-sq	0.203	0.216	0.193	0.192
N	3,909	3,909	3,909	3,909

The coefficients represent the effect of a unit change on the dependent variable, given that all other variables are held constant and estimated using OLS regression. The p-value for this statistic is reported in parentheses. The interaction terms represent the multiplication of repeated syndication with the dummy of, (i) top quartile repeated syndications and (ii) bottom quartile repeated syndications

performance even after controlling for possible observable endogeneity.

Finally, we use the IV two-stage least square model. In the first stage, we estimate repeated syndication as a function of various control variables, including our instrument. We use an investment concentration index as our instrument, which is likely to influence the choice of repeated syndication but not necessarily the performance. Following Tian (2012), we construct an investment concentration index for each VC firm in each year based on CEPRES industry classification. The index measures by how much a VC firm's portfolio deviates in industry composition from a market portfolio consisting of all portfolio companies in which a VC firm could have invested. The index is equal to 0 if the VC firm's portfolio has the same industry composition as the market portfolio. In other words,

Table 4 Multivariate analysis examining the joint effect of repeated syndication and age-based experience on VC performance (top/bottom quartile age)

	Dependent Variable: IRR		*Dependent Variable: PME*	
Panel A	Model I	Model II	Model III	Model IV
Top Quartile Age		0.0314		0.0522
		(0.212)		(0.189)
Repeated Syndication x Top Quartile		0.1334**		0.2347**
		(0.036)		(0.022)
Bottom Quartile Age	0.2129*		0.1119*	
	(0.081)		(0.074)	
Repeated Syndication x Bottom Quartile	−0.0935*		−0.0645*	
	(0.074)		(0.066)	
Repeated Syndication	−0.1008***	−0.1635***	−0.0991***	−0.1173***
	(0.000)	(0.000)	(0.000)	(0.007)
Recession Dummy	−0.045	−0.1702***	−0.0263	−0.0235
	(0.216)	(0.005)	(0.624)	(0.691)
Volatility Index	−0.0424***	−0.0391*	−0.014	−0.0603***
	(0.001)	(0.087)	(0.469)	(0.005)
Ln(1 + Firm Age)	−0.0179*	−0.004	−0.0051	−0.0127
	(0.059)	(0.750)	(0.730)	(0.282)
Fund Size	0.0401**	0.0410**	0.0412**	0.0411**
	(0.026)	(0.038)	(0.036)	(0.032)
Ln(1 + Fund Age)	0.0885***	0.1360***	0.2041***	0.2006***
	(0.002)	(0.008)	(0.000)	(0.000)
Number of Rounds	0.0062	0.0024	0.0052	0.0043
	(0.321)	(0.431)	(0.442)	(0.410)
Industry Experience	0.0069***	0.0044	0.0075**	0.0177***
	(0.001)	(0.447)	(0.026)	(0.001)
IPO Proportion	0.0066***	0.008	0.0087***	0.0082**
	(0.001)	(0.203)	(0.008)	(0.015)
Contribution	−0.0012*	−0.0037***	−0.0007	−0.0022*
	(0.090)	(0.006)	(0.526)	(0.088)
FE—Industry	Yes	Yes	Yes	Yes
FE—Stage Finance	Yes	Yes	Yes	Yes
FE—Country	Yes	Yes	Yes	Yes
Adj-R-sq	0.202	0.212	0.194	0.193
N	3,909	3,909	3,909	3,909
	Dependent Variable: IRR		*Dependent Variable: PME*	
Panel B	Model I	Model II	Model III	Model IV
Top Quartile Industry Experience		0.0440**		0.0701**
		(0.032)		(0.026)
Repeated Syndication x Top Quartile Industry		0.1551**		0.2012**
Experience		(0.021)		(0.031)
Top Quartile Stage Experience	0.0342*		0.0410*	
	(0.075)		(0.068)	
Repeated Syndication x Top Quartile Stage	0.1135**		0.1246**	

Table 4 (continued)

	Dependent Variable: IRR		*Dependent Variable: PME*	
Panel A	Model I	Model II	Model III	Model IV
Experience	(0.023)		(0.037)	
Repeated Syndication	−0.1011***	−0.1642***	−0.0986***	−0.1181***
	(0.000)	(0.000)	(0.000)	(0.000)
Recession Dummy	−0.0436	−0.1711***	−0.0252	−0.0238
	(0.224)	(0.004)	(0.455)	(0.513)
Volatility Index	−0.0426***	−0.0341*	−0.016	−0.0606***
	(0.001)	(0.077)	(0.339)	(0.006)
Ln(1 + Firm Age)	−0.0168*	−0.0050	−0.0054	−0.0132
	(0.072)	(0.733)	(0.711)	(0.276)
Fund Size	0.0403**	0.0412**	0.0417**	0.0414**
	(0.025)	(0.032)	(0.031)	(0.039)
Ln(1 + Fund Age)	0.0878***	0.1355***	0.2046***	0.2008***
	(0.004)	(0.009)	(0.000)	(0.000)
Number of Rounds	0.0062	0.0024	0.0052	0.0043
	(0.321)	(0.431)	(0.442)	(0.410)
Industry Experience	0.0064***	0.0041	0.0077**	0.0171***
	(0.003)	(0.435)	(0.028)	(0.006)
IPO Proportion	0.0065***	0.007	0.0086***	0.0084**
	(0.001)	(0.203)	(0.008)	(0.015)
Contribution	−0.0014*	−0.0035***	−0.0006	−0.0023*
	(0.092)	(0.008)	(0.456)	(0.072)
FE—Industry	Yes	Yes	Yes	Yes
FE—Stage Finance	Yes	Yes	Yes	Yes
FE—Country	Yes	Yes	Yes	Yes
Adj-R-sq	0.214	0.222	0.214	0.193
N	3,909	3,909	3,909	3,909

This table considers the effect of the variables of interest on VC performance. The coefficients represent the effect of a unit change on the dependent variable, given that all other variables are held constant and estimated using OLS regression. The p-value for this statistic is reported in parentheses. The interaction terms in Panel A represent the multiplication of repeated syndication with the dummy of, (i) top quartile age and (ii) bottom quartile age. In Panel B we use industry and stage as additional experience measures

the equivalent proportion of companies from each industry as the market portfolio, which increases as the VC firm's portfolio becomes more concentrated in a few industries. Therefore, highly concentrated portfolios increase the investment risks to VC, and they might seek to syndicate with the same VC to minimize their risks exposures. We expect the concentration index to influence VC decisions not only to syndicate for the first time, but also to subsequently syndicate. We compute the index following Tian (2012). Suppose that in year t, firm j has $w_{i,t,j}$ portfolio firms in industry i and there is a total of $\overline{w}$ i,t portfolio firms in industry i. The *investment concentration index* of firm j in each year is defined as the sum of the squared deviations of $w_{i,t,j}$ from $\overline{w}$ $_{i,t}$, as shown in the equation below:

$$investmentconcentrationindex = \sum_{i=1}^{N-industry} \left(W_{i,t,j} - \overline{W}_{i,t} \right)$$

If VC investments are concentrated in a few industries, the index value will be very high, suggesting concentration; hence VCs would need to diversify. Therefore, the chance for such VCs to repeat syndication is very high. When the index value is low, it means that VC investments are not concentrated and thus do not need to diversify.

Table 5 Sample selection based on a sample of fully realized and entropy balancing

	Sample selection		Entropy balancing	
Panel A	Model I: IRR	Model II: PME	Model III: IRR	Model IV: PME
Repeated Syndication	−0.1222**	−0.0973**	−0.0918***	−0.0964***
	(0.015)	(0.022)	(0.000)	(0.003)
Recession Dummy	0.0219	0.1967**	0.0013	0.0052
	(0.761)	(0.029)	(0.176)	(0.284)
Volatility Index	−0.0415**	−0.0444*	−0.0016	−0.0211
	(0.018)	(0.082)	(0.211)	(0.241)
Ln(1 + Firm Age)	0.0249	−0.1027***	−0.0041	−0.0102
	(0.322)	(0.006)	(0.204)	(0.241)
Fund Size	0.0382**	0.0396**	0.0401**	0.0406**
	(0.025)	(0.033)	(0.028)	(0.030)
Ln(1 + Fund Age)	−0.1451	0.9174***	0.0401	0.0310
	(0.444)	(0.001)	(0.231)	(0.210)
Number of Rounds	0.0062	0.0024	0.0052	0.0043
	(0.321)	(0.431)	(0.442)	(0.410)
Industry Experience	0.0054	0.0132***	0.0014	0.0021
	(0.112)	(0.009)	(0.241)	(0.323)
IPO Proportion	0.0066***	0.008	0.0083***	0.0085**
	(0.001)	(0.201)	(0.009)	(0.016)
Contribution	0.0022	−0.0137***	−0.0011	−0.0013
	(0.424)	(0.001)	(0.171)	(0.176)
Inverse Mills	−0.0289	0.0284		
	(0.256)	(0.204)		
FE—Industry	Yes	Yes	Yes	Yes
FE—Stage Finance	Yes	Yes	Yes	Yes
FE—Country	Yes	Yes	Yes	Yes
Adj-R-sq	0.208	0.232	0.064	0.056
N	2,257	2,257	3,909	3,909
Panel B	Repeated Syndications		One-off Syndication	
	Mean	Variance	Mean	Variance
Firm Age	9.371	139.300	9.944	134.602
Fund Age	2.242	6.942	2.244	7.943
Industry Experience	29.221	1567.000	28.552	1433.000
Contribution	55.464	1201.000	54.223	1120.000
Volatility Index	19.853	38.342	19.453	41.222

This table considers the effect of the variables of interest on VC performance controlling for sample selections and observable endogeneity. The coefficients represent the effect of a unit change on the dependent variable, given that all other variables are held constant. The p-value for this statistic is reported in parentheses

Table 6 shows the results of our two-stage IV model. Our instrument in stage I is highly significant and increases repeated syndication among the VC firms. In stage II, we use a predicted value from stage I instead of repeated syndication. It is evident in stage II that repeated syndication (i.e., predicted value) has a negative effect on performance as measured by IRR or PME. The magnitude of the estimated coefficients is broadly consistent with that reported in the previous tables. Based on the stage

Table 6 Two stage IV model

	Stage I: Estimation	Stage II: Estimations	
		IRR	PME
Instrument	0.1444***	−0.0919***	−0.0668**
	(0.000)	(0.000)	(0.012)
Recession Dummy	0.0298	0.0455	−0.0324
	(0.178)	(0.179)	(0.526)
Volatility Index	−0.0816***	−0.0416***	−0.0321*
	(0.000)	(0.001)	(0.092)
Ln(1 + Firm age)	−0.0041	−0.0051	−0.0042
	(0.252)	(0.452)	(0.693)
Fund Size	0.0389**	0.0409**	0.0418**
	(0.042)	(0.033)	(0.025)
Ln(1 + Fund age)	0.0880***	0.0900***	0.1210***
	(0.001)	(0.001)	(0.005)
Number of Rounds	0.0062	0.0052	0.0043
	(0.321)	(0.442)	(0.410)
Industry Experience	0.0257***	0.0076***	0.0096***
	(0.000)	(0.000)	(0.004)
IPO Proportion	0.0240***	0.0083***	0.0085**
	(0.001)	(0.009)	(0.016)
Contribution	−0.0014*	−0.0013*	−0.0026**
	(0.066)	(0.071)	(0.022)
Durbin-Wu-Hausman Test (p-value)		***(0.185)***	***(0.192)***
Overidentification J-test (p-value)		***(0.226)***	***(0.217)***
FE—Industry	Yes	Yes	Yes
FE—Stage Finance	Yes	Yes	Yes
FE—Country	Yes	Yes	Yes
Adj-R-sq	0.244	(0.238)	(0.289)
N	3,909	3,909	3,909

The dependent variable in stage I is the repeated syndication, the instrument is investment concentration index. The coefficients represent the effect of a unit change on the dependent variable, given that all other variables are held constant. The p-value for this statistic is reported in parentheses

II results and the Durbin-Wu-Hausman test, we conclude that our ordinary least squares results reported above are robust.

5.4 Robustness tests

In order to assess robustness of our recession measure, in Table 11 we investigate the post-crisis effect on the relationship between repeated syndication and VC performance. We find a similar relationship between repeated syndication and VC performance compared to the periods of recession. In the aftermath of the global financial crisis, the negative effect of repeated syndication on exuberant (top quartile) performance is accentuated (Model I, III). This is also the case for stagnant returns, when VCs repeatedly collaborate. Other variables are similar in effect and magnitude to the baseline results.

We investigate a cross-border setting including additional measures of cultural difference. In Table 12 Models I-II (IRR) and III-IV (PME), we explore whether repeated collaboration is different when VCs are in the same versus different regions/countries. We use an indicator (cross-border) which takes a value of 1 if any of the VCs are based in a different location and 0 otherwise. We additionally control for cultural distance, geographical distance, regulatory distance, political stability and legal system difference between VCs syndicated members. The cultural distance is measured based on Hofstede's dimensions (Hofstede & Bond, 1988; Nahata

et al., 2014), the geographic distance is the physical distance between the VC firms' countries (Dai & Nahata, 2016). We follow Li and Zahra (2012) to compute the regulatory distance approximating regulatory quality scores. We use Li et al. (2014) and La Porta et al. (1998) to measure political stability and legal system differences, respectively. Consistent with previous evidence, we find that a cross-border setting contributes to decreasing returns. However, this effect is not statistically significant in our analysis. We observe a statistically significant negative relationship between cross-border and repeated syndication, only for the top quartile performance. Interestingly, we find similar relationships across distance measures, which includes culture, regulatory and political stability distance, for both VC performance categories (top and bottom quartile). Specifically, we observe that a greater distance negatively affects the performance (Models II, IV), while simultaneously boosting exceptional returns (Models I, III). Furthermore, when VCs operate within differing legal systems, the relationship between legal system differences and top/bottom quartile VC performance appear to vary. These findings underscore the importance of contract enforcement and investor protection rights in shaping for VCs performance (see La Porta et al., 1998).

We further explore whether our baseline results hold after controlling for market conditions and year fixed effects in Table 13. It is likely that the negative effect of repeated collaboration on performance is explained away by market and economic conditions (i.e., Gompers et al., 2008). We use FDI movement, GDP growth, trade openness and stock market liquidity retrieved from the World Bank to measure market and economic conditions (Yoon et al., 2020). Models I and IV show the results for the IRR and PME, respectively. It is evident from the results that our baseline findings are robust controlling for market conditions.

We investigate the effect of repeated syndication over a two-year period. The results are reported in Table 14. It is evident that the time between the first and second syndication influences the relationship between repeated syndication and performance. In fact, repeated collaboration in quick succession has a positive effect and more importantly moderates the negative effect of repeated collaboration.

Finally, Table 15 shows the results of using bonding measures between VCs as alternative measures of repeated collaborations. Although our base measure of repeated syndication does not outweigh multiple financing rounds by construction, we might outweigh the joint financing of VCs of larger syndicates, which may lead to spurious results. Hence, we account for the size of the syndicate that the distinct VC pair is co-investing. We include two measures: Bonding Measure 1 in Models I-III includes a weight based on the number of syndicators to the accumulated number of previous repeated collaborations (De Clercq & Dimov, 2004). For instance, if there are two syndicated members, the weight equals $\frac{1}{2} = 0.5$; in the case of three syndicator members, the weight is $\frac{1}{3} = 0.3333$. Bonding Measure 2 in Models IV-VI follows Seo et al. (2020), focusing on the specific syndicate itself. Hence, we approximate the strength of bond using $K = \frac{n(n-1)}{2}$ where $n=$ the number of syndicators and thus is calculated for each syndication occurrence individually. The results show that our baseline results hold, even after accounting for the number of syndicators. Both alternative bonding measures show a negative relationship on the high return group (top quartile performance), but a positive effect on stagnant returns.

6 Discussion and conclusions

VC syndication has garnered the interests of many researchers because of its profound implications on risk diversification, inter-organizational relationships and entrepreneurship (De Clercq et al., 2008; Dimov & Milanov, 2010; Manigart et al., 2006; Wright & Lockett, 2003). However, relatively limited attention has been paid to explain the role of repeated decisions to syndicate in influencing investment performance outcomes (see for instance, De Clercq & Dimov, 2008; Bellavitis et al., 2019). We extend prior VC syndication studies by showing that repeated decisions to syndicate have a negative effect on high generating investment returns, but positive effect on low yield investment returns. We show that the periods of recession accentuate the negative relationship between repeated syndication and high returns and the positive relationship between repeated syndication and stagnant investment returns. The following summarizes the contributions of our study:

First, we contribute to the entrepreneurial finance and VC syndication literature (De Clercq et al., 2008; Dimov & Milanov, 2010; Manigart et al., 2006; Wright & Lockett, 2003) by carefully opening the established

yet under-examined duality of repeated syndication on performance. We have proposed that repeated syndication decisions incur structural inertia and impede divergent thinking, thereby hampering the exceptionally high investment performance. The build-up of trust and sharing of skills through previous collaborations allows VC syndicates to achieve stagnant investment returns through repeated syndication. Thus, our theoretical framework outlining the specific mechanisms enables us to critically examine the relationship between repeated syndication and VC performance.

Second, we contribute to the enhanced understanding of the performance implications of repeated syndications decisions by offering further insights into the underlying mechanisms of interorganizational relationships at work. The findings indicate that high returns are further reduced when syndication is repeated during recessions. This implies that the members within a repeated syndication network tend to become more risk-averse, thus diminishing their chances of attaining exceedingly high returns. This shift occurs because of the global financial crisis, which prompts them to follow familiar paths and converge quickly on solutions, often without exploring a range of alternative strategic options. Conversely, our research reveals that repeated syndicates achieving stagnant investment returns are heightened during recessions. This observation suggests that trust and cohesion within the repeated syndication group emerge to the forefront during recessions, serving as a stabilizing force for investment returns.

Third, our study contributes to the ongoing research on repeated collaborations, a topic that has been explored in various contexts such as scientific research teams, movie production teams, and more (Belkhouja et al., 2021; Dahlander & McFarland, 2013; Narayan & Kadiyali, 2016; Seo et al., 2020). Scholars have delved into several facets of repeated collaborations, encompassing the motives and consequences of such collaborations, the contrasting factors influencing temporal versus repeated collaborations, and the management of these collaborations between individuals and organizations. However, the field of research concerning repeated collaboration within the realm of VC syndication is relatively underdeveloped. To be more precise, our research extends previous studies on repeated collaboration by offering a more intricate and nuanced comprehension of this phenomenon.

Our study also has implications for managers. Our findings show that VCs should closely monitor the evolution and progression of their syndication networks over time. They should tailor their collaboration timelines to align with their specific performance objectives. In this context of repeated syndication, it seems that repeated syndication decisions are valuable for low yield investments, but not for high investment returns. Although it is widely recognized that the primary motive for VC syndication is risk diversification and maintaining expected returns (as indicated by Brinster & Tykvová, 2021; Casamatta & Haritchabalet, 2007; Jääskeläinen, 2012; Lerner, 1994; Manigart et al., 2006; Sorenson & Stuart, 2001). Nevertheless, our study underscores the importance of considering inter-organizational learning and collaboration within this framework (see for instance Eftekhari & Timmermans, 2022). This suggests that simply diversifying a VC's portfolio through repeated syndication is insufficient to achieve exceptionally high returns. Therefore, VCs should proactively pursue decisions that enhance their opportunities for learning, enabling them to offer innovative solutions to challenges and ultimately improve their returns on investment.

APPENDIX 1

Tables 7, 8, 9, 10, 11, 12, 13, 14 and 15

Table 7 Operationalization of variables

Variables	Description
Repeated Syndication	This measure counts the repeated syndications of a specific VC syndication pair after the tie is formed across time
Top/Bottom Quartile Repeated Syndication	1 if the specific VC syndication pair is in the top (bottom) quartile of the repeated syndications, and 0 otherwise
Recession Dummy	1 if the FRED St. Louis indicates a recession based on the OECD composite leading indicator for the main countries in the sample (USA, UK, Canada, France, Germany, Italy, Japan), and 0 otherwise
Post-Crisis Dummy	1 if the investment is between 2009Q4-2011Q4 to capture the aftermath of the global financial crisis, and 0 otherwise
Volatility Index	CBOE volatility index (VIX) is a market estimate of future volatility
Firm Age	Natural logarithm of the age (years in business) of a VC firm at the time of an initial investment in a portfolio company
Number of Rounds	Number of rounds of finance received by the portfolio company
Top/Bottom Quartile Age	1 if the investment VC pair is on the top (bottom) quartile of absolute difference measure of the VC firms' ages, and 0 otherwise
Fund Age	Natural logarithm of the age (years in business) of a VC firm's fund at the time of an initial investment in a portfolio company
Fund Size	Natural logarithm of the fund size at the time of an initial investment in a portfolio company
Industry Experience	The total number of investments in the industry of the portfolio company
Top/Bottom Quartile Industry Experience	1 if the specific VC syndication pair is in the top (bottom) quartile of the industry experience, and 0 otherwise
Stage Experience	The total number of investments in the stage of the portfolio company
Top/Bottom Quartile Stage Experience	1 if the specific VC syndication pair is in the top (bottom) quartile of the stage experience, and 0 otherwise
IPO Proportion	Proportions of portfolio companies taken public relative to the trade sale exit
Contribution	The equity invested in the portfolio companies. Investment size
High-tech Dummy	1 if the investment is in a high-tech industry and zero otherwise
Time Dummy	1 if the repeated syndication happened within two years
Cross-border Dummy	1 if the VCs are from different regions, and 0 otherwise

Table 8 Correlation matrix of variables

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Repeated Syndication	**(1)**	1												
Recession Dummy	**(2)**	-0.012	1											
Post-Crisis Dummy	**(3)**	0.017	0.072	1										
Volatility Index	**(4)**	0.042	0.034	0.061	1									
Firm Age	**(5)**	-0.093	-0.082	0.132	-0.039	1								
Fund Size	**(6)**	-0.042	0.028	0.011	-0.036	0.094	1							
Fund Age	**(7)**	-0.029	0.012	0.003	-0.025	0.086	0.379	1						
Number of Rounds	**(8)**	0.011	0.015	0.004	0.018	0.077	0.089	0.041	1					
Industry Experience	**(9)**	0.063	-0.005	0.024	-0.008	0.015	0.028	0.027	0.022	1				
IPO Proportion	**(10)**	0.041	-0.003	0.012	-0.006	0.014	0.036	0.018	0.019	0.234	1			
Contribution	**(11)**	-0.061	0.049	0.021	-0.062	-0.012	-0.017	0.032	0.117	0.171	0.114	1		
High-tech Dummy	**(12)**	0.081	-0.015	-0.020	-0.022	-0.020	-0.044	0.172	0.075	0.061	0.121	0.077	1	
Time Dummy	**(13)**	0.072	0.076	0.066	0.031	0.041	0.053	0.035	0.069	0.047	0.087	0.055	0.141	1
Cross-border Dummy	**(14)**	0.097	0.035	0.088	0.041	0.052	0.065	0.036	0.045	0.064	0.094	0.049	0.017	0.097	1

Table 9 Descriptive statistics

	All Repeated Syndications		
Full sample	Mean	Median	St. Dev
Repeated Syndication (#)	2.87	0.00	6.68
Firm Age (Years)	10.24	7.83	11.03
Fund Size (Ln)	5.65	5.28	4.70
Fund Age (Years)	2.23	1.25	2.76
Number of Rounds	4.00	3.00	2.00
General Experience	98.83	54.00	112.24
Industry Experience	27.78	14.00	36.23
IPO Proportion	0.19	0.187	0.13
Contribution Difference	60.82	6.42	187.15
IRR	0.32	0.14	1.46
PME	1.87	1.08	4.65
Post-Crisis Dummy	0.13	0.00	0.18
Recession Dummy	0.06	0.00	0.24
Volatility Index (%)	19.96	19.54	6.32
N	***3,909***		

This table shows the measures for mean, median and standard deviation for the variables of interest for the entire sample of repeated syndicated VC investments.

Table 10 Variance inflation factors

Variable	VIF	1/VIF
Repeated Syndication	2.23	0.4484
Recession Dummy	2.88	0.3472
Post-Crisis Dummy	2.85	0.3509
Volatility Index	2.47	0.4049
Firm Age	2.18	0.4587
Fund Size	2.71	0.3690
Fund Age	3.11	0.3215
Number of Rounds	2.66	0.3750
Industry Experience	2.17	0.4608
IPO Proportion	1.81	0.5520
Contribution	1.67	0.5988
High-tech Dummy	1.89	0.5291
Time Dummy	2.34	0.4274
Cross-border Dummy	2.47	0.4049
Average	**2.38**	

This table shows the variance inflation factors (VIF) for the variables of interest

Table 11 Multivariate analysis examining the moderating effect of post-crisis on the relationship between repeated syndication and the top/bottom quartile of VC performance

	Dependent Variable: IRR		*Dependent Variable: PME*	
	Top quartile	Bottom quartile	Top quartile	Bottom quartile
Variables	Model I	Model II	Model III	Model IV
Repeated Syndication x Post-Crisis	-0.2562**	0.2761**	-0.2713**	0.2861**
	(0.012)	(0.032)	(0.024)	(0.031)
Repeated Syndication	-0.1647***	0.0255**	-0.1446**	0.0292**
	(0.000)	(0.022)	(0.000)	(0.022)
Post-Crisis Dummy	-0.2076**	-0.2018**	-0.2235**	-0.2077**
	(0.033)	(0.022)	(0.024)	(0.026)
Volatility Index	-0.0673***	-0.0662**	-0.0746**	-0.0655**
	(0.000)	(0.023)	(0.018)	(0.019)
Ln(1 + Firm Age)	-0.0101	-0.0083	-0.0091	-0.0074
	(0.682)	(0.571)	(0.688)	(0.633)
Fund Size	0.0681**	0.0594**	0.0664**	0.0587**
	(0.020)	(0.019)	(0.032)	(0.038)
Ln(1 + Fund Age)	0.1117**	0.0975**	0.1089	0.0963**
	(0.017)	(0.011)	(0.015)	(0.012)
Number of Rounds	0.0064	0.0053	0.0058	0.0047
	(0.436)	(0.365)	(0.440)	(0.405)
Industry Experience	0.0147***	0.0114***	0.0148***	0.0125***
	(0.000)	(0.000)	(0.000)	(0.000)
IPO Proportion	0.0089**	0.0069**	0.0090**	0.0076**
	(0.022)	(0.027)	(0.022)	(0.029)
Contribution	-0.0032**	-0.0022**	-0.0025*	-0.0019*
	(0.027)	(0.024)	(0.083)	(0.065)
FE—Industry	Yes	Yes	Yes	Yes
FE—Stage Finance	Yes	Yes	Yes	Yes
FE—Country	Yes	Yes	Yes	Yes
Pseudo R-sq	0.202	0.213	0.196	0.199
N	3,909	3,909	3,909	3,909

The dependent variable for Models I and II represents the top and bottom quartile of deal performance as measured by IRR. Similarly, the dependent variable for Models III and IV identifies the top and bottom quartile performance as measured by PME, respectively. We use Quantile regressions to estimate the coefficients of Model I through Model IV. We report the corresponding p-values in parentheses

Table 12 Multivariate analysis examining the moderating effect of cross-border investments on the relationship between repeated syndication and the top/bottom quartile of VC performance including measures of distance

	Dependent Variable: IRR		*Dependent Variable: PME*	
	Top quartile	Bottom quartile	Top quartile	Bottom quartile
Variables	Model I	Model II	Model III	Model IV
Repeated Syndication x Cross-border Dummy	-0.1615**	0.0319**	-0.1554**	0.0253**
	(0.012)	(0.037)	(0.036)	(0.038)
Cross-border Dummy	-0.0259	-0.0174	-0.0227	-0.0188
	(0.144)	(0.156)	(0.196)	(0.135)
Repeated Syndication	-0.1646***	0.0287**	-0.1408**	0.0275**
	(0.000)	(0.022)	(0.000)	(0.032)
Recession Dummy	-0.0615	-0.0284	-0.0394	-0.0296
	(0.223)	(0.247)	(0.311)	(0.264)
Volatility Index	-0.2075**	-0.2019**	-0.2235**	-0.2077**
	(0.031)	(0.031)	(0.021)	(0.021)
Ln(1 + Firm Age)	-0.0672***	-0.0661**	-0.0746**	-0.0656**
	(0.000)	(0.022)	(0.017)	(0.018)
Fund Size	0.0432**	0.0387**	0.0474**	0.0336**
	(0.032)	(0.038)	(0.029)	(0.042)
Ln(1 + Fund Age)	-0.0101	-0.0083	-0.0091	-0.0074
	(0.682)	(0.571)	(0.688)	(0.633)
Number of Rounds	0.0081	0.0075	0.0089	0.0063**
	(0.317)	(0.211)	(0.215)	(0.312)
Industry Experience	0.0146***	0.0114***	0.0149***	0.0124***
	(0.000)	(0.000)	(0.000)	(0.000)
IPO Proportion	0.0147***	0.0115***	0.0148***	0.0127***
	(0.000)	(0.000)	(0.000)	(0.000)
Contribution	0.0019	0.0001	0.0002	0.0001
	(0.167)	(0.168)	(0.149)	(0.169)
Geographical distance	0.0042	0.0017	0.0034	0.0034
	(0.109)	(0.479)	(0.126)	(0.101)
Cultural distance	0.0673**	0.0490**	0.0625**	0.0621**
	(0.041)	(0.046)	(0.012)	(0.022)
Regulatory distance	-0.0334**	-0.029*	-0.0405**	-0.0370**
	(0.018)	(0.083)	(0.026)	(0.034)
Political stability distance	-0.0142*	-0.0078*	-0.0114*	-0.0099*
	(0.053)	(0.061)	(0.057)	(0.063)
Legal System difference	-0.1614**	0.0319**	-0.1553**	0.0252**
	(0.012)	(0.037)	(0.036)	(0.038)
FE—Industry	Yes	Yes	Yes	Yes
FE—Stage Finance	Yes	Yes	Yes	Yes
FE—Country	Yes	Yes	Yes	Yes
Pseudo R-sq	0.213	0.224	0.203	0.204
N	3,909	3,909	3,909	3,909

The dependent variable for Models I and II represents the top and bottom quartile of deal performance as measured by IRR, respectively. Similarly, the dependent variable for Models III and IV identifies the top and bottom quartile of the performance as measured by PME, respectively. We use Quantile regressions to estimate the coefficients of Model I through Model IV. The cross-border dummy takes a value of 1 if the VC managers are from different regions. We report the corresponding p-values in parentheses

Table 13 Multivariate analysis examining the effect of market conditions on VC performance

Variables	Model I IRR	Model II Top quartile	Model III Bottom quartile		Model IV PME	Model V Top quartile	Model VI Bottom quartile
Repeated Syndication	-0.0958***	-0.2284***	0.0623**	-0.0851***		-0.2019***	0.0533**
	(0.001)	(0.000)	(0.023)	(0.006)		(0.000)	(0.042)
Ln(1 + Firm Age)	-0.0151	-0.0085	-0.0070	-0.0124		-0.0064	-0.0051
	(0.456)	(0.783)	(0.644)	(0.307)		(0.860)	(0.805)
Fund Size	0.0443**	0.0533**	0.0416**	0.0481**		0.0634**	0.0421**
	(0.032)	(0.024)	(0.026)	(0.027)		(0.024)	(0.033)
Ln(1 + Fund Age)	0.1699**	0.1251**	0.1092	0.1902***		0.1786**	0.1579**
	(0.016)	(0.023)	(0.016)	(0.000)		(0.019)	(0.016)
Number of Rounds	0.0081	0.0071	0.0092	0.0072		0.0081	0.0061
	(0.231)	(0.217)	(0.211)	(0.221)		(0.315)	(0.412)
Industry Experience	0.0071***	0.0109***	0.0085***	0.0093**		0.0175***	0.0147***
	(0.001)	(0.000)	(0.000)	(0.017)		(0.000)	(0.000)
IPO Proportion	0.0131***	0.0147***	0.0115***	0.0136***		0.0148***	0.0127***
	(0.000)	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)
Contribution	-0.0060*	-0.0026**	-0.0018**	-0.0133*		-0.0026*	-0.0020*
	(0.086)	(0.040)	(0.033)	(0.079)		(0.097)	(0.094)
Volatility Index	-0.0578***	-0.0476***	-0.0467**	-0.0329**		-0.0536**	-0.0469**
	(0.000)	(0.000)	(0.014)	(0.038)		(0.014)	(0.012)
FDI Movement	0.0314***	0.0537**	0.0535**	0.0421***		0.0376**	0.0373**
	(0.000)	(0.033)	(0.032)	(0.009)		(0.038)	(0.028)
GDP Growth	0.0237***	0.0357***	0.0396***	0.0401***		0.0471***	0.0469***
	(0.000)	(0.000)	(0.000)	(0.000)		(0.000)	(0.000)
Trade Openness	0.0377***	0.0551	0.0580***	0.0328**		0.0559**	0.0568**
	(0.005)	(0.005)	(0.002)	(0.015)		(0.036)	(0.032)
Stock Market Liquidity	0.0115**	0.0163**	0.0165**	0.0156**		0.0186**	0.0188**
	(0.027)	(0.029)	(0.035)	(0.033)		(0.032)	(0.038)
FE—Year	Yes	Yes	Yes	Yes		Yes	Yes
FE—Industry	Yes	Yes	Yes	Yes		Yes	Yes
FE—Stage Finance	Yes	Yes	Yes	Yes		Yes	Yes
FE—Country	Yes	Yes	Yes	Yes		Yes	Yes
Adj. R-sq. (Pseudo R-sq.)	0.273	(0.231)	(0.224)	0.172		(0.201)	(0.203)
N	3,909	3,909	3,909	3,909		3,909	3,909

This table considers the effect of the variables of interest on VC performance. Model I and IV are estimated using OLS, while the remaining Models are estimated using Quantile regression. The coefficients represent the effect of a unit change on the dependent variable, given that all other variables are held constant. The p-value for this statistic is reported in parentheses. We control for various market variables conditions including FDI movement, GDP growth, trade openness and stock market liquidity

Table 14 Multivariate analysis examining the interaction effect of time and repeated syndication on VC performance

	Model I	Model II
Variables	IRR	PME
Repeated Syndication x Time	0.0534**	0.0764**
	(0.036)	(0.026)
Time Dummy	0.0480**	0.0481**
	(0.025)	(0.022)
Repeated Syndication	-0.0975***	-0.0953***
	(0.000)	(0.009)
Recession Dummy	-0.0169	-0.0186
	(0.122)	(0.768)
Volatility Index	-0.165**	-0.275**
	(0.025)	(0.030)
Ln(1 + Firm Age)	-0.0414***	-0.0580***
	(0.001)	(0.006)
Fund Size	0.0446**	0.0483**
	(0.037)	(0.029)
Ln(1 + Fund Age)	-0.0053	-0.0012
	(0.440)	(0.308)
Number of Rounds	0.0051	0.0041
	(0.326)	(0.432)
Industry Experience	0.0076***	0.0081**
	(0.000)	(0.027)
IPO Proportion	0.0066***	0.0088***
	(0.001)	(0.005)
Contribution	-0.0014*	-0.0023*
	(0.067)	(0.074)
FE—Year	Yes	Yes
FE—Industry	Yes	Yes
FE—Stage Finance	Yes	Yes
FE—Country	Yes	Yes
Adj. R-sq	0.221	0.196
N	3,909	3,909

This table considers the effect of the variables of interest on VC performance. The coefficients represent the effect of a unit change on the dependent variable, given that all other variables are held constant. The p-value for this statistic is reported in parentheses. The interaction terms represent the multiplication of repeated syndication with the time dummy taking the value of one if the repeated syndication happened within two years

Table 15 Multivariate analysis using alternative measures of repeated collaboration

	Model I	Model II	Model III	Model IV	Model V	Model VI
Panel A	IRR	Top quartile	Bottom quartile	IRR	Top quartile	Bottom quartile
Bonding Measure #1	-0.0651***	-0.1456***	0.0428**			
	(0.000)	(0.000)	(0.0216)			
Bonding Measure #2				-0.0573***	-0.1539***	0.0482***
				(0.004)	(0.000)	(0.023)
Recession Dummy	-0.0152	-0.0146	-0.0149	-0.0155	-0.0198	-0.0199
	(0.427)	(0.666)	(0.664)	(0.512)	(0.528)	(0.542)
Volatility Index	0.0073***	0.0047***	0.0060***	0.0070***	0.0069***	0.0087***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ln(1 + Firm Age)	-0.0058*	-0.0051*	-0.0057*	-0.0059*	-0.0055*	-0.0062*
	(0.082)	(0.095)	(0.086)	(0.074)	(0.083)	(0.095)
Fund size	0.0440**	0.0532**	0.0418**	0.0484**	0.0631**	0.0424**
	(0.041)	(0.029)	(0.033)	(0.032)	(0.026)	(0.031)
Ln(1 + Fund Age)	-0.0603***	-0.0792***	-0.0776***	-0.0585***	-0.0582***	-0.0571***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of Rounds	0.0064	0.0053	0.0058	0.0053	0.0041	0.0048
	(0.436)	(0.365)	(0.440)	(0.635)	(0.381)	(0.439)
Industry Experience	0.0311***	0.0308***	0.0296***	0.0361***	0.0260***	0.0250***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
IPO Proportion	0.0073**	0.0083**	0.0061**	0.0081**	0.0083**	0.0070**
	(0.032)	(0.021)	(0.026)	(0.033)	(0.022)	(0.029)
Contribution	0.0236***	0.0214***	0.0223***	0.0235***	0.0213***	0.0223***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FE—Year	No	No	No	No	No	No
FE—Industry	Yes	Yes	Yes	Yes	Yes	Yes
FE—Stage Finance	Yes	Yes	Yes	Yes	Yes	Yes
FE—Country	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-sq. (Pseudo R-sq.)	0.233	(0.193)	(0.204)	0.172	(0.191)	(0.194)
N	3,909	3,909	3,909	3,909	3,909	3,909
	Model I	Model II	Model III	Model IV	Model V	Model VI
Panel B	PME	Top quartile	Bottom quartile	PME	Top quartile	Bottom quartile
Bonding Measure #1	-0.0732***	-0.1628***	0.0317***			
	(0.000)	(0.000)	(0.000)			
Bonding Measure #2				-0.0633**	-0.1554**	0.0513**
				(0.021)	(0.022)	(0.034)
Recession Dummy	-0.0127	-0.0159	-0.0148	-0.0108	-0.0141	-0.0129
	(0.311)	(0.357)	(0.517)	(0.338)	(0.356)	(0.462)
Volatility Index	0.0010***	0.0018**	0.0020**	0.0090**	0.0024**	0.0025**
	(0.008)	(0.012)	(0.018)	(0.020)	(0.017)	(0.027)
Ln(1 + Firm Age)	-0.0133**	-0.0170**	-0.0169**	-0.0132**	-0.0145**	-0.0144**
	(0.016)	(0.028)	(0.035)	(0.022)	(0.039)	(0.038)
Fund size	0.0445*	0.0531**	0.0419**	0.0483**	0.0635**	0.0423**
	(0.034)	(0.028)	(0.021)	(0.032)	(0.026)	(0.039)
Ln(1 + Fund Age)	-0.0238**	-0.0383**	-0.0388**	-0.0283**	-0.0239**	-0.0241**
	(0.028)	(0.041)	(0.041)	(0.020)	(0.036)	(0.036)

Table 15 (continued)

	Model I	Model II	Model III	Model IV	Model V	Model VI
Number of Rounds	0.0062	0.0054	0.0056	0.0052	0.0031	0.0046
	(0.435)	(0.363)	(0.420)	(0.626)	(0.371)	(0.432)
Industry Experience	0.0410***	0.0343**	0.0356**	0.0407***	0.0554**	0.0575**
	(0.004)	(0.017)	(0.020)	(0.007)	(0.022)	(0.031)
IPO Proportion	0.0071**	0.0081**	0.0062**	0.0077**	0.0084**	0.0065**
	(0.031)	(0.022)	(0.024)	(0.032)	(0.023)	(0.021)
Contribution	0.0401***	0.0673***	0.0681***	0.0397***	0.0547***	0.0551***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
FE—Year	Yes	Yes	Yes	Yes	Yes	Yes
FE—Industry	Yes	Yes	Yes	Yes	Yes	Yes
FE—Stage Finance	Yes	Yes	Yes	Yes	Yes	Yes
FE—Country	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R-sq. (Pseudo R-sq.)	0.175	(0.185)	(0.192)	0.172	(0.196)	(0.196)
N	3,909	3,909	3,909	3,909	3,909	3,909

This table shows the results for using bonding as alternative measure of repeated syndication. This table considers the effect of the variables of interest on VC performance. The coefficients represent the effect of a unit change on the dependent variable, given that all other variables are held constant. Model I and IV are estimated using OLS, while the remaining Models are estimated using Quantile regression. The p-value for this statistic is reported in parentheses. Bonding Measure#1 is the repeated collaboration weighted by the number of syndicators. Bonding Measure#2 follows Seo et al. (2020) and uses a combinatory weight

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