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**| RESEARCH ARTICLE**

**Venture Capital Research: An In-Depth-Cluster Analysis**

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**| ABSTRACT**

This exploratory bibliometric study reviews and classifies the existing state of venture capital research. By conducting a co-citation analysis with a sample of 1,410 papers, we complement existing qualitative and quantitative studies while visually uncovering the intellectual structure of venture capital research. We identify three broad research areas (venture capital life cycle, interfirm relationships and knowledge exchange as well as economic and policy perspectives) that also reveal the evolution of the research field. These research areas are composed of 13 thematic clusters. In addition, we introduce the idea of connecting and methodology papers: we explore thematic linkages between the respective clusters as these connecting papers bring together research topics from at least two different fields of research. We highlight the most important articles, show how clusters interact with each other and finally identify potential future research directions.

**| KEYWORDS**

Venture capital, co-citation-analysis, entrepreneurial finance, scientific visualization, start-up financing, bibliometric analysis

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**1. Introduction**

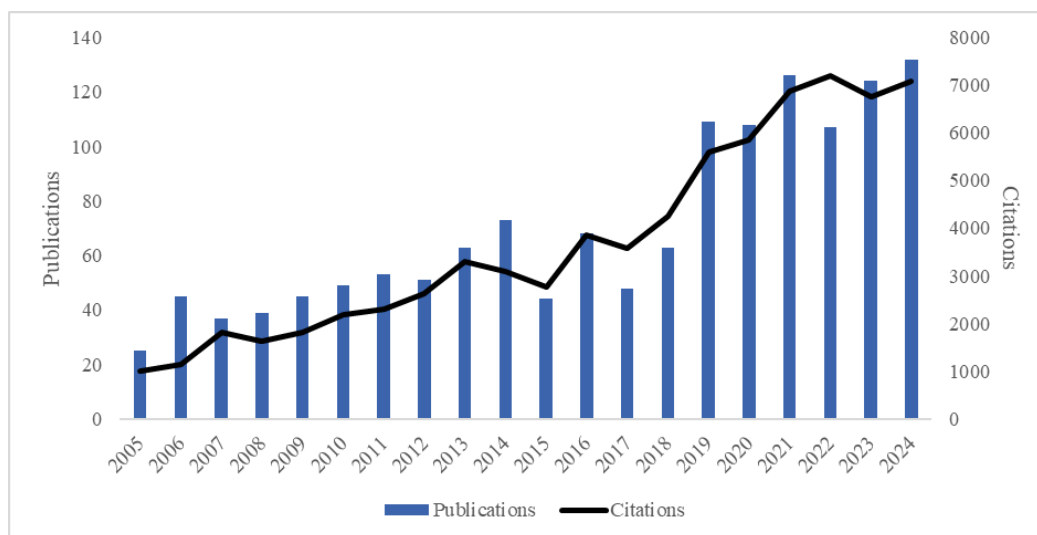
Despite start-ups contribute significantly to economic growth and innovation (Acs & Mueller, 2008; Jáki & Molnár, 2021; Kortum & Lerner, 2000), new ventures often face a lack of financial resources (Grilli et al., 2018). Therefore, start-ups seek funding from angel investors, crowdfunding or venture capitalists (VCs), representing the key players of entrepreneurial finance (Bessière et al., 2020). For most early-stage firms, venture capital is the preferred form of financing (Drover et al., 2017), as start-ups benefit not only from the funding itself, but also from the VC's expertise and networks (Hochberg et al., 2007). In recent years, both the amount of venture capital investment and the number of published research articles have increased sharply (see Table 1). However, although the first venture capital firm was founded as early as 1946, this funding source did not get much attention until the 1980s (Gompers et al., 1998). Over the past 40 years, venture capital investment has grown to \$739 billion by 2021 (National Venture Capital Association, 2023). The U.S. is clearly the leading nation in terms of venture capital (Grilli et al., 2018), but it has also gained significant traction in Asia and Europe over the past decade (LiPuma & Park, 2014). Although only few start-ups receive venture capital funding (Puri & Zarutskie, 2012), these are often the ventures with the highest growth rates and value. Accordingly, multinational firms such as Google, Starbucks, Airbnb or Uber have been venture capital-backed (Devigne et al., 2018; Gornall & Strebulaev, 2020).

VCs are financial intermediaries providing money (and other value-added services) to new ventures (Cornelius & Persson, 2006; Tykiová, 2018). Before selecting potential start-ups, VCs, respectively the general partners, collect money from both private and institutional investors (Sahlman, 1990), also called limited partners (Grilli et al., 2018). VCs invest in start-ups with high potential that at the same time face a significant risk of failure (Sahlman, 1990). Usually, VCs seek to generate returns over a period of up to 10 years (Drover et al., 2017; Gompers & Lerner, 2000). The demand is especially high as venture capital-backing leads to higher levels of professionalization (Hellmann & Puri, 2002). Moreover, VCs provide mentoring, expertise and the use of their network partners to the start-ups (Gompers, 1995; Grilli et al., 2018; Hochberg et al., 2007; Hsu, 2006). In most cases, VCs push

start-ups to go public in order to achieve a high return on investment. After a successful exit, VCs look for new, promising ventures to invest in and the “venture cycle” starts all over again (Gompers & Lerner, 2001).

Due to the growing economic importance and a multitude of venture capital-backed ‘success stories’, the volume of venture capital-related publications and citations has grown substantially over the past 20 years, as shown in Table 1. More specifically, the rise in VC publications is considerably higher compared to papers on similar forms of financing (1,260 publications in the last 20 years), such as private equity (618 publications) or angel investments (169 publications). The increasing number of papers makes it difficult to assign the term ‘venture capital’ to a specific discipline (Cornelius & Persson, 2006), and to understand the state of theoretical and empirical knowledge in the field of venture capital research. Publishing journals are typically rooted in the fields of entrepreneurship, finance, or management research. Our approach of quantitatively reviewing and visually presenting the current state of literature on venture capital will help to further structure this research domain.

**Table 1:** Number of venture capital-related publications and citations 2005-2024.



In addition to literature reviews and meta-analyses, bibliometric analysis is currently establishing itself as a third method for examining existing literature (Zupic & Čater, 2015). Although some bibliometric analyses on venture capital have been published in recent years, these studies have only descriptively analyzed the most influential authors and journals (Cancino et al., 2018; Padilla-Ospina et al., 2018). Accordingly, these papers do not address how venture capital research is structured thematically. While Cumming et al. (2022) give an overview of authors, collaboration patterns and research themes in both venture capital and private equity, we provide an in-depth-cluster analysis on venture capital research. Accordingly, our primary research goal is to deliver a detailed description of each cluster by examining its content, evolution, theoretical foundations, and interrelationships with other clusters. That is why our overarching research questions are: What is the intellectual structure of venture capital research? What are the predominant research clusters, and how has this research field evolved?

Therefore, our exploratory study contributes to the existing literature on entrepreneurial finance. First, we complement existing qualitative and quantitative studies by offering new perspectives on the characteristics of venture capital literature. We visually structure the heterogeneous and fragmented field of research by conducting a co-citation analysis. Our study reviews, classifies and presents the existing state of venture capital research. Consequently, we identify three major research areas consisting of 13 thematic clusters. We obtain a holistic understanding of the intellectual structure of venture capital research as we also relate the clusters to their respective theoretical background. Second, we provide a detailed overview of the most influential articles, identify predominant thematic research areas, track their evolution, and derive links between authors, articles, or clusters. At the cluster level, we demonstrate how distinct research paths have evolved around the core concepts of the three research areas. Furthermore, as a novel approach to bibliometric analysis, we introduce the so-called connecting papers that bring together research topics from at least two distinct clusters. The inclusion of this additional category allows us to more accurately assess the relevance and size of each cluster, while also highlighting seminal papers that integrate core concepts from two different research fields. Third, our study stimulates future venture capital research by providing scholars with a systematic understanding of the intellectual landscape and its research frontiers. Therefore, to advance the literature on entrepreneurial finance, we

highlight future research directions by analyzing the content of the research areas and, in particular, the interdependencies between the clusters.

## **2. Methodology**

### **2.1 Database and Data Collection**

In accordance with existing research (Donthu et al., 2021; Reverte & Badillo, 2019), we used the reputable database Web of Science to draw the sample for our bibliometric study. In analogy to similar studies, we used the following approach to receive our final sample of studies: first, only studies containing the keywords "venture capital\*" and "VC" in their title were included. The sample was not limited in time in order to provide a comprehensive overview of the research field and to show its evolution (Casprini et al., 2020; Lampe et al., 2020). Second, further restrictions were made by selecting English-language publications (Ferasso et al., 2020; Shashi et al., 2021) from the Web of Science research area "Business Economics" (Castillo-Vergara et al., 2018; van Oorschot et al., 2018). Without narrowing, we would have had to include many studies from other disciplines, which would then no longer correspond to a paper from business sciences. In terms of document type, we only considered articles, proceeding papers, reviews and early access papers in order to analyze a uniform database and its citation network (Castillo-Vergara et al., 2018; Shashi et al., 2021). Third, we did a manual review and checked for duplicates. Finally, the names of both authors and journals were standardized to one spelling. In the end, we selected 1,410 articles from 319 journals, containing 34,487 references. The initial search was first conducted in the second week of April 2022 and updated in January 2025.

### **2.2 Bibliometric Analysis**

In bibliometrics, a distinction is made between performance analysis and science mapping. The former provides a descriptive overview of a research field, for example, by analyzing publication numbers per author or institution (Noyons et al., 1999). Thus, we begin with a brief descriptive analysis, primarily using the R-based software tool Bibliometrix (Aria & Cuccurullo, 2017), to identify the main protagonists in venture capital research. However, the focus of the underlying paper is on science mapping as it examines the intellectual structure of the research strand. We track the development of research areas and derive interdependencies between articles, authors or journals (Donthu et al., 2021; Ramos-Rodríguez & Ruíz-Navarro, 2004; Zupic & Čater, 2015). Co-citation analysis is a popular form of science mapping as it indicates which studies are cited together by a primary source (Small, 1973). For example, a particular paper (study C) cites both Porter's work (study A) and Hofstede's paper (study B) - since both references are found in the bibliography of study C, it is assumed that there is some thematic connection between studies A and B, thus creating a link between the two articles. The more frequently two studies are found together (co-cited) in the bibliographies of the publications examined, the more likely their content is related and a tie emerges between both articles (Small, 1973; Zupic & Čater, 2015). If one follows this basic idea and applies the methodology to many more studies, the intellectual structure of a research field can be identified (McCain, 1990; Zupic & Čater, 2015). Therefore, the more often two papers are cited together, the more likely it is that they represent seminal studies in a specific field of research (Small, 1973). Accordingly, co-citation analysis serves to identify the central papers and most influential authors, offering insights into the roots of a research field and its subsequent intellectual development.

VOSViewer is a useful application to quantitatively map and visualize a certain research field (van Eck & Waltman, 2010, 2017). As for the clustering mechanism, VOSViewer applies a smart local moving algorithm solving an optimization problem (van Eck & Waltman, 2014). The distance-based visualization algorithm helps to determine the location and proximities of the respective references in the co-citation map. Therefore, economists have already conducted several bibliometric analyses with VOSViewer (Anand et al., 2021; Apriliyanti & Alon, 2017; Castillo-Vergara et al., 2018). Based on the results from VOSViewer, we created a co-citation map (Figure 1) in which we included other relevant information such as cluster sizes or the distribution of publication years.

Since our sample consists of 1,410 studies with more than 34,450 references, the number of cited papers must be limited. Following comparable bibliometric studies (Raghuram et al., 2010; Schildt et al., 2006), we first chose a threshold of 2% of the database (1,410 studies) as a starting point (30 co-citations; leading to 260 co-cited studies) and then tested different levels to also include more recent works. Ultimately, a minimum threshold of 10 co-citations was set to ensure that we both process a manageable number of publications and select only studies that are sufficiently cited (Zupic & Čater, 2015). In particular, we chose this threshold because it provides both detailed and robust results (across various threshold levels). More precisely, the narrowing down yields 958 cited studies with more than 173,000 co-citation links. Compared to other bibliometric studies, our analysis contains a large number of publications, which in turn leads to a fragmented overview of the venture capital literature.

### 3. Descriptive Analysis

#### 3.1 Publication Analysis

To establish a comprehensive understanding of the research field, its key protagonists, and interdependencies in the following co-citation analysis, we begin our bibliometric study by descriptively highlighting the major authors, journals, and publications in the field of venture capital research. Douglas Cumming, Mike Wright, and Josh Lerner are among the most active authors of the sample, having published 15 or more papers on venture capital (see Table 2). It is striking that one third of all publications were (co-)published by American institutions (456 studies in total), with Harvard University taking the leading position with 44 publications. Chinese and British institutions follow with 125 and 115 (co-)authorships respectively. Since the sample also includes early access (43 studies) and proceeding papers (45 studies), the increasing importance of venture capital research is emphasized.

**Table 2:** 15 most publishing authors in the field of venture capital.

Author	Number of publications
CUMMING D	33
WRIGHT M	25
LERNER J	18
GOMPERS P	17
MANIGART S	17
ZACHARAKIS A	14
BERTONI F	13
COLOMBO MG	13
MASON CM	13
MAULA M	13
SCHWIENBACHER A	13
CROCE A	12
GRILLI L	12
HELLMANN T	11
LI Y	11

Note. Only publications with the search terms "venture capital\*" or "VC" in the title are considered.

The Journal of Business Venturing (JBV) is clearly the journal with the most publications (125 papers). In fact, it has twice as many publications as the second-placed journal *Small Business Economics* (57 publications). The Journal of Corporate Finance and Entrepreneurship Theory & Practice follow in the next places (see Table 3). Analyzing the journal publications by percentage terms, every tenth paper is published in the JBV or even every fifth paper in one of the four journals mentioned. The journals also vary in terms of journal ranking, with some - such as *Academy of Management Journal* or *Journal of Finance* - recognized for their high quality. Consequently, these journals boast high scores on the SCImago Journal Rank (SJR), which comprises the evaluation of more than 5,000 international publishers. Other journals have a lower ranking but as their publication titles suggest, place a stronger emphasis on entrepreneurial finance research. The SJR indicator assesses the prestige of academic journals by taking into account both the volume of citations a journal receives and the prestige of the journals from which these citations originate (IAES, 2024). Thus, higher SJR values indicate greater prestige of the journal, with a value of one representing the average citation potential.

**Table 3:** 15 most publishing journals in the field of venture capital.

Journal	Articles	% of Sample	SJR Indicator (2023)
JOURNAL OF BUSINESS VENTURING	125	8.8%	4.813
SMALL BUSINESS ECONOMICS	57	4.0%	2.530
JOURNAL OF CORPORATE FINANCE	45	3.2%	3.182
ENTREPRENEURSHIP THEORY AND PRACTICE	42	3.0%	5.819
RESEARCH POLICY	31	2.2%	3.219
VENTURE CAPITAL	30	2.1%	0.749
JOURNAL OF FINANCIAL ECONOMICS	29	2.1%	13.655
STRATEGIC ENTREPRENEURSHIP JOURNAL	27	1.9%	3.628
JOURNAL OF BUSINESS RESEARCH	25	1.8%	3.128
JOURNAL OF SMALL BUSINESS MANAGEMENT	25	1.8%	1.632
JOURNAL OF BANKING & FINANCE	23	1.6%	1.663
JOURNAL OF FINANCE	23	1.6%	19.139
ACADEMY OF MANAGEMENT JOURNAL	21	1.5%	8.271
FORTUNE	21	1.5%	0.118
STRATEGIC MANAGEMENT JOURNAL	20	1.4%	7.820

Note. Only publications with the search terms "venture capital\*" or "VC" in the title are considered.

### 3.2 Citation Analysis

We provide a brief overview of the general citation structure of the selected sample (see Table 4). Of the 1,410 studies, the vast majority was cited less than 50 times (1,095 studies). As venture capital literature has grown rapidly in recent years, many studies are still new and have therefore been cited relatively little. Nevertheless, 22 % of the selected studies were cited more than 50 times. In addition, 45 studies with over 250 citations serve as seminal papers that form the intellectual foundation of venture capital research.

**Table 4:** Citation structure of sample.

Number of citations	Number of studies	% of all papers
≥ 500	13	0.9%
≥ 250	32	2.3%
≥ 100	125	8.8%
≥ 50	145	10.3%
≥ 0	1,095	77.7%
Total:	<b>1.410</b>	100.0%

Local citations measure the number of citations the author, paper or journal analyzed has received from the studies included in our sample. When compared to the most publishing authors category, some notable differences become apparent (see Table 5). Wright (582 citations) and Cumming (799 citations) still rank in the top 10, but no longer in the top three of most cited authors. Josh Lerner and Paul Gompers are the only two researchers to exceed the 1,000+ citations threshold, with 1,297 and 1,108 citations respectively. Highlighting the leading role of the US in venture capital research, American scholars have more than 35,900 citations in total. This is almost ten times more than the UK and Canada have, which follow in terms of citations, with 4,357 and 3,692 citations respectively.

**Table 5:** Most local cited authors.

Author	Local Citations
LERNER J	1,297
GOMPERS PA	1,108
HELLMANN T	894
CUMMING D	799
SAHLMAN WA	635
PURI M	622
WRIGHT M	582
SAPIENZA HJ	520
KAPLAN SN	478
MANIGART S	453
STROMBERG P	449
HOCHBERG YV	416
LOCKETT A	378
DUSHNITSKY G	372
LJUNGQVIST A	362

Not surprisingly, finance and entrepreneurship-related journals top the list of most cited journals (see Table 6). Again, the Journal of Business Venturing ranks first with 5,529 citations, followed by the Journal of Finance (4,519 citations) and the Journal of Financial Economics (3,570 citations). Taken together, these three journals account for about one fifth of all citations, indicating their relevance for venture capital research. However, journals that predominantly have a different focus, such as strategy (Strategic Management Journal), management (Academy of Management Journal; Administrative Science Quarterly), innovation (Research Policy) or organizational research (Organization Science), follow in the next places. Therefore, venture capital research is much broader in scope and can be classified as interdisciplinary (Cherif & Khalid, 2021). The primary research field of each journal was accessed by the Academic Journal Guide 2024 (AJG) . A closer examination reveals that the ten most cited journals are without exception of the highest reputation, as indicated by the SJR.

**Table 6:** Most local cited sources in the field of venture capital.

Sources	Total Citations	SJR Indicator (2023)	Research Field (Academic Journal Guide 2024)
JOURNAL OF BUSINESS VENTURING	5,529	4.813	Entrepreneurship and Small Business Management
JOURNAL OF FINANCE	4,519	19.139	Finance
JOURNAL OF FINANCIAL ECONOMICS	3,570	13.655	Finance
STRATEGIC MANAGEMENT JOURNAL	2,804	7.820	Strategy
ACADEMY OF MANAGEMENT JOURNAL	1,933	8.271	General Management, Ethics, Gender and Social Responsibility
ADMINISTRATIVE SCIENCE QUARTERLY	1,588	14.175	General Management, Ethics, Gender and Social Responsibility
RESEARCH POLICY	1,525	3.219	Innovation
ENTREPRENEURSHIP THEORY & PRACTICE	1,389	5.819	Entrepreneurship and Small Business Management
REVIEW OF FINANCIAL STUDIES	1,229	17.654	Finance
MANAGEMENT SCIENCE	1,131	5.438	Operations Research and Management Science
ORGANIZATION SCIENCE	1,072	5.632	Organizational Studies
SMALL BUSINESS ECONOMICS	1,003	2.530	Entrepreneurship and Small Business Management
JOURNAL OF CORPORATE FINANCE	988	3.182	Finance
ACADEMY OF MANAGEMENT REVIEW	963	10.486	General Management, Ethics, Gender and Social Responsibility
VENTURE CAPITAL	954	0.749	Entrepreneurship and Small Business Management

The importance of the journals mentioned also stems from the fact that the most cited studies were published in them (see Table 7). It shows the number of citations a paper has received from studies contained in the entire Web of Science database. The papers identified represent seminal studies in the field of venture capital research. Analyzing Table 7, many of the known researchers are listed: while Megginson and Weiss (1991) (1,091 citations) examine the VCs' certification role in IPOs, Sahlman (1990) (1,079 citations) focuses on VCs' relationship with both investors and entrepreneurs and how contracting might resolve

agency conflicts. In third place is Hellmann and Puri's (2002) study (856 citations) on the impact of venture capital funding on start-ups' professionalization measures. Since the absolute number of citations provides only limited information about the relevance of the respective studies due to different publication years, we also consider the studies with the most citations per year. While Hochberg et al. (2007) examine the impact of venture capital firms' networks on fund performance, Kaplan and Strömberg (2003) analyze the contracting design.

**Table 7:** Most global cited documents.

Article	Citations (Rank)		Main Topic
	Total	per year	
Meggison and Weiss (1991) Venture Capitalist Certification in Initial Public Offerings. <i>Journal of Finance</i>	1,091 (1)	34 (5)	Certification role of VCs in initial public offerings
Sahlman (1990) The structure and governance of venture-capital organizations. <i>Journal of Financial Economics</i>	1,079 (2)	33 (8)	VC's relationships, agency conflicts & contracts
Hellmann and Puri (2002) Venture Capital and the Professionalization of Start-Up Firms: Empirical Evidence. <i>Journal of Finance</i>	856 (3)	41 (2)	Impact of venture capital backing on start-ups
Gompers (1995) Optimal Investment, Monitoring and the Staging of Venture Capital. <i>Journal of Finance</i>	838 (4)	30 (9)	Agency costs, monitoring & investment staging in venture capital
Kortum and Lerner (2000) Assessing the Contribution of Venture Capital to Innovation. <i>The RAND Journal of Economics</i>	787 (5)	34 (4)	Impact of venture capital on innovation
Hochberg, Ljungqvist and Lu (2007) Whom You Know Matters: Venture Capital Networks and Investment Performance. <i>Journal of Finance</i>	766 (6)	48 (1)	Relevance of VCs networks & syndicates for (IPO) performance
Kaplan and Strömberg (2003) Financial Contracting Theory Meets the Real World: An Empirical Analysis of Venture Capital Contracts. <i>The Review of Economic Studies</i>	739 (7)	37 (3)	Contracting and rights allocation in venture capital industry
Gompers and Lerner (2001) The Venture Capital Revolution. <i>Journal of Economic Perspectives</i>	639 (8)	29 (10)	Overview paper
Black and Gilson (1998) Venture capital and the structure of capital markets: banks versus stock markets. <i>Journal of Financial Economics</i>	618 (9)	25 (16)	Venture capital contracting: exit strategies (IPOs)
Gorman and Sahlman (1989) What do venture capitalists do? <i>Journal of Business Venturing</i>	563 (10)	17 (39)	VC-entrepreneur relationship & VC's involvement
Hsu (2004) What Do Entrepreneurs Pay for Venture Capital Affiliation? <i>Journal of Finance</i>	542 (11)	29 (11)	Certification and value-added roles of VCs
Gompers (1996) Grandstanding in the venture capital industry. <i>Journal of Financial Economics</i>	520 (12)	19 (25)	IPOs, VC's involvement, VC's reputation
Barry et al. (1990) The role of venture capital in the creation of public companies. <i>Journal of Financial Economics</i>	504 (13)	15 (48)	VC's involvement patterns (monitoring) & effects on IPOs
Tyejee, & Bruno (1984) A Model of Venture Capitalist Investment Activity. <i>Management Science</i>	486 (14)	12 (74)	the five main tasks of venture capital deal-making
Lerner (2000) The Government as Venture Capitalist. <i>Journal of Business</i>	481 (15)	20 (23)	Governmental venture capital
Chen, Yao and Kotha (2009) Entrepreneur Passion and Preparedness in business plan presentations: A persuasion analysis of venture capitalists' funding decisions. <i>Academy of Management Journal</i>	476 (16)	34 (6)	VC's decision-making process
Drover et al. (2017) A Review and Road Map of Entrepreneurial Equity Financing Research: Venture Capital, Corporate Venture Capital, Angel Investment, Crowdfunding, and Accelerators. <i>Journal of Management</i>	203 (65)	34 (7)	Review of entrepreneurial finance sources
Gompers et al. (2020) How do venture capitalists make decisions? <i>Journal of Financial Economics</i>	85 (199)	28 (12)	VC's decision-making, valuation, and post-investment value-added
Chemmanur, Loutskina and Tian (2014) Corporate Venture Capital, Value Creation, and Innovation. <i>The Review of Financial Studies</i>	238 (50)	26 (13)	Impact of corporate venture capital (CVC) on innovation
Sorensen (2007) How Smart Is Smart Money? A Two-Sided Matching Model of Venture Capital. <i>Journal of Finance</i>	404 (20)	25 (14)	Agency issues: Involvement & matching, going public process

Note. The 15 most cited articles in total and per year (average number of citations per year) are selected.

#### 4. Co-Citation Analysis

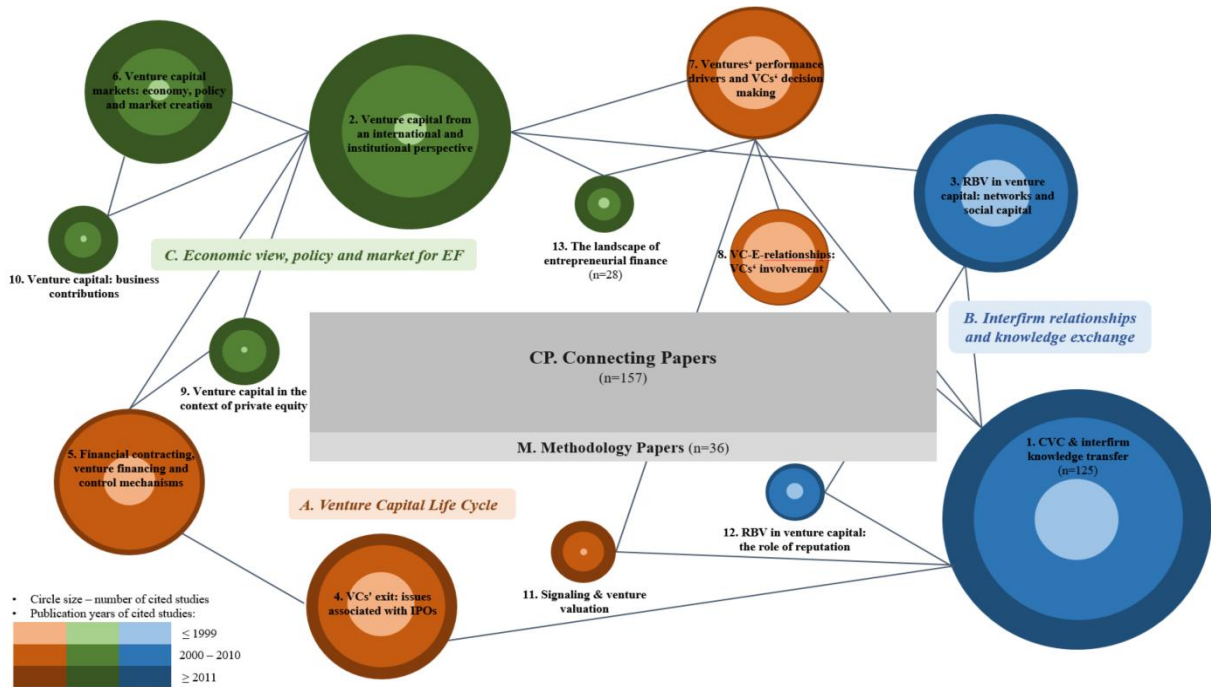
In order to uncover the interdependencies between the publications, a co-citation analysis is applied in the following subchapter. In terms of methodology, we switch from performance analysis to science mapping (C. Chen, 2017; Verma & Gustafsson, 2020). In total, we find 13 clusters that are assigned to three major research areas. The algorithm classified a cluster as independent if the included studies showed a clear, divergent research direction and the number of publications amounted to at least 25 papers. The foundations of research were laid as early as the 1990s, as the "oldest" clusters have an average publication year around the turn of the millennium.

Since we identified strong interrelationships between several clusters, we decided to introduce two additional groups to categorize the studies: methodology papers and 'connecting papers'. We developed this new approach within bibliometrics because we recognized that assigning certain papers to only one cluster would not reflect the actual intellectual structure of venture capital research. We therefore use both categories to better deal with the interdisciplinary nature of the research field. As the name implies, the former are papers that have laid the methodological foundation for many studies from different clusters. For example, sample selection bias (Heckman, 1979) or standard errors (White, 1980) are relevant to many papers, regardless of their thematic focus. Conversely, the connecting papers cover various venture capital-related aspects and cannot be assigned to only one particular cluster. The respective papers bring together key ideas or concepts from (at least two) different clusters and are therefore often found in the center of our bibliometric map. Thus, these studies represent the foundations of research and are (co-)cited by many researchers with different foci. For example, Gompers and Lerner (2001) contribute a connecting paper, as their work addresses the history, return, and internationalization of venture capital.

In most cases, the algorithm either assigns a study precisely to a specific cluster or leaves it unclassified. Studies not assigned to any cluster were manually reviewed and then categorized as connecting papers or allocated to an appropriate cluster. Additionally, all studies (within the existing clusters) were double-checked to determine whether they fit thematically with the content of each cluster. If a study's co-citation links to at least two clusters were at least 10% each, or if more than 15 percent of its links were directed to the connecting papers, it was reclassified as a connecting paper. In the end, roughly one sixth of all studies (157 papers) were categorized as connecting papers.

Figure 1 graphically depicts the intellectual structure of venture capital research. The 13 circles correspond to the different thematic clusters. The positioning of the clusters is derived from the network generated by the distance-based algorithm of VOSViewer and has been further refined by the authors. This implies that clusters arranged closer together on the map share co-citation links between their studies, indicating a stronger (thematic) connection to nearby clusters than to those further apart. The total size of each circle symbolizes the number of included studies of the corresponding cluster. Cluster 1 (125 studies) represents the largest group of studies, while cluster 13 includes only 28 papers. The three color schemes (blue, red, and green) highlight the affiliation of the clusters to the respective major research areas (A - C). Similarly, within a cluster, we address the temporal distribution of studies by referring to publication years. Studies are assigned to three different periods ( $\leq 1999$ ; 2000-2010;  $\geq 2011$ ), with darker shades corresponding to more recent publication years. We have distinguished these three periods because venture capital began to attract greater academic interest around the turn of the millennium, leading to a considerable increase in publications. For example, while we find many older studies in cluster 8 (VC's involvement), cluster 2 (venture capital from an international and institutional perspective) includes more recent studies. The connecting lines between the circles symbolize which clusters are closely linked, so that there are also many co-citations between the respective groups of studies. For each cluster, the connecting lines highlight the two strongest connections to other clusters. To illustrate the two additional categories of publications in our map, we use the gray boxes in Figure 1. To highlight the relevance of the methodology (M) and connecting papers (CP), we positioned two boxes in the center of our map, as numerous papers from different clusters refer to both categories. In particular, the CP box (in light gray) is of considerable size to emphasize that the connecting papers are also relevant in terms of their number (157 papers). These CP papers integrate aspects from multiple (at least two) clusters. Table 8 provides a detailed description of the research areas and their respective clusters.

Figure 1: Co-citation network 1921-2020.



Note. Research Areas (A-C) are named after the average publication year of the included studies, starting with the oldest studies (A.). Clusters are named according to their size in terms of included studies, starting with the largest (1st: CVC). For each cluster, the connecting lines show the two strongest connections to other clusters.

Table 8: Cluster description of the co-citation network 1921-2020.

Research Area	Cluster No. & Area	Cluster name	Size (Mean year of publication)	Description	Representative Articles	Theoretical Background
A. Venture Capital Life Cycle (LC)	4 (LC)	VCs' exit: issues associated with IPOs	70 (2000)	Underpricing, exit choice, VC's certification & reputation, creation of public companies	Megginson & Weiss 1991, Gompers 1996; Barry et al. 1990, Lee & Wahal 2004	Information asymmetries (Leland & Pyle, 1977); Specific concepts: certification role (Megginson & Weiss, 1991), underwriter reputation (Carter & Manaster, 1990), grandstanding hypothesis (Gompers, 1996)
	5 (LC)	Financial contracting, venture financing and control mechanisms	70 (2001)	Information asymmetries, governance, agency problems, hold up, moral hazard, adverse selection, (control) rights, monitoring, contracting, convertible securities, corp. finance	Kaplan & Strömberg 2003; Kaplan & Strömberg 2004; Admati & Pfleiderer 1994; Bergemann & Hege 1998	Agency theory (Jensen & Meckling, 1976); contracting & corp. finance theories (Myers & Majluf, 1984; Grossman & Hart, 1986); moral hazard (Holmström, 1979)

	7 (LC)	Ventures' performance drivers and VCs' decision-making	64 (1998)	VC's decision-making process, selection criteria and success factors	Tyebjee & Bruno 1984; Macmillan et al. 1985, Fried & Hisrich 1994	Signaling theory (Spence, 1973); resource-based view (Barney, 1991); upper echelon theory (Hambrick & Mason, 1984)
	8 (LC)	VC-E-relationships: VCs' involvement	46 (1996)	VC's involvement; monitoring; VC's value adding activities; control & advice; VC's governance; trust	Gorman & Sahlman 1989; Sapienza 1992; Macmillan et al. 1989	Agency theory (Fama & Jensen, 1983; Eisenhardt, 1989a); organizational trust (Mayer et al., 1995)
	11 (LC)	Signaling & venture valuation	30 (2006)	Competitive advantage, quality signals, human capital, social capital, reputation & status	Shane & Cable 2002; Hsu 2007; Hsu & Ziedonis 2013	Signaling theory (Spence, 1973)
<b>B.</b>  <b>Interfirm relationships and knowledge exchange (IR)</b>	1 (IR)	CVC and interfirm knowledge transfer & acquisition	125 (2003)	Organizational learning, Knowledge transfer, Strategic venture investing, Interfirm collaboration, Innovation strategy	Dushnitsky & Lenox 2005; Dushnitsky & Lenox 2006; Katila et al. 2008	Absorptive capacity (Cohen & Levinthal, 1990); dynamic capabilities (Teece et al., 1997); organizational learning (March & Levitt, 1988), knowledge-based theory (Grant, 1996)
	3 (IR)	RBV in venture capital: The role of networks and social capital	76 (2000)	Syndication networks, interorganizational networks, relationship formation, partnerships, reputation & status, resource accumulation	Sorenson & Stuart 2001; Lerner 1994, Stuart et al. 1999, Wright & Lockett 2003	RBV (Pfeffer & Salancik, 1978); Social network theory (Granovetter, 1973); social capital (Coleman, 1988), organizational ecology (Hannan & Freeman, 1977); Theory of syndicates (Wilson, 1968)
	12 (IR)	RBV in venture capital: the role of reputation	28 (2003)	Reputation, status, prestige, information, attention	Dimov, Shepherd & Sutcliffe 2007; Pollock et al. 2010; Lee, Pollock & Jin 2011	Agency & signaling theories, attention-based view (Ocasio, 1997)
<b>C.</b>  <b>Economic view, policy, and market for entrepreneurial finance (EP)</b>	2 (EP)	Venture capital from an international and institutional perspective	94 (2006)	Cross-country & cultural distance, VCs in emerging economies, localization, Institutional differences; market differences	Cumming, Schmidt & Walz 2010; La Porta et al. 1998; Dai et al. 2012	Institutional economics & legal theory (La Porta et al., 1997; La Porta et al., 1998; North, 1989); cultural dimensions (Hofstede, 1980); liability of foreignness (Zaheer, 1995)
	6 (EP)	Venture capital markets: economy, policy, and market creation	69 (2007)	Government policies, venture capital market creation, legislation and institutional setting, economic impact: growth & employment, governmental venture capital (GVC); macro level perspective	Jeng & Wells 2000; Lerner 2000; Leleux & Surlemont 2003; Grilli & Murtinu 2014	Broad application of different theories such as institutional & legal theory (La Porta et al., 1998), public finance theories, regulatory economics, or information asymmetries (Akerlof, 1970)
	9 (EP)	Venture capital in	33 (2009)	Risk & return, private equity fund	Kaplan & Schoar 2005; Gompers 2000;	Broad application of different theories depending

		the context of private equity		structure, fund performance	Cochrane 2005	on the research focus of the studies
	10 (EP)	Venture capital: business contributions	32 (2007)	Innovation, growth, performance, professionalization measures, patenting	Kortum & Lerner 2000; Hellmann & Puri 2000; Chemmanur et al. 2011	Broad application of different theories depending on the research focus of the studies
	13 (EP)	The landscape of entrepreneurial finance	28 (2006)	Business angels, crowdfunding, informal venture capital, bank, equity financing,	Elitzur & Gaviols 2003; Drover et al. 2017; Mason & Harrison 2002	Broad application of different theories depending on the research focus of the studies
<b>D. Connecting and Methodology Papers</b>	M	Methodology Papers	36 (1995)		Heckman 1979; White 1980	
	CP	Connecting Papers	157 (1996)		Sahlman 1990; Gompers 1995, Hellmann & Puri 2002	Amongst others: Agency theory (Jensen & Meckling, 1976); Behavioral theory of the firm (Cyert & March, 1963); RBV (Barney, 1991 & Wernerfelt, 1984); Information asymmetries & hidden characteristics (Akerlof, 1970); theory of economic development (Schumpeter, 1934); economic & risk theory (Knight, 1921)

In each of the following sections, we first provide a general overview of the three major research areas: A. Venture capital life cycle (LC); B. Interfirm relationships and knowledge exchange (IR); and C. Economic view, policy, and the market for entrepreneurial finance (EP). Then we delve deeper into the associated clusters, exploring their evolution over time and the underlying theories. We start with the LC as the first research area, although it does not have the largest cluster (in terms of number of studies included). In fact, we follow a different logic in order to show the development of the entire research field. We call LC the first major research area because it has the oldest studies, measured by the average year of publication. Accordingly, the third research area (EP) includes studies that are more recent. However, we named each cluster according to the number of included studies, i.e., cluster 1 has the most studies (although it is not part of research area A), whereas cluster 13 includes the fewest studies of the sample. Since we present the intellectual structure chronologically, the following section begins with the largest cluster (in terms of number of studies) of the oldest research area – in this case, cluster 4 dealing with IPO-related issues. Hereinafter, the central research aspects and developments of each cluster are identified and shown. Likewise, the most important papers (measured by the number of citations and links within the cluster) of the respective research strand are named, summarized, and related to each other.

**A. Venture Capital Life Cycle (LC)**

This group of clusters deals with the venture capital life cycle. The process usually begins with the VC’s **decision-making (cluster 7)** and **venture valuation (11)**. The venture selection process is followed by **contracting issues (5)** and **VCs’ involvement practices (8)** in the development of the start-up. Finally, going public with the venture is the VC’s preferred **exit option (4)**. Since the transitions between the individual phases are fluid, there are also strong links between the respective clusters. This is especially true for the VC’s decision-making process and involvement activities, as the VC-entrepreneur relationship begins with the selection process and continues through the subsequent stages. Similarly, clusters 4 and 5 are closely linked, as potential exit scenarios are already recorded when the contract is signed. The strong overlap is also reflected in the fact that similar journals are cited most frequently per cluster. While finance journals (Journal of Finance; Journal of Financial Economics) clearly dominate clusters 4 and 5, the Journal of Business Venturing is by far the leader in clusters 7 and 8 (with more than one-third of all papers in the two clusters) indicating an entrepreneurial focus. As the studies of this research area are the

"oldest" in our sample (average year of publication is around the turn of the millennium), the venture capital life cycle represents the foundation of the underlying field of research. Agency theory (Jensen & Meckling, 1976) and information asymmetries (Akerlof, 1970; Stiglitz & Weiss, 1981) are the dominant explanatory approaches both in these clusters and in the literature as a whole. Since these theories are equally relevant to other clusters, the corresponding papers have been predominantly placed in the "connecting papers" group. However, these theoretical contributions have set the starting point for further research on information asymmetries. While entrepreneurs usually act as agents, VCs take on the role of principals, as they mandate the founders to increase the value of the start-up. The agency dilemma becomes apparent here: because of the possibly divergent goals, the entrepreneur might take measures that conflict with the goals of the investor. While VCs aim to maximize their returns (Metrick & Yasuda, 2011; Rosenbusch et al., 2013), entrepreneurs seek long-term stability (Lewis & Churchill, 1983). Agency-specific concepts such as moral hazard or adverse selection offer further theoretical explanations for dealing with information asymmetries (Holmström, 1979). For instance, in terms of the decision-making process or IPO-related investment decisions, adverse selection may occur because investors have less information about the quality of the company than the founders have and therefore may come to wrong decisions.

**Cluster 4. VCs' exit: issues associated with IPOs.** This research cluster focuses on the IPO process of venture capital-backed start-ups. As early as the 1990s, IPO-specific issues were addressed that remain relevant today, such as underpricing, VC's certification, and underwriter reputation. Barry et al. (1990) first analyze whether VCs' involvement and monitoring practices affect IPO performance. They conclude that high quality monitoring leads to lower underpricing. Similarly, Megginson and Weiss (1991) examine the benefits of venture capital funding for start-ups going public: Since VCs are better able to reduce information asymmetries among the parties involved in the IPO process, the costs of going public are scaled down and the issuing company can expect higher earnings. The VC's certification role represents a widely accepted explanation for the performance advantage of venture capital-funded companies. As a VC is engaged in the issuing company, the quality of both the business idea and the management team is confirmed (or certified) to potential investors. In addition, Gompers (1996) finds that new VCs want to take their financed companies public earlier than established VCs, as an IPO is generally assessed positively. These VCs can thus build a good reputation and raise further funds in the future. Therefore, young VCs are more willing to go public early and to accept higher underpricing. Gompers consequently calls it 'grandstanding'. Lee and Wahal (2004) support the grandstanding hypothesis, as higher underpricing (and earlier reputation building) will pay off financially for venture capital firms in the future. In subsequent years, Krishnan et al. (2011) observe that start-ups backed by reputable VCs are more successful because, for example, VCs select stronger ventures or show higher post-investment involvement. Theoretical background: Information asymmetries and agency-related problems are highly relevant for this cluster as the protagonists are confronted with them during IPOs or reputation building (Leland & Pyle, 1977). Moreover, IPO-specific theories have developed, such as the certification role (Megginson & Weiss, 1991), underwriter reputation (Carter & Manaster, 1990) or the above-mentioned grandstanding hypothesis (Gompers, 1996).

**Cluster 5. Financial contracting, venture financing and control mechanisms.** In this cluster, the researchers are particularly concerned with information asymmetries, such as agency-related conflicts, moral hazard, monitoring and contracting. After the theoretical foundations for contract design were laid in the 1980s (Holmström, 1982; Sahlman, 1988), researchers investigated agency-related phenomena in a venture capital context in the 1990s. Accordingly, Admati and Pfleiderer (1994) show how financial contracts between VCs and start-ups must be designed in order to mitigate potential conflicts. Likewise, Bergemann and Hege (1998) examine emerging agency-related problems at several stages in the VC-entrepreneur-relationship ('dynamic agency model'). To resolve such conflicts, the authors recommend the use of a 'time-varying share contract which provides intertemporal risk-sharing' between both parties. Kaplan and Strömberg (2003, 2004) analyze the contract design in more detail by examining the VC's allocation of various rights (e.g. cash flow rights, board rights or voting rights). Later, Cumming (2008) addresses the relationship between venture capital contract design and exit options. Therefore, he examines how the allocation of ownership and rights may affect the respective exit options (e.g., acquisition, IPOs, and write-off exits). Similar studies continue to this day, with the goal of designing an optimal contract with specific rights (Burchardt et al., 2016). Theoretical background: Again, agency theory and imperfect information (Stiglitz & Weiss, 1981; Trester, 1998) provide the theoretical explanation why contracts and control mechanisms are used in start-up financing. For this reason, theories of contracting and corporate finance are relevant in this cluster (Grossman & Hart, 1986; Myers & Majluf, 1984).

**Cluster 7. Ventures' performance drivers and VCs' decision-making.** This cluster analyzes both VCs' financing decision processes and their selection criteria when assessing new investment opportunities. Tyebjee and Bruno (1984) divide the deal-making activities into five main tasks: deal origination, deal screening, deal evaluation, deal structuring and post investment activities. Again, Tyebjee and Bruno, along with Macmillan et al. (1985) and Macmillan et al. (1987) identify potential selection criteria for evaluating start-ups, including factors like market attractiveness, product differentiation, managerial capabilities, and the entrepreneur's experience or personality. Other decision-making criteria, such as the venture capital firm's requirements or strategic-competitive approaches, have been examined in the subsequent period (up to the present day) (Hall &

Hofer, 1993; Muzyka et al., 1996; Petty & Gruber, 2011). Correspondingly, researchers focus primarily on start-ups' human capital (Dimov & Shepherd, 2005) and social capital (Shane & Stuart, 2002) as both selection criteria and success factors. Theoretical background: Since information asymmetries exist to the detriment of the VC, signaling theory (Spence, 1973) is fundamental to understanding the VC's decision-making process. However, as we have identified a separate cluster for signaling within the underlying research area, further explanation is found in cluster 11. As a means of signaling, new ventures highlight the TMT's characteristics or their competitive advantage (Beckman & Burton, 2008; Colombo & Grilli, 2005) - we call them potential 'performance drivers'. Accordingly, many links to the resource-based-view (Barney, 1991) are evident because a start-up's resource endowment - particularly resources that are rare or challenging to replicate - can create a competitive advantage and possibly attract investors. Furthermore, upper echelons theory can be used as an explanatory approach: the founder's characteristics could predict the venture's outcomes and are therefore highly relevant in the decision-making process.

**Cluster 8. VC-entrepreneur-relationship: VCs' involvement.** In principle, venture capital affects at least two parties - the VC and the start-up's management team. Correspondingly, the papers in this cluster between 1980 and 1995 mainly deal with VC-founder interactions and the VC's practices to get involved in the financed start-up. The most common activities of VCs' are monitoring, board participation, strategy formulation, financial consultancy and raising additional funds, or recruiting and management selection (Gorman & Sahlman, 1989; Macmillan et al., 1989). According to Sapienza (1992), the more innovative the business idea, the more closely the VC is involved. He also highlights the positive impact of VC's involvement on business development at all stages of the venture. However, this contradicts the work of Busenitz et al. (2004) who find that VCs' advice on strategy analysis and formulation, for example, does not add any value to the new venture. Additionally, before the turn of the millennium, there was an increasing number of studies dealing with the importance and development of trust between the two parties and associated CEO dismissals after venture capital investments (Bruton et al., 2000; Das & Teng, 1998). In the 00s (to date), the VC-founder relationship continues to be studied intensively - especially the value added by the VC, but also conflicts are addressed (Higashide & Birley, 2002). Theoretical background: Agency theory as well as theories of ownership, governance and control are indispensable to this field of research (Eisenhardt, 1989a; Fama & Jensen, 1983). In relation to the ex post agency conflict, one speaks of moral hazard when the agents act in their own interest at the expense of the principal, since the principal cannot fully observe or even control the agents' activities (Elitzur & Gavious, 2003). Transferred to the VC-entrepreneur relationship after receiving the investment, founders could, for example, reduce their efforts and rely on the VC's network and support. Since this field of research deals with interpersonal relationships, organizational trust also represents an important theoretical explanatory approach (Mayer et al., 1995).

**Cluster 11. Signaling & venture valuation.** This cluster is closely related to the decision-making process, as it deals with signaling the venture's potential success factors and its valuation. It is only since the turn of the millennium that signals from start-ups to investors have been studied more intensively. To convince investors to obtain financing (and to overcome information asymmetries), founders try to signal the quality of their start-up. Many firm and founder characteristics are highlighted and explored, such as the importance of an entrepreneur's social capital and reputation (Shane & Cable, 2002), start-up experience and human capital (Hsu, 2007), or patents (Mann & Sager, 2007). This list could be supplemented by many other signals such as board structure (Certo, 2003) or TMT characteristics (Higgins & Gulati, 2006). In the last decade, the aspect of uncertainty in the valuation of new ventures has also gained increasing attention (Kollmann & Kuckertz, 2010). Theoretical background: Spence's (1973) signal theory is the central approach in this group of studies, as his paper even gives its name to the cluster. Signaling represents a solution approach for the principal-agent conflict. The agent (founder) has more information about an issue (the venture's quality) than the principal (VC) and therefore tries to send signals to the principal that reduce the principal's uncertainty (investment decision or valuation).

## ***B. Interfirm Relationships and Knowledge Exchange (IR)***

This research area takes a view on partnerships in a venture capital context, resulting in both knowledge acquisition and interorganizational learning. **Cluster 1** therefore provides an overview of **corporate venture capital** as an instrument of knowledge transfer. Similarly, **cluster 3** focuses on **interorganizational networks**, in particular studying venture capital syndication. In addition, **cluster 12** addresses the role of **VC's reputation**. For this reason, journals focusing on (strategic) management and organizational research, such as *Academy of Management Journal*, *Administrative Science Quarterly* and *Strategic Management Journal*, are the most cited in this field. We establish a link between the above clusters and resource-based view, as both networks and reputation are vital and strategic resources that can provide a competitive advantage (Barney, 1991). Moreover, according to absorptive capacity (Cohen & Levinthal, 1990), firms need the ability to identify new resources (e.g. by CVC programs) and implement them in their own operations. In line with this proposition, Dushnitsky and Lenox (2005) find that the greater a firm's absorptive capacity, the more likely it is to invest in new ventures.

**Cluster 1. CVC and interfirm knowledge transfer.** This cluster dedicates itself to corporate venture capital, abbreviated as CVC. It represents a variant of venture capital in which an established company funds a start-up in exchange for a minority equity stake (Basu et al., 2011). By establishing a relationship, both parties aim to derive mutual benefits: while the investing company strives to become more efficient through interorganizational learning, the new venture is provided with required resources (Knyphausen-Aufseß, 2005). In the 1980s and early 1990s, this cluster primarily focused on various forms of interfirm linkages (Kogut, 1991; Winters & Murfin, 1988). From the mid-1990s onwards, however, the focus shifted to knowledge transfer and learning through CVC programs. (Lane & Lubatkin, 1998). In terms of CVC research, Gary Dushnitsky and Michael Lenox are the most influential scholars, as they set the starting point for the increasing attention to this research strand with three contributions in 2005 and 2006. These studies mainly analyze the investment strategies of established firms and the value added to the investing parties. Conversely, Katila et al. (2008) examine the decision of new ventures to enter into an investment relationship with a corporate partner. Later, Chemmanur et al. (2014) compare the outcomes of CVC-backed firms with those of independent venture capital backed firms. Moreover, in the 2010s, particular attention has been paid to the extent to which CVC affects the innovation performance of the investing firm (Wadhwa et al., 2016). Theoretical background: Since one of the main goals of CVC is knowledge transfer and acquisition, the connection to theories such as absorptive capacity (Cohen & Levinthal, 1990), dynamic capabilities (Teece et al., 1997), and organizational learning (Levitt & March, 1988) is little surprising. Consequently, these theories refer to the corporation's ability to adapt to new conditions, be open to new ideas, and ultimately to incorporate them into its own processes. The aforementioned concepts are based on both the knowledge- and resource-based view (Grant, 1996; Wernerfelt, 1984).

**Cluster 3. RBV in venture capital: networks and social capital.** Following the resource-based view, cluster 3 is concerned with VCs' resources that are crucial for their success. Social capital and interorganizational networks, particularly in the form of syndication, are examined. Syndication refers to the formation of partnerships between two or more venture capital firms (or other investor types e.g. VC-angel syndicates) to jointly invest in a portfolio firm (Wright & Lockett, 2003). Between the 1960s and the end of the 1980s, most of the research is theoretical, dealing fundamentally with the role of networks and social ties (Granovetter, 1973). Then, Bygrave (1987) notes that venture capital syndication stems from the uncertainty of the projects being funded rather than the financial burden. Although, there is still no strong venture capital focus in the 1990s, Lerner (1994) advances syndication research by confirming the knowledge sharing motive and emphasizing that syndication occurs throughout the entire investment process. Furthermore, Sorenson and Stuart (2001) focus on the spatial distribution of venture capital syndicates. Towards the end of the 2000s, the research focus shifted to the growing importance of partner selection, determinants, and the outcome effects of venture capital syndication (Jääskeläinen, 2012; Sorenson & Stuart, 2008). Theoretical background: As the title of the cluster suggests, the resource-based view (Barney, 1991; Wernerfelt, 1984) represents the central theoretical explanation because valuable resources such as networks and social capital are analyzed. Moreover, both social network (Granovetter, 1973) and social capital theory (Coleman, 1988) are crucial to examine venture capital partnerships. Granovetter distinguishes between strong and weak social ties, while social capital theory states that building social networks facilitates individual or collective action. Additionally, this cluster includes the work of Wilson (1968), who developed a (not venture capital-specific) theory on syndicates. Forty years later, Sorenson and Stuart (2008) formulated a theory of VC's network formation that addresses the conditions under which relationships are formed with varying degrees of distance.

**Cluster 12. RBV in venture capital: the role of reputation.** Reputation represents another critical resource for the success of VCs in securing and managing investments. While most of the studies in the 1990s focused on the relevance, development, and management of status and reputation (Fombrun & Shanley, 1990), there was a shift in the 00s toward analyzing the effects of reputation. As such, Dimov et al. (2007) study VC's decision-making. They find that the higher the VC's financial expertise, the lower the probability of an early-stage investment - this relationship is even pronounced for VCs with a good reputation. Closely related to cluster 3, Pollock et al. (2010) examine how start-ups signal their quality by drawing on their prestigious network partners: both the number and type of new ventures' high-status affiliates affect IPO valuations. Similarly, Lee et al. (2011) analyze the impact of VCs' reputation on the post-IPO performance of the start-ups they fund. Theoretical background: Reputation represents a resource that takes time and effort to build and maintain. Thus, as for the entire research area, the resource-based view is the central explanatory approach. Due to the peculiarities of reputation and its character as an intangible resource, signaling theory (Spence, 1973) and the attention-based view (Ocasio, 1997) (as an advancement of RBV) are of great importance for understanding the theoretical background of this cluster.

### **C. Economic View, Policy, and the Market for Entrepreneurial Finance (EP)**

The third research area focuses on economic, institutional, and international issues, with the **globalization of the venture capital industry** being addressed in **cluster 2**. Studies of this research area also deal with the **creation of venture capital markets (6)** and the **business contributions (10)** of such investments. In addition, the research area provides an overview of **private equity investors (9)** and other **players in entrepreneurial finance (13)**, such as business angels or crowdfunding. Despite being a relatively diverse research area, it is little surprise that Research Policy and Journal of Business Venturing are the most co-cited journals as they cover economic and policy issues, along with the market for start-up financing. Moreover, as rather novel phenomena such as venture capital globalization or crowdfunding are addressed, the average publication years of these clusters are between 2006 and 2009, making this research area by far the most recent. Since this research area is mainly concerned with economic and market-related issues, institutional economics (La Porta et al., 1998), in conjunction with economic and public theories, is particularly pertinent in this context.

**Cluster 2. Venture capital from an international and institutional perspective.** The vast majority of the 94 studies included either deal with venture capital in a cross-country context or with cultural, institutional, and geographic distance. The foundations of this cluster were laid in the 1980s and 1990s, when outstanding seminal papers on internationalization and the role of institutions were published (Hofstede, 1980; La Porta et al., 1998). The first comparisons of venture capital markets between different countries were also made at this time (Ooghe et al., 1991; Sapienza et al., 1996). Since the early 2000s, researchers have mainly concentrated on identifying the institutional frameworks that are most critical for VCs when planning cross-border market entry. For instance, Bruton and Ahlstrom (2003) analyze the institutional differences between venture capital markets in China and the Western world. While VCs in China are far less involved in value-added activities than their counterparts in America, Chinese VCs monitor the new ventures more carefully. Similarly, Guler and Guillén (2010) examine institutional factors (rights protection, exit options or political stability) that are most relevant to VCs when they consider entering foreign markets. Cumming et al. (2010) also note that legislative issues, such as accounting standards or investor protection, could influence VCs' cross-cultural investment processes. Accordingly, more recent papers have focused on syndication between domestic and foreign investors, as well as on the determinants and outcomes of cross-border investments (Groh & Wallmeroth, 2016; Tykvová & Schertler, 2014). Theoretical background: Most cross-border studies refer to institutional economics. Consequently, La Porta et al. (1998) contribute the second most co-cited paper within the cluster. Institutional theory explains VC's internationalization behavior, as it highlights the role of different social, political, and economic systems. That is why reference is also made to investor protection, legal and corporate governance theories (La Porta et al., 1998). Furthermore, Hofstede's (1980) essay provides a theoretical starting point for understanding the influence of cultural dimensions on cross-border collaboration. Additionally, Zaheer's (1995) paper on the liability of foreignness deserves mention, as it explores the costs associated with operating in cross-border contexts.

**Cluster 6. Venture capital markets: economy, policy, and market creation.** This cluster examines governmental venture capital (GVC) and policy measures designed to stimulate the development of active venture capital markets. Additionally, it explores the impact of venture capital activity on macroeconomic indicators, such as growth and innovation. In the 1980s and 1990s, the focus of academic papers was predominantly on venture capital-related policy measures, including taxation and regional development (Florida & Kenney, 1988a; Poterba, 1989). Correspondingly, Jeng and Wells (2000) examine economic variables (gross domestic product, accounting standards or governmental programs) to see whether they promote the presence of strong venture capital markets. Regarding government intervention in the venture capital market, they note that it can be beneficial by setting a regulatory framework. Since the 2000s, research interest has notably shifted toward investigating governmental authorities as active participants in the venture capital landscape. As such, Lerner (2000) finds that start-ups funded by an US governmental initiative grow significantly faster and are able to attract private investors more easily than comparable new ventures lacking public support. Consequently, he explains that GVC's motives are twofold: To create spillover effects that positively affect society, and to certify the quality of new ventures to other potential investors. Leleux and Surlemont (2003) emphasize that GVC initiatives contribute to market creation, resulting in higher overall amounts of venture capital investment. In the ensuing period, researchers analyze both the measures implemented by the state to develop a robust venture capital market and the outcomes of the state acting as an investor. For this reason, Da Rin et al. (2006) investigate the influence of various policy instruments such as labor regulations, public R&D investments or corporate capital gains tax rate. In recent years, governmental and independent venture capital have also been compared in terms of their impact on economic macroeconomic indicators such as growth, job creation or innovation rates (Grilli & Murtinu, 2014). Theoretical background: Due to the diverse research foci within this cluster, no single theoretical framework dominates. Nonetheless, theories from public finance, institutional economics, and regulatory economics are pertinent, as they explore how legislative frameworks shape key outcomes such as innovation capacity, entrepreneurial activity, and unemployment rates.

**Cluster 9. Venture capital in the context of private equity.** In cluster 9, most papers are devoted to the structure and characteristics of the private equity market (in comparison to venture capital markets). The first papers from this cluster date back to the mid-1990s and are overviews of the private equity industry (Fenn et al., 1997). In subsequent years, the focus has been on the returns and risks of private equity investments. While Phalippou and Gottschalg (2009) examine the portfolio firms' performances, Kaplan and Schoar (2005) compare different types of private equity investors and their impact on fund performance. In principle, private equity returns are on a comparable level to those of the S&P 500, but venture capital funds perform better in terms of lucrativeness. Generally, this cluster describes and analyzes the private equity market in its various forms, determinants and outcomes (Lerner et al., 2011). Recent studies have increasingly turned their attention to private equity investors and their specific characteristics (Bertoni et al., 2013). Finally, it is worth to mention that the term private equity is often used as an umbrella term or synonym for phenomena such as venture capital or buyouts (Gompers & Lerner, 2000; Phalippou & Gottschalg, 2009). Theoretical background: Highlighting individual theories is challenging due to the multifaceted nature of this cluster's content. However, since venture capital is (partly) seen as a subcategory of private equity in the literature, the previously mentioned theories are also relevant here, such as agency or contracting theory.

**Cluster 10. Venture capital: business contributions.** This group of studies is concerned with the impact of venture capital investments, examining aspects such as innovation capacity, growth, or employment. Until the mid-2000s, the papers primarily focus on the impact of venture capital investments on innovation performance. Accordingly, Kortum and Lerner (2000) find a significant positive correlation between venture capital activity and technological innovation. Similarly, Florida and Kenney (1988b) refer to VCs as "technological gatekeepers". In contrast, Caselli et al. (2009) state that venture capital, at least in Italy, does not foster innovation but rather affects sales growth. Furthermore, venture capital-backed start-ups need less time to bring their products to market (Hellmann & Puri, 2000). From an economic perspective, Samila and Sorenson's (2011) research indicates that venture capital has a positive impact on entrepreneurship and employment. Theoretical background: Like the entire research area, institutional theory plays a central role as an explanatory framework, highlighting the impact of environmental conditions on venture capital outcomes.

**Cluster 13. The landscape of entrepreneurial finance.** This cluster addresses venture capital in relation to other participants in the field of entrepreneurial finance, such as business angels or crowdfunding investors. Thus, already known topics, such as contracting (Elitzur & Gavius, 2003) or signaling (Ahlers et al., 2015) are studied in connection with different investor types and compared to venture capital. In the 1980s and 1990s, business angel investors and their specific investment process are primarily analyzed as a counterpart to VCs (Freear et al., 1994; Wetzel, 1983). In particular, the 2000s witness comparisons between business angels and VCs, highlighting differences in investment performance, governance, and ownership structures (Bruton et al., 2010; van Osnabrugge, 2000). An interesting line of research raises the question of whether venture capital is more of a substitute or a complement to the aforementioned investors (Hellmann & Thiele, 2015). Beginning in the 2010s, research has shifted its focus to new forms of financing, such as crowdfunding (Bruton et al., 2015). Consequently, among the most cited papers is the recent study by Drover et al. (2017), which provides an overview of the entrepreneurial finance landscape and even points to emerging financing mechanisms such as accelerators. Theoretical background: Similar to the previous sections, this cluster also deals with different research questions, which is why there is a wide application of theories such as signaling (Ahlers et al., 2015) or game theory (Fairchild, 2011).

#### **D. Connecting Papers (CP) and Methodology Papers (M)**

Although most studies (765 of 958) have been assigned to a specific cluster, some papers do not only relate to a single research field. These studies link the clusters either by addressing topics that thematically belong to at least two clusters or by drawing on established methodologies. Consequently, we call them 'connecting papers' and 'methodology papers'. By introducing these additional categories, we are able to provide a more fine-grained analysis of the actual relevance and size of the respective clusters. The connecting papers were identified in two steps: First, the algorithm did not assign some studies to any cluster. These unclassified studies were reviewed and most of them – if appropriate – were categorized as connecting papers. Second, all other publications (already placed in clusters) were analyzed for their interdisciplinarity with other clusters. If a paper's co-citation links to at least two clusters were at least 10% each, or if more than 15 percent of its links were directed to the connecting papers, it was reclassified as a connecting paper.

**CP. Connecting Papers.** Six of the identified connecting papers are also among the 15 most cited documents worldwide (cf. Table 7) representing the foundations of research. For example, Sahlman (1990) describes the structure and relationship formation of venture capital firms and analyzes the importance of contracting in the context of agency problems. Both Gompers (1995) and Lerner (1995) show how monitoring, board involvement or contracting can minimize agency costs. The two previously mentioned authors together (2001) provide a prime example of a connecting paper, as their work addresses, for example, the history, return, and internationalization of venture capital. Hsu's (2004) study deals with the VC's certification role,

value-added and reputation. Sorensen (2007) strongly refers to cluster four and eight, as he finds that the involvement of experienced investors is more likely to lead to an IPO of the funded start-up. In addition, he notes that experienced investors add more value to portfolio firms and that VCs have selection skills to choose higher quality companies in the screening process. Theoretical background: As the preceding sections have already emphasized the central theoretical approaches, it is hardly surprising that Jensen and Meckling's agency theory (1976) as well as Wernerfelt's (1984) and Barney's (1991) resource-based view are among the most important connecting papers. The same is true for Akerlof's study (1970) which was the first to address information asymmetries, or more precisely, hidden characteristics. Among the connecting papers are also essays of world renown that have shaped the theoretical foundations of economic research, such as Schumpeter's (1934) theory of economic development. Equally important, also in the venture capital context, is Knight's study (1921), which elaborated the distinction between risk and uncertainty that is still valid today. Since more than 34,450 studies are cited in our sample, other major economic theories such as organization theory (Cyert & March, 1963) or transaction cost theory (Williamson, 1985) are classified as connecting papers.

**M. Methodology Papers.** We identified some outstanding methodological papers, which are categorized separately due to their relevance to numerous studies across various clusters. These studies do not connect the clusters at the content level, but in terms of the selected methodologies. For example, references are made to studies on sample selection bias (Heckman, 1979), standard errors (White, 1980), or case study research (Eisenhardt, 1989b).

## **5. Discussion**

By visually mapping the literature on venture capital, we uncover the intellectual framework, identify connections among clusters and trace the evolution of this dynamic field of research. The substantial growth in studies, coupled with the exploration of diverse topics within venture capital literature, underscores the necessity of this study to tackle the increasing fragmentation and complexity of the research field. Our study reveals that early venture capital research was primarily structured around the investment process, exploring various milestones such as valuation, decision-making, involvement, and exit options. Afterwards, the second major research area concentrated on the role of relationships in the venture capital context and the associated knowledge transfer. In particular, a specific form of venture capital, CVC, has attracted attention as it is seen as a valuable strategic tool for established companies. Consequently, researchers from both entrepreneurial finance and strategic management disciplines have intensively studied CVC. Finally, the third and most recent research area offers a broader perspective on the venture capital industry, addressing macroeconomic effects, institutional factors, and alternative forms of start-up financing. The research field remains highly dynamic, driven by the emergence of new investor types in entrepreneurial finance, such as crowdfunding platforms and accelerators, and evolving investment structures like VC-angel-syndicates (Drover et al., 2017). Regarding the theories applied, the research initially relied on well-established economic frameworks such as the RBV, agency theory, and network theory. Over time, as venture capital research matured, more specific frameworks were developed like Sorenson and Stuart's (2008) theory on venture capital syndication or Megginson and Weiss' (1991) paper on VC's certification role.

Furthermore, one of our main contributions is that we structure the research field into three research areas, each consisting of multiple interconnected clusters. The connecting lines in Figure 1 show, for each cluster, the two strongest co-citation links to other clusters. Within a single research area (A-C), these links are particularly strong. For instance, 12% of the co-citation links for cluster 6 (policy and venture capital market creation) refer to the neighboring cluster 2 (venture capital from an international perspective), both belonging to research area C. This demonstrates the fluid transitions between the research clusters. Referring to the example above, a connection is formed between both clusters, as a target country's legislation may attract or deter foreign investors (Bruton et al., 2005). However, our map indicates that some clusters exhibit strong links with each other, even though they are not part of the same research area. For instance, cluster 8 (VC's involvement) is closely linked to cluster 1 (CVC). There is strong research interest in the involvement activities and value-added of CVC investors (Chemmanur et al., 2014; Park & Steensma, 2012), especially in comparison to independent VCs, as CVC firms benefit from a wide range of resources and in-house R&D departments. Overall, the analysis of the strongest co-citation links for each cluster further emphasizes the interdisciplinary nature of venture capital research.

Our findings enhance existing research on venture capital by revealing its primary research themes and theoretical underpinnings. These insights offer a roadmap for researchers to identify and engage with key conversations in venture capital studies, facilitating a deeper understanding of the current knowledge landscape across specific topics. Building on these findings, we propose avenues for future research in the field, which are detailed in the subsequent sections. Additionally, we address the limitations of our study, offering a nuanced perspective on its scope and implications.

### 5.1 Implications for Future Research

First, we identify 13 thematic clusters, each examining a particular venture capital-related topic. Similar to the research questions addressed in the connecting papers, researchers could investigate the interactions of distant research strands and bring together different phenomena, concepts, and theories. The existing connecting papers have demonstrated that interdisciplinary questions (involving multiple clusters) have contributed to substantial research advancements and have ultimately been recognized as pioneering studies (Hsu, 2004; Sahlman, 1990). For example, researchers could select two distant clusters, such as CVC (cluster 1) and venture capital internationalization (2), and explore their potential relationship: Are incumbents investing in new ventures not only to gain insight into technology, but also to test and learn about foreign markets? How do cross-border CVC investments help the incumbent achieve its strategic goals? Does the geographic diversity of a CVC investment portfolio foster or harm the incumbent's performance? Researchers could derive research questions by applying the same procedure to smaller clusters as well. By combining the policy and venture capital market creation perspective (cluster 6) with the concept of VC's reputation (cluster 12), researchers could investigate whether reputation is also crucial for governmental VCs, even though they pursue other (non-financial) investment objectives than those of independent VCs. In this regard, it could be interesting to explore which indicators lead to building GVC's reputation when financial return is not the main evaluation criterion. Alternatively, researchers could broaden the research scope to examine which policies and legislation promote a region or country's reputation as an attractive location for start-up investors. Consequently, a region's good reputation and the availability of venture capital could attract new ventures to relocate their operations (Prijcker et al., 2019). Since the studies included in our analysis are predominantly from journals in the fields of management, entrepreneurship, and finance, researchers could explore how these disciplines can be integrated to create interdisciplinary insights within the context of venture capital research.

Second, we found cluster 9 (private equity) and cluster 13 (business angels, crowdfunding, or accelerators), which deal with other key players of the entrepreneurial finance ecosystem. With respect to these types of start-up financing, we see two potential avenues for further research. On the one hand, scholars could intensify their efforts to study the interplay of venture capital with the various sources of financing. It needs to be clarified in which start-up phases venture capital complements other types of entrepreneurial finance and under which circumstances it tends to substitute them (Capizzi et al., 2022; Hellmann et al., 2021). On the other hand, venture capital remains the most extensively studied form of entrepreneurial finance. Applying similar selection criteria, we find 877 studies on crowdfunding, 519 papers on private equity research and only 95 on business angels, compared to 1,410 studies in our sample. In particular, the scarcity of angel investment research is surprising as in terms of total investment amount it equals venture capital (Organisation for Economic Cooperation and Development, 2011). Since these alternative forms of start-up financing have not yet been sufficiently explored, scholars could adopt venture capital-related research questions and apply them to other sources of entrepreneurial finance. For example, researchers could investigate which policy initiatives favor crowdfunding activities, how corporate accelerators build reputation, or the institutional conditions that influence business angels to invest internationally.

Third, as the number of publications on venture capital is increasing rapidly, separate bibliometric analyses could be conducted for some of the identified clusters. Although we set a threshold of at least ten co-citations per study to be included in a cluster, the CVC and internationalization clusters have 125 and 94 papers, respectively. Applying a lower threshold and thus analyzing a larger number of studies could provide a more fragmented view of the research cluster and identify more recent research trends. While we provide a comprehensive bibliometric analysis on the entire field of venture capital research, the proposed procedure would allow focusing on a specific dimension.

Fourth, our analysis reveals that agency theory, RBV and institutional theory are the predominant conceptual frameworks. However, scholars may investigate other theories and their potential relevance to venture capital-related contexts. As such, researchers could link venture capital research to Hambrick and Mason's (1984) upper echelon theory. The analysis could be applied to VCs, CVC managers, and the start-up team to deepen our understanding of how individual characteristics and perceptions influence the funding process, involvement, or performance. Consequently, researchers could build on Dimov et al. (2007) and Patzelt et al. (2009) to further investigate strategic decision-making in the context of venture capital. In a similar vein, scholars could address venture capital-related issues through the lens of stakeholder theory (Freeman, 1984). Although a number of publications in recent years have already dealt with CSR-related topics in the context of entrepreneurial finance (Alakent et al., 2020; Mrkajic et al., 2019), there remains substantial scope for further research in this area. In particular, when focusing on CVC and GVC programs, the stakeholder approach should be considered, as these investment settings impact various groups of interest. Likewise, researchers could explore the tensions that emerge between stakeholders and examine how these conflicts are managed.

Fifth, from a methodological perspective, we see the possibility of conducting more meta-analyses in the future. To date, we are aware of only four meta-analyses on venture capital. While Rosenbusch et al. (2013) study the performance effects of independent venture capital investments, Huang and Madhavan (2021) as well as Haslanger et al. (2022) apply a similar approach for CVC. In addition, Dalal (2022) addresses the determinants of country-level venture capital activity. Therefore, further meta-analyses are needed that examine other outcome effects of venture capital funding such as the start-up's innovation performance. Similarly, scholars could meta-analyze the determinants that influence the VC's investment decision.

Sixth, it has become apparent that venture capital is a broad and interdisciplinary research field that leaves room for more intensive research. On the one hand, the literature on venture capital is heterogeneous within economics, as it concerns areas such as strategy, management, entrepreneurship, or finance. On the other hand, there has been an evident emergence of connections with other disciplines, including psychology, sociology, and technology research. Accordingly, to identify potential research gaps, scholars could delve deeper into each research area and analyze which topics have been overlooked in the present map. In particular, to address the 'holes' within the intellectual network, it would be interesting to conduct boundary-spanning research projects. In this regard, research examining the gender gap in the venture capital industry has only recently received more attention (Brush et al., 2018; Malmström et al., 2017). Likewise, no study has analyzed the psychological traits of VCs. Conducting such a study would also be of great importance for practitioners, as it would allow for more comprehensive consideration of the potential impact of VCs' personality traits or human values on financing decisions.

## **5.2 Limitations**

Inevitably, the present study is not without limitations. First, by conducting a co-citation analysis, we can indeed identify seminal papers, uncover the intellectual structure, and trace the evolution of the venture capital research field. However, since the analysis of co-citations relies on studies that have been jointly cited in the bibliography of a paper in the past, a weakness of this methodology becomes apparent. Older studies may have been co-cited more often, resulting in a potential overrepresentation, while more recent contributions require some time to accumulate citations and are therefore underrepresented (Zupic & Čater, 2015). To overcome this shortcoming and obtain an understanding of the latest trends in a particular research field, bibliographic coupling can be utilized. This method identifies a link between two publications when they cite the same third study, meaning both reference a common underlying work in their bibliographies (Kessler, 1963).

Second, the study has limitations due to the complexity of citation practices, as authors cite papers for a variety of reasons. While citations often highlight important research in a specific field, they can also be influenced by journal prestige, author reputation, or methodological relevance. The Matthew effect further skews citation patterns: Widely accepted studies tend to receive even more citations over time (García-Lillo et al., 2017). Moreover, co-citation analysis struggles to distinguish whether an article is being cited for its content, its methodology, or simply for the prominence of its authors. To address this shortcoming of co-citation analysis, we introduced two additional categories: methodology papers and connecting papers. Citation bias can also be the result of cronyism, where researchers disproportionately cite colleagues and friends (Cole & Cole, 1974). In addition, journal policies regarding the number of references vary, with some requiring extensive bibliographies and others limiting citations, ultimately shaping the selection of references in scholarly works (Hota et al., 2020).

Third, our sample selection was intentionally selective. In order to conduct a focused economic analysis of venture capital research, we only included papers that have 'venture capital\*/VC' in their title and are assigned to the Web of Science category 'Business Economics'. This approach ensures a clear delineation from other research areas. Additionally, to maintain a manageable scope of studies and to identify the most important contributions, we set a threshold of at least ten citations per study to be included in a cluster. Consequently, the analysis was conducted on a subset of 958 references, out of a total of 34,500 co-cited references. However, venture capital is a broad and vibrant field of research that overlaps with areas such as technology or engineering. As mentioned earlier, the selection of a lower threshold would enable researchers to obtain a more fragmented perspective of the research area. By either expanding the keyword search (e.g., to include other sources of entrepreneurial finance) or by refining the selection criteria and thresholds, researchers could undertake more interdisciplinary studies or conduct highly focused bibliometric analyses on venture capital-related topics.

## **6. Conclusion**

Over the past decade, the volume of global venture capital investments has increased sharply, driving a substantial growth in publications on venture capital. Conducting descriptive analysis, the present study provides (future) researchers with a comprehensive overview of the most influential authors and journals in the field of venture capital research. Similarly, we identify and emphasize seminal papers that warrant attention. Through co-citation analysis, we visually structure the heterogeneous

nature of research, highlight its evolution, and uncover content overlaps between certain research strands. In total, 13 thematic clusters are found and characterized, assigning them to three major research areas: (A) venture capital life cycle, (B) interfirm relationships and knowledge exchange, (C) economic view, policy, and the market for entrepreneurial finance. Likewise, we illustrate the thematic distances between the respective clusters and explore how they are interconnected. We have also introduced the category of connecting papers, which address phenomena spanning multiple clusters. Accordingly, this exploratory paper complements, organizes and extends the existing venture capital literature, ultimately stimulating future research projects.

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