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Sustainability in Private Capital Investing: A Systematic Literature Review

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Abstract

The private capital asset class has grown to over $10 trillion in assets under management and has significant potential to contribute to environmental, social, and governance (ESG) goals. However, there is a dearth of academic research about ESG with regards to private capital investing. This literature review adopted a mixed-methods approach, combining a quantitative (bibliometric) analysis with a qualitative review of the articles. It was found that less than 1% of the literature, written in English, between 1960–2020 on private equity and venture capital addresses topics related to sustainability. It was also observed that the 46 papers which address sustainability topics can be categorized into 13 themes, including certifications and standards, impact investing, and corporate social responsibility. Investment in private securities grew at twice the rate as public securities during the end of this time-period and interest in sustainability integration in private capital investing is growing. Incentives for private equity and venture firms to engage with sustainable investments are being driven by institutional investors, such as pension funds and insurance companies. The focus of sustainability research has typically been on public markets, hindering the potential of private capital investment to influence sustainable policy and practices. The objective of this paper is to provide evidence of the dearth of academic literature on the topic of private capital markets and sustainable investment, while identifying current themes in the existing literature so that future work may address gaps in research.

Keywords: venture capital, private equity, sustainable investment, environmental, social, governance (ESG), sustainable finance

Glossary of frequently used terms:

- Private equity (PE): An investment asset class which is defined by a fund (investor) acquiring a minority or majority share in a company (target) for the purposes of financial return
- Venture capital (VC): An early stage, often technology focused, and debt-averse version of private equity, which carries out similar investment transactions with companies using minority stakes
- Private capital investment (PCI): Literature on private equity and venture capital, with titles, abstracts and key words containing conventional investment terminology
- Private capital sustainable investment (PCSI): Literature on private equity and venture capital, with titles, abstracts and keywords containing sustainability-related terminology
- Environmental, social, governance (ESG): A framework used in the financial sector which helps companies and investors identify and manage sustainability-related risks

1. Introduction

When referring to the COVID-19 pandemic, Emily Brown, partner at law firm Schulte Roth & Zabel, stated:

> Ten years from now I would like to be looking back and saying that private equity was not only part of the solution to the crisis we are entering at the moment, but that it was seen to be a vital part of the solution (Private Equity International, 2020, p. 2).

There is increasing demand by institutional investors to invest responsibly, and this trend is likely to continue

(Cumming & Johan, 2007). Incentives for private equity (PE) and venture capital (VC) firms to engage with Socially Responsible Investment (SRI) activities are being driven by development finance institutions, pension funds, philanthropic, and faith-based funds (Teti et al., 2012). This has also led PE to become the single largest asset class of signatories in the Principles for Responsible Investment (PRI) (Knyphausen-Aufsess & Koehnemann, 2012). However, the majority of sustainable finance literature appears to address public markets. This has hindered the potential of private capital investment (PCI) as a powerful mechanism to influence sustainable development (Scholtens, 2006). Thought leadership articles, as part of the Davos Agenda at the World Economic Forum, have recently stated that private capital investors should not just participate in the environmental, social, governance (ESG) movement, but lead it due to the unique positioning and goals of this asset class (Bangs, 2022).

Despite the recent uptake of sustainability and ESG integration in private capital markets, literature on the subject is scarce. Furthermore, a systematic review of sustainable investment articles in the private markets has not yet been conducted.

This study seeks to investigate what fraction of PCI literature may be classified as private capital sustainable investment (PCSI). PCSI papers are defined as those papers which use sustainability-related keywords such as social responsibility, ESG, ethics, green investing and impact investing. Comparative growth trends are observed between PCI and PCSI literature to analyze how the PCSI literature is developing over time. In addition, the study attempts to review the geographical origin of the literature. Finally, the top authors and thematic clusters are also analyzed. This is followed by a detailed thematic review of the PCSI literature to identify which topics are most important in the current PCSI work. The results of the research point to a 'science-practice gap' in sustainable investment in private capital markets, wherein academic research is not keeping pace with industry practice (Banks et al., 2016). In order to fill this gap in the coming years, opportunities for future research into PSCI topics are identified.

2. Background

Private equity (PE) firms are characterized by private fundraising through limited partners and PE contracts, which allow an acquisition between "the fund" (investor) and "target" (company) to take place (Knyphausen-Aufsess & Koehnemann, 2012). In recent years, growth in PE has been double that of public equities; a trend which began in 2007 and has continued ever since (McKinsey, 2020). In terms of financial performance, private capital investment (PCI) has consistently outperformed the S&P 500 index over the past decade (Graham, 2019). These trends, i.e., valuations and performance, have established the importance of PCI in the financial sector and for sustainable development. The concentration of sustainable finance research on public markets—likely due to the sheer size of public securities as well as the lack of available data in the private markets—has resulted in lack of knowledge about sustainable finance in PE (Scholtens, 2006).

In this paper, the terms PE and Venture Capital (VC) are used interchangeably, since the differences are mainly in the size, stage and sector of investment (Pitchbook, 2020) rather than the structure of the transaction itself. In some senses, VC can be considered an early-stage, technology-focused, and debt-averse category of PE. Both can be discussed in the same vein as an asset class without any theoretical conflict. As Williams and Sharamitaro (2002) have observed, VC once referred to all of the activities related to PE-style transactions. However, as the industry has grown, VC has been increasingly associated with early-stage companies. This does not mean that that PCI excludes other asset classes, such as real estate and debt markets, but, for the purposes of this paper, we are only considering the largest categories of PCI, i.e., PE and VC, to refer to PCI.

When looking at the current literature on PCI and sustainability linkages, the thematic analysis indicates 13 key themes, including certifications and standards, clean investments, corporate social responsibility, economic and financial sector issues, impact investing, decision making, socially responsible investment, sustainability, value creation, and social venture capital. However, there is no comprehensive literature review on PCI scholarship which shows us *what* percentage of the overall literature has sustainability linkages, *who* is writing about sustainability in the PCI domain and *where* they are writing from, as well as the keywords associated with this sub-set of literature. As the role of PCI in the mainstreaming of ESG in the financial markets becomes more important, this information can lead to future work addressing the gap in private capital sustainability literature.

3. Methods

This study applied a mixed-methods approach to review the source material, undertaking quantitative (bibliometric) analysis of articles (PCI and PCSI) and complemented these findings with a qualitative review focusing on the PCSI literature. The reason that the qualitative review only focuses on PCSI papers is because the research is not a literature review of all PCI literature in general, but one which seeks to highlight PCI

literature which contains sustainability mentioned. We refer to this, sustainability-linked literature, as PCSI.

3.1 Quantitative Methods

The study begins with a bibliometric analysis: an inductive, quantitative method (Pritchard, 1969) that aids in providing an objective analysis of a body of literature. In contrast to a traditional systematic review, bibliometrics describe the structure of scientific literature (Nakagawa et al., 2019), studying publication patterns based on the article's metadata (such as how many articles have been published, or who are the most prominent authors, journals, institutions, and keywords). In recent years advanced computer software has contributed to the increased use of bibliometric analysis (Ellegaard, 2015).

A five-step workflow, developed by Zupic and Cater (2015), was followed to conduct the bibliometric analysis: (1) determine the research question; (2) compile relevant data; (3) analyze the data; (4) visualize the findings; and (5) interpret the results. Bibliometrics are particularly useful in evaluating trends over time and delineating latent themes of interest, thus informing the first portion of our results, showing growth in the field and prominent players.

Next, a text analysis was conducted to examine the keywords generated by authors, Scopus, and Web of Science to further delineate the central foci of each field. An inductive, comparative analysis of the most frequently used keywords was also undertaken to examine thematic trends and areas of divergence between PCI and PCSI literature. Points of divergence (namely around risk and governance) inform a complementary deductive analysis of the keywords' trends and applications.

To provide avenues for replicability, the study adopted the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) protocol (Moher et al., 2009). Metadata were exported from the Web of Science (WoS) and Scopus databases using two queries (presented in Table 1) relating to *private equity*, *venture capital* and *investment*, compared with literature on *private equity*, *venture capital* and *sustainable investment* principles such as *sustainable*, *ethical*, *responsible*, *impact*, *green* and *ESG*.

Table 1. PCI and PCSI Queries

PCI	PCSI
((“private equity” OR “venture capital”) AND (“invest*”))	((“private equity” OR “venture capital”) AND (“sustainab* invest*” OR “ethic* invest*” OR “responsible invest*” OR “impact invest*” OR “social invest*” OR “ESG” OR (environment* AND social AND governance)))
Language: English	Language: English
Timespan: 1960–2020	Timespan: 1960–2020
Document Type: Articles	Document Type: Articles

The selection of sustainability-related, query keywords replicated the bibliometric study by Daugaard (2020) on concepts of ESG-investing; the related queries led to a final list of publications. Some screening measures were used to guide the research results: (1) the language of publications was restricted to English, (2) publication dates span from the earliest publication on the topic, 1960, to the end of 2020, and (3) articles appearing in peer-reviewed journals.

The screening mentioned above resulted in 6148 relevant articles (see Table 2). Duplicates were then removed between the two databases, as well as articles with missing metadata, such as those which did not have indexed abstracts.

With the focus of the paper being on PCSI literature, each of the 70 PCSI papers were also reviewed manually to account for false positives. An example of a false positive scenario is when a paper contains the words “impact” and “investment” beside each other, but was used in a verb form rather than as a noun unique to the topic of sustainability. For example, “ABC impacts investments in XYZ manner” was detected incorrectly as a sustainability concept when, in fact, the word ‘impact’ here is being used in the transitive verb form. An additional example of a false positive is that a paper may have mentioned the phrase “social capital” as meaning “strength of relationships or networks” but had no relation with the social impact of capital from a sustainability perspective. Thus, 24 false positives were removed, leaving 46 papers which could be confirmed as having valid connections to sustainability.

The final sample included 4913 documents, comprising 4867 publications on PCI, and 46 publications on PCSI. Metadata such as author, journal, abstract, and others were exported as a BibTeX file in December 2020.

Table 2. Databases and results

Query	PCI OS	PCI Scopus	PCSI WOS	PCSI Scopus	Total
Initial Query	2545	3603	50	48	6248
Exclusion of duplicates, incomplete data, false positives	4867		46		4931

The analysis was conducted using R using the Bibliometrix package (Aria & Cuccurullo, 2017), the tidytext package (Silge & Robinson, 2016), and the ggplot2 package (Wickham, 2009). Relevant publications and their metadata are exported as BibTeX files. The bibliometric analysis quantifies related metadata across topics and over time to infer trends in the evolution of the field. The complementary text analysis relies on the content of publication abstracts and keywords to further delineate the central foci of each respective field. Using the Bibliometrix package, trends in the growth of PCI and PCSI research were extrapolated based on the total number of publications in each field over time. Prominent authors, journals, countries, and institutions emerge as the most influential players in each field, based on the total number of publications. Finally, influential publications are identified based on their citation counts. The tidytext package highlights more nuanced trends in the field withthe analysis of unstructured texts. An inductive and deductive analysis was conducted.

3.2 Qualitative Methods

While the bibliometric analysis of the sampled papers provided quantitative insights into the PCI and PCSI literature, a more nuanced assessment was merited to contextualize the studies in greater depth and to supplement the quantitative data with further insight (Herther, 2009). The qualitative analysis of the 46 PCSI articles was undertaken to provide a more in-depth discussion of the identified patterns and themes relating to sustainability literature. The approach to coding the data was inductive and integrated methodological principles from the thematic analysis (TA) and grounded theory (GT) techniques. It is important to note that a qualitative literature review was only undertaken on PCSI papers (those with sustainability linkages) between 1960–2020. Any papers which published after 2020 were not taken into consideration. In addition, any PCI papers published within this time period (1960–2020) were only used in the bibliometric (quantitative) analysis mentioned above, i.e., a qualitative review of PCI papers was not undertaken since the focus of this study is *sustainability* in private capital investing, not private capital investing in general.

TA and GT are analytical methodologies of pattern identification and are well established in the social sciences (Bowen, 2009; Braun & Clarke, 2012; Charmaz, 2015; Timonen et al., 2018; Wertz et al., 2011). The bottom-up, i.e., inductive, approach grounds the findings in the data, which is to say the patterns and themes are based on what is found in the data sample, versus a deductive approach which imposes predefined criteria on the sample (Braun & Clarke, 2012).

There are two main challenges to this approach: bias and time. Personal biases influence a researcher's ability to code data in a reliable and verifiable manner (Erlingsson & Brysiewicz, 2017; Norton, 2008). Subjectivity could lead to misinterpretation of codes, inclusion of unnecessary codes, or missing them entirely. The second challenge is that of time. The inductive approach to thematic identification is necessarily iterative, with multiple readings of the literature required to identify codes, categories, and themes (Vaismoradi et al., 2016).

The solution to both challenges was to select two coders to complete independent evaluations of the literature. The two researchers chosen to complete the qualitative analysis were selected based on their differing backgrounds and experience, in terms of industry and academic work. Independently of one another, the two coders completed an initial scan and codification of the literature, with one coder focusing on titles, abstracts, and keywords and the other focusing on the entirety of each text. This approach was taken to discern whether the front matter was representative of the actual arguments being made by the selected authors, which had the effect of generating more accurate codes and representative themes. Once completed, the codes were compared and discussed to address any discrepancies or disagreements relating to the interpretation of the data. Codes were then merged into a master list, and an additional reading of the literature was completed to ensure accuracy and reliability of the codes. A similar process to thematic identification followed, with each coder using the master list of codes to independently categorize the codes and then to use these categories to identify potential themes (Braun & Clarke, 2012). Similar methodologies have been applied in the sustainability field, such as in mixed methods reviews of municipal climate change plans (Guyadeen et al., 2019). These categories and themes were then compared, discussed, and merged into a final set of 13 overarching themes comprising the foundation for the qualitative discussion.

The contribution of the selected papers to the identified themes were then discussed in terms of the evolution of

each theme over time, during the periods of 1995–2000, 2001–2005, 2006–2010, 2011–2015, and 2015–2020.

4. Results

First, the quantitative (bibliometric) results of the analysis are presented. A descriptive analysis of the metadata, including trends in growth, authorship, and cited research is outlined. This is complemented with a deeper inductive analysis of the articles.

4.1 Quantitative (Bibliometric) Results

First, the data on trends and growth in the field is presented. Second, the publications are analyzed to identify authors; and their geographical and institutional origins are assessed

4.1.1 Trends and Growth in the Field of Study

In looking at the year-over-year growth of publications on PCI, stable growth is observed after 1980 (after the first private equity structures were established), up to around the year 2000. However, an exponential rise is observed after 2005 with the growth rate between 2005–2007 more than doubling from around 75% to almost 200%. This is of significant interest in light of the fact that these years preceded the financial crisis of 2008.

The field of PCI has grown from 1725 publications in 2010 to 4872 in 2020—an approximate increase of around 182% over the period. However, only 46 articles (0.9%) contain references to sustainability (see Figure 1). Their most frequent keywords are venture capital, investment, private equity, corporate social responsibility, entrepreneurship, governance, sustainable development, China, impact, and finance. The growth rate of PCSI scholarship could be deceptive, in that, during the last five years, from 2015–2020, PCSI literature has grown by around 170% while conventional PCI literature only grew by around 60% (see Figure 2). However, due to the relatively miniscule volume of papers currently available, this growth rate would yield less than 130 articles (out of approximately 8,000) by 2025 and less than 400 articles (out of approximately 8,000) by 2030. In order for PCSI literature to take on a significant proportion of PCI work, the growth rate would have to significantly increase as well.

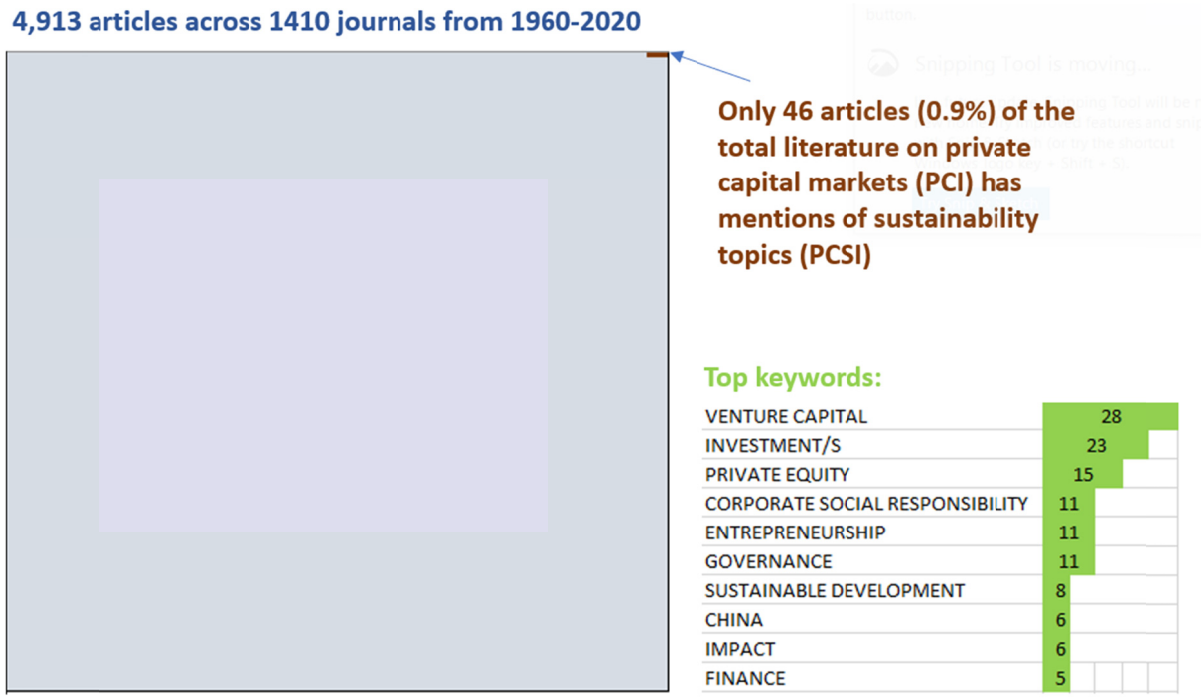

Figure 1. Percentage of PCSI in the PCI

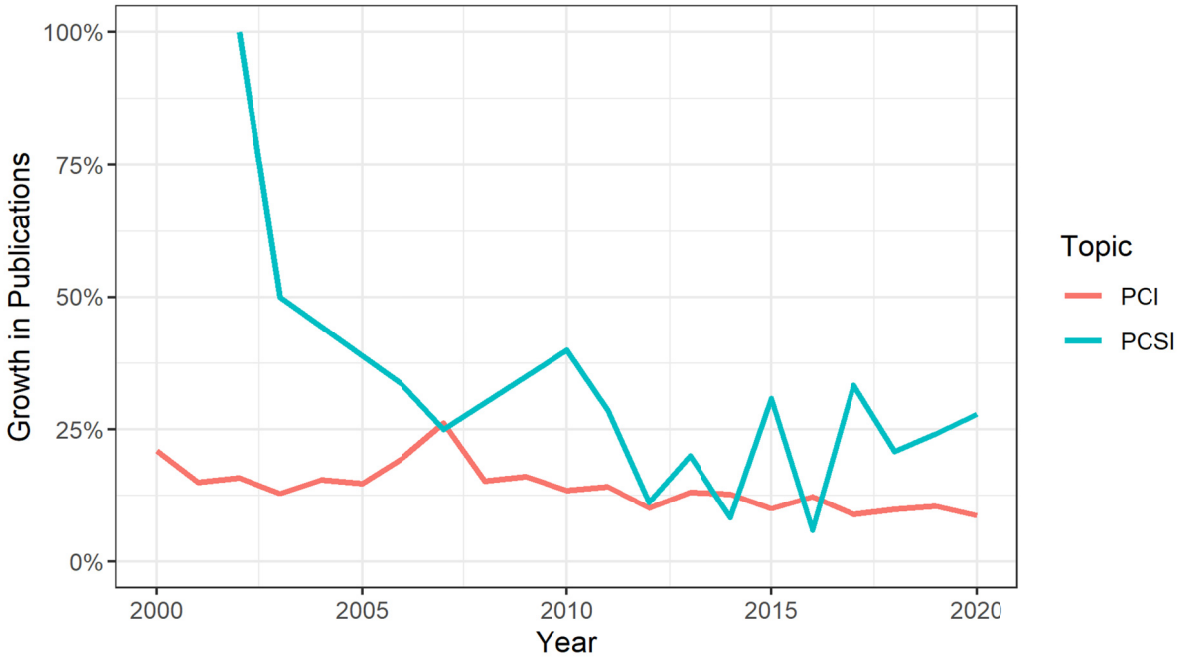

Figure 2. Annual growth rate of PCI versus PCSI since 2000

4.1.2 Top Journals

Two journals, *Journal of Business Venturing* and *Venture Capital* constitute around 10% of the literature on PCI. The top five journals comprise approximately 17% of the total, and the top 10 journals constitute around 23% of the overall literature. The journals contain a mix of keywords including venture capital (N = 1835), investment/s (N = 1251), private equity (N = 726), innovation (N = 441), performance (N = 438), entrepreneurship (n = 411), finance (N = 235), and firms (N = 223). Corporate governance that has some connection with sustainable finance is mentioned 180 times.

However, literature which mentions sustainability topics is only present in three of the top 10 journals: *Journal of Business Venturing*, *Journal of Private Equity* and *Journal of Corporate Finance*. Despite the growth in PCSI literature between 2015–2020 the second-most-voluminous journal on PCI, *Venture Capital*, does not contain a single article which can be classified as having sustainability linkages among their 249 PCI-related publications (see Figure 3).

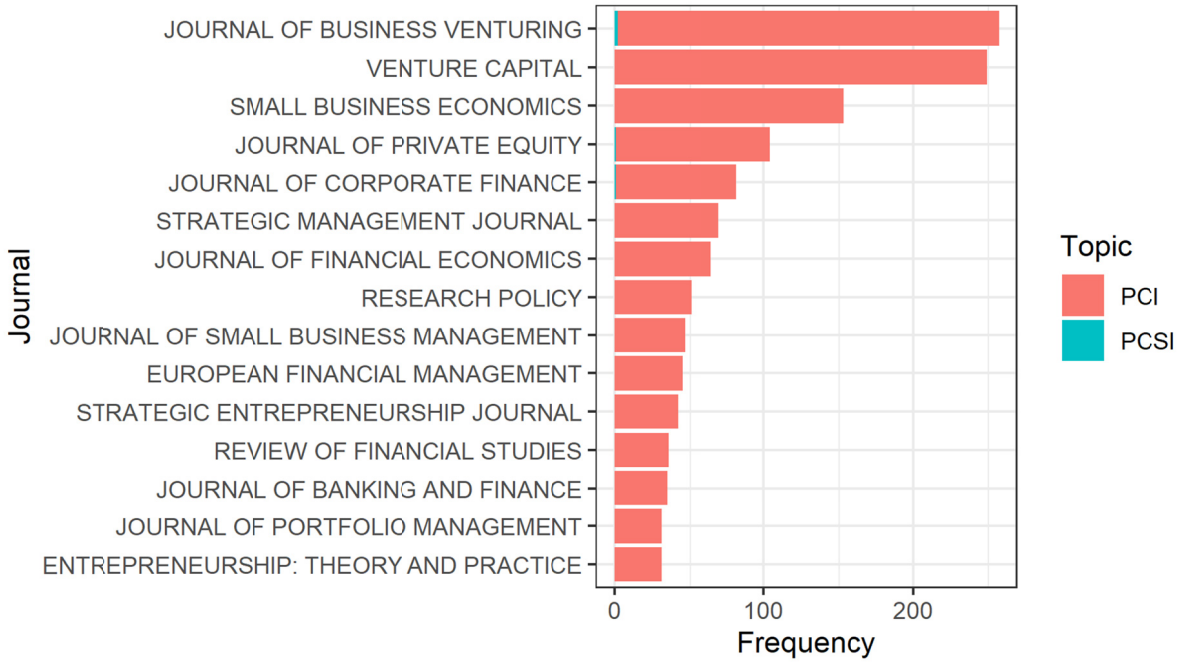

Figure 3. PCI and PCSI publications in the ten top journals

The results presented in Figure 3 clearly demonstrate that sustainability topics are not at the centre of PCI research between the 1960-2020 year period. Most of the top 10 journals have not even published a single PCSI paper. The three journals which do contain PCSI papers each have one paper which has been outlined in Table 3 below, with the three papers each addressing one major topic of sustainability, namely, ESG, B-Corporations and Impact Investing.

Table 3. PCSI papers appearing in Top 10 PCI Journals

Title	Year	Journal
The price of environmental, social and governance practice disclosure: An experiment with professional private equity investors	2015	Journal of Corporate Finance
A configural framework of practice change for B corporations	2018	Journal of Business Venturing
The Need for Localized Risk (Venture) Capital: Place-Based Impact Investing	2018	Journal of Private Equity

Having observed that only three out of the top 10 PCI journals contain articles with sustainability linkages, it is worthwhile to analyze the most prominent authors working on these topics.

Ten authors have written 8% of the total body of literature on PCI. The top author, Wright, has written around 100 articles on PCI. Wright has not, however, published on sustainability-related topics. However, Cumming, the second ranked author on PCI, is also one of the top ranked authors on PCSI which paints a more positive picture about the scholarly potential of PCSI. Cumming is the only author from the top 10 PCI list who also appears as a top author on PCSI. None of the other top 10 authors writing about PCSI appear in the top authors list on PCI. In looking at the top five authors on PCSI, we can see that three out of five share common research interests in social responsibility, sustainable finance, and impact investing. Cumming is the only author who seems to have a conventional focus on private equity, venture capital, hedge funds, etc., but has still written about PCSI. This shows us that although some authors are taking interest in the sustainability aspects of PCI, most authors in this space continue to focus on conventional topics like financial performance, networking and relationships, and the path from private to public listings, i.e., initial public offering (IPO). With PE gaining more traction in the sustainable finance industry, through milestones such as the recent Ceres report on "The Changing Climate of Private Equity," and John Kerry, U.S. Special Presidential Envoy for Climate Change's, acknowledgement of PE's role in a net-zero economy (Ceres Network, 2021), it would be worthwhile to see how these trends evolve from 2021 onwards.

In terms of top countries publishing PCI literature, the United States is a clear category leader with almost three times the number of publications than the next in rank, the United Kingdom. In fact, the United States has released more papers (1514) on the subject than the next four countries: United Kingdom, China, Germany, and Canada combined (1511). The United States also has the largest number of papers issued on PCSI but the spread of these papers, albeit low in number, is much more even across the top 10 countries. The leading countries for PCSI are the United States (N = 8), China and France (N = 5 each), Canada, Germany, The Netherlands, Switzerland, and United Kingdom (N = 3 each), and Australia, Italy, Spain, and Sweden (N = 2 each). One publication has also originated from each of the following countries: Belgium, Czech Republic, Denmark, India, Jamaica, Japan, Lithuania, New Zealand, Poland, Romania and South-Africa.

From a growth perspective, although the top four countries (United States, United Kingdom, China and Germany) are showing a growth trend when it comes to publications per year, China, has experienced significant growth in the past five years, more than doubling the number of publications on PCI and securing their position as having the second highest growth after the United States At this rate it would not be surprising if China were to soon overtake the United Kingdom as the country with the second-highest number of PCI papers.

Finally, a note about PCSI in the context of important institutions. Out of the top 30 institutions researching PCI, the four institutions that have produced PCSI literature are York (Canada), Cambridge (United Kingdom), Sichuan (China) and Lund (Sweden). None of the top 30 universities for PCI which are also producing PCSI literature are based in the United States; this is despite the fact that the majority of PCI literature is produced in the United States. This indicates that the top United States-based institutions and authors interested in conventional PCI literature have not caught on to sustainability topics up to the year 2020. Considering that the majority of the top 43 private equity firms publishing ESG reports in 2020 are based in the United States (Mirza, 2022), this may indicate a 'science-practice gap' within the United States between academic institutions and commercial firms involved in the private equity industry. With the changing landscape of sustainable finance after the COVID-19 pandemic, and private markets being brought into the fold of ESG integration, it would be interesting to observe whether a shift in uptake by academic will be seen from 2021 onwards.

4.1.3 Influential Publications

The top-cited papers in the PCI sample include three papers with over 1000 citations (on either Web of Science or Scopus) written between 1990 and 2001. These are Stuart et al. (1999), Sahlman (1990), and Lee et al. (2001).

The top three cited papers from all literature on PCI address the advantages of 'networking' and 'relationships' between investors, firms, investee companies and strategic partners. It is noteworthy that these papers could very well have focused on more common themes related to investment like financial performance, investment strategy, processes, structures, and innovation, but the papers appear instead to be significantly skewed towards topics related to strategic relationships, alliances, and the importance of networking linkages. This shows the importance of strategic business relationships in PCI. Thus, studies on how such strategic relationships play a part in sustainability integration could be a critical area for future research in the PCSI literature, particularly through the lens of legitimacy, stakeholder, and agency theory.

Regarding sustainability-linked literature (PCSI), the top three papers with the most citations were written between 2003–2015 with between 45–130 citations of each paper. The top paper, Scholtens (2006), discusses how the focus of previous literature on sustainable investment has been on the role of public shareholders in shifting corporate policy and performance in a more sustainable direction. The author observes that the role of finance in promoting socially and environmentally desirable activities seems to be more than what has been acknowledged in the literature, especially when it comes to credit channels and private equity.

The second top cited paper, Bocken (2015), provides insight into how VCs can contribute to sustainable business success. The role, motivations, investment theses, and barriers and enablers to success of sustainable ventures are investigated and the following question is addressed: How can sustainable venture capitalists contribute to the success of sustainable start-ups?

The third most cited, paper, Randjelovic et al. (2003) examines how eco‐oriented start‐ups and environmental innovations have recently come under the radar of environment-related VCs or green VCs. The article provides an overview of this industry, its characteristics, processes, mechanisms, problems, drivers and definitions.

Thus, the results suggest that the PCSI literature is primarily focused on the role of PE and VC in driving environmental and social performance, as well as looking at the underlying motivations and challenges of such investments.

4.1.4 Inductive Content Analysis

VC and PE keywords aside, 'entrepreneurship' and 'innovation' were the top keywords found in the literature. These two areas are critical to PCI as the primary work of PCI is to first find worthy *entrepreneurs* in which to invest and then inject *innovation* in business processes, products, and people to increase company valuations for exits and returns. Thus, the topics of entrepreneurship and innovation and their linkages with sustainability themes can be another important area of study for future work.

The analysis shows that the three most common keywords in the PCI and PCSI literature are the same (venture capital, investment, private equity). The only other keyword with similar mention is finance. These keywords, however, are conventional to the industry and would be expected to be common across both categories. The remaining 20 keywords are different between the PCI and PCSI literature. None of the PCI keywords are related to impact or sustainability, two topics that are prevalent in the majority of the PCSI top 30 keywords.

This reveals: (1) there is a gap with regard to impact and sustainability issues in the PCI literature; and (2) there is potential for research that addresses the impact and the sustainability of PCI.

4.1.5 Deductive Content Analysis

As of the 2008–2009 financial crisis, sustainability became relevant for investors and other stakeholders' perceptions on firm risk and performance (Grove et al., 2011; Jizi et al., 2014). Institutional investors often associate ESG performance with high-quality risk management (Salama et al., 2011). Overall, ESG scores are known for positively impacting financial risk (Matos et al., 2020) and long-term risk-adjusted returns (Borgers et al., 2015; Shrivastava et al., 2019). ESG practices and disclosures improve financial and reputational risk with investors (Weber, 2014) by enhancing brand loyalty, reducing the cost of capital, maintaining social acceptance, and improving revenues and returns (Arayssi et al., 2020; Camilleri, 2015; Salama et al., 2011). Environmental and social criteria are also linked with the credit risk assessment of commercial loans (Weber et al., 2015). Similarly, financial institutions with better ESG performance and higher sustainability material risks show better performance than firms with lower materiality scores (Khan et al., 2016). Furthermore, positive social performance and reporting facilitate firms' lower risk for labour disputes, customer health controversies (Waddock & Graves, 1997), and environment-related litigations (Weber et al., 2010).

In light of the above relationship between sustainability and risk management, a deductive analysis was performed in the PCSI articles with the term 'risk'. Mentions of risk appear in PCSI papers in 2010 and an increase of around 50% is seen from 2019 to 2020. This data seems to correlate with increased work coming out of international organizations, non-governmental organizations and think tanks around capital markets and sustainability risk just before this period. For example, the World Economic Forum's Global Risks Perception Survey 2017–2018 identified the top risks in terms of size and likelihood directly related to the Sustainable Development Goals (SDGs). These included extreme weather events, food security, biodiversity loss, and ecosystem collapse; these risks can have material impacts on a business' operational costs, reputation and profitability (World Economic Forum, 2018). On the PCI side, from a total sample set of 4913 articles, the word 'risk' appears in the abstracts of approximately 1966 articles or 40% of the literature on PCI which shows the inherent ties of risk-related issued to conventional PCI research. The importance of risk and its ties to sustainability and ESG management in PCSI literature will continue to be an important area of study.

4.1.6 Theoretical Considerations

In doing a basic bigrams study of words associated with 'theory', it was observed that agency theory, institutional theory and signaling theory have a high prevalence in the PCI literature with over 100 mentions. Agency theory is used to "explain and resolve" issues between business principles and their agents (Eisenhardt, 1989); institutional theory deals with the rules, norms and authority structures of social behaviour (Scott, 2005); and signalling theory deals with the communication of species between each other (Morris, 1987). Thus, it is evident that theoretical approaches within PCI scholarship address relationships, networking, communication, and power structures. On the PCSI side, when analyzing abstracts, real options theory appears twice, and finance theory appears once. Within keywords, agency theory is most prevalent in PCI literature (appearing 39 times) while institutional theory is most prevalent in PCSI. Agency theory does not appear in the PCSI papers, providing an important area for further research.According to industry practice, the principal–agent model of limited partner (LP) and general partner (GP) in PCI is a fundamental driving force behind stronger sustainability performance (Ceres Network, 2021) and the agency effect of LPs demanding higher ESG standards is becoming stronger over time. These agency effects between LP and GP, and their impact on sustainable investment practices deserve due attention. In the past, a major challenge with PCI has been the disparate disclosure and quality of private equity data available for research. While several commercial enterprises like Venture Economics, Preqin, and Cambridge Associates collect performance data on PCI, the data

is often obscure, lacks regular periodic collection and is not available for all funds (Harris et. al, 2012). However, availability of both financial performance and sustainability data in the private capital space is becoming more common and might facilitate the creation of mathematical models within the sustainable finance space.

Drawing from the findings, a theoretical framework consisting of *agency theory*, *legitimacy theory*, and *stakeholder theory* can be presented to explain sustainability behaviour in the private capital markets. Agency theory involves the relationships between principals and agents meant to represent their interests (Shapiro, 2005). In the context of private capital markets and sustainability, agency theory is noteworthy as it can describe the governance of behaviour in the LP-GP relationship which is central in the private equity context. This is because the PE firm, also known as the GP, acquires and manages assets (capital) on behalf of LPs or shareholders, and invests them with a fiduciary duty to grow the capital in the form of returns, thereby establishing anagency relationship.

Legitimacy theory is grounded in the concept that business and society are bound by a social contract and that business is not free from environmental and social responsibility (Burlea & Popa, 2013). Legitimacy theory has conventionally been associated with reporting and disclosure in public markets, i.e., corporations listed on stock exchanges, but can be applied to PCI to generate new theoretical contributions.

Finally, a study about investment firms and sustainability cannot be complete without taking stakeholder theory into account. Stakeholder theory proposes that business entities impact multiple constituencies like employees, suppliers, local communities, and the environment (Freeman, 2015). These impacts and relationships also create a need for risk management as each stakeholder presents inherent risks. Thus, as presented in the chart below, these three theories, agency theory, legitimacy theory and stakeholder theory, serve to explain behaviour vertically and laterally in PCI and can establish afoundation of future theoretical work in PCI and sustainability research.

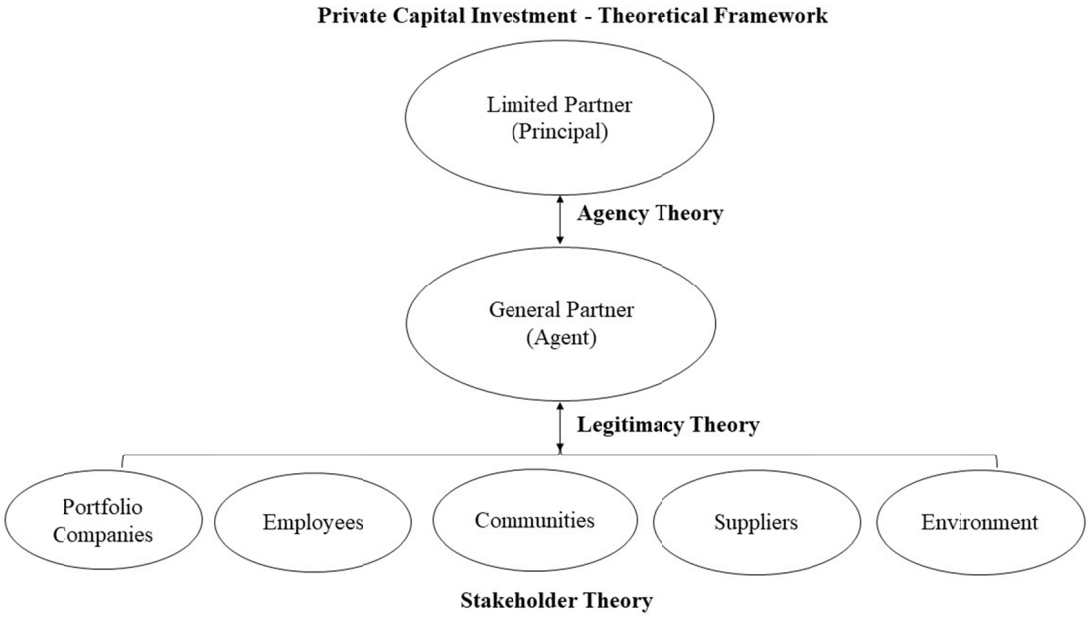

Figure 4. Proposed theoretical framework for future research and contributions in PCI and sustainability

Future work on theoretical contributions to PCI and sustainability research could delve further into each of these theories and whether theoretical principles are exhibited in the behaviour of private equity firms.

4.2 Qualitative Results

PCI research directly addressing sustainability has grown rapidly in the last five years, despite sustainability concerns receiving relatively little attention since 1960, with the first major contribution from Waddell (1995), who raised questions around economic reform, future economies, and challenges to socially guided, i.e.,

sustainable, investments, with a key challenge being that the criteria for this class of investments were unclear and that they were perceived to have produced lower returns than those of traditional VCs.

Thematic analysis of the 46 PCSI papers addressing sustainability concepts uncovered 13 major themes (see Table 4). As would be expected, individual papers addressed more than one theme, with the corresponding result that more PCSI themes are addressed in periods of higher publication rates. The qualitative findings reflected those of the bibliometric analysis, showing that PCSI literature increased markedly from 2006–10, but rapidly in the most recent five-year period of 2016–2020.

Table 4. Key themes emerging from the Thematic Analysis

Key themes	
1.	Certifications and standards
2.	Clean/green investments
3.	Corporate social responsibility and social entrepreneurship
4.	Economic issues and disruption (i.e., innovation)
5.	Environmental, social, and governance issues
6.	Financial sector and performance issues
7.	Impact investing and thematic issues
8.	Influences and decision making
9.	Socially responsible investment and thematic issues
10.	Structural and process issues
11.	Sustainability and sustainable investment issues
12.	Value creation
13.	Venture capital and social venture capital

More than half of the PCSI themes were not addressed in the 1995–2000 period, due to there being only a single work published in this field at that time (Waddell, 1995), but that single work addressed nearly as many themes as later periods during which multiple authors published PCSI material, suggesting that Waddell's (1995) publication was an early disruptor in the literature, focusing on challenging topics such as economic reform, poor financial performance of socially guided investments, and unclear social returns on those investments, while suggesting that social investment does, however, provide market access opportunities for those outside the system. A prediction is made that social goals will continue to be increasingly incorporated into investment decisions; this later proves to be true.

In the 2001–2005 period, two publications shift the focus more onto the environment, suggesting that eco-oriented start-ups have not been as successful as social enterprises, but make the case for their potential to support sustainable development, likely reflecting the newly established United Nations Millennium Development Goals (MDGs) (Randjelovic et al., 2003; Williams & Sharamitaro, 2002). An important connection is made here between the environment and culture, highlighting that impacts to the environment were having deleterious impacts on culture, and so interest grew in screening companies for both social and environmental performance, while also highlighting the need for innovative financial tools to support sustainable development.

From 2006–2010, the number of PCSI publications doubled to four, but the number of themes addressed did not increase in number or differ significantly from what had been addressed in the previous period (Cumming & Johan, 2007; Joly, 2010; Scarlata & Alemany, 2010; Scholtens, 2006). However, important connections were made between financial development and sustainable development (Scholtens, 2006), and Joly (2010) observed that SRI has gone from niche in the 1980s and '90s to mainstream by the 2010, which accounts for and predicts the marked increase in literature on this topic over the following ten years to the present day; the observation also reflects the relative paucity of work on this topic since Waddell (1995). Of note is the call from Joly (2010) for a new kind of growth, which picks up on the prediction made by Waddell (1995) that social goals will become increasingly important to investors and the call of Scholtens (2006) to bridge financial and sustainable development; this is also reflected by the spirit of the now ten-year-old UN MDGs, the momentum of which was picked up by the Sustainable Development Goals (SDGs) in 2015, leading not only to the established significance of social and sustainable investments, but to the drastic increase in PCSI literature in 2016–2020.

In the 2011–2015 period, an increase was observed in the number of PCSI themes addressed compared to all previous periods, likely in anticipation of the 2015 deadline for the MDGs and the unveiling of the SDGs in 2015, which possibly also accounts for the significant focus on impact investing (Bocken, 2015; Crifo & Forget, 2013; Crifo et al., 2015; Ioannou, 2015; Jones & Turner, 2014; Serrano-Cinca & Gutiérrez-Nieto, 2013;

Spiess-Knafla & Aschari-Lincoln, 2015; Teti et al., 2011). Bocken (2015) calls on VC to support sustainable start-ups, indicating that sustainable business models are becoming more attractive to investors than those which do not perform well in these areas. On the note of performance, Chiapello and Gaëtan (2017) identify a weak point in reporting, highlighting that a label cannot be equated with continuous performance indicators, which recalls Waddell's (1995) early observation that criteria for this type of investment were unclear.

Coming to the most recent period of 2016–2020, there is a drastic increase in PCSI publications, with all but one theme (ESG issues) being directly addressed, although they are indirectly linked to other themes (Aggarwal & Elembilassery, 2018; Agrawal & Hockerts, 2019; Alakent et al., 2020; Antarciuc et al., 2018; Bazley et al., 2017; Bhatt & Ahmad, 2017; Cetindamar & Ozkazanc-Pan, 2017; Chiapello & Gaëtan, 2017; Cumming et al., 2016; de Lange, 2019; Desmarais et al., 2017; Genoud, 2020; Indahl & Jacobsen, 2019; Jadevicius, 2020; Kölbel et al., 2020; Lu et al., 2020; Mayer & Scheck, 2018; Milam, 2018; Poyser et al., 2020; Prelipcean & Boscoianu, 2020; Precup, 2019; Puaschunder, 2017; Sharma et al., 2018; Siddiqui & Marinova, 2019; Watts & Scales, 2020; Xue et al., 2019; Zaccone & Pedrini, 2020; Zhu & Lu, 2020). We expect the sudden increase in publications, with ten published in 2020 alone, is due to the UN SDGs, the COVID-19 pandemic's influence on the focus on social and public well-being, including calls for renewed energy in the fight against climate change and corporate corruption, which many of these authors have touched upon.

One theme which has remained prominent at every time scale has been that of economic issues and disruption, which included the codes 'economic reform', 'future economy', and 'disruption'. On its own, but especially considering the events followingMarch 2020, this suggests a consistent interest in "doing things differently," which offers researchers and investors alike an opportunity to contribute new ideas to a reformed economy that better serves the public interest.

Some limitations to the thematic analysis were, most significantly, that of time, with this being an iterative process consumptive of time, energy, and focus. Preferring broader themes not only allowed us to optimize our time, but also offered more inclusive points of contact between periods and authors. This will offer researchers strong starting points in which to contextualize their work for the 2021–2025 period and beyond in the lead-up to the deadline for Agenda 2030. In light of the fact that PCSI literature has increased in line with international goal setting, there is an expectation of this trend to continue as pressure mounts and public demand for and awareness of sustainability increases; the themes presented here intend to support future researchers in that effort.

5. Discussion

The results of the research suggest that the ratio of sustainability-related research in private equity (PE) and venture capital (VC) research is small. Less than 1% of the literature—46 articles—in VC and PE address sustainability issues. Furthermore, only three articles related to sustainability appeared in three of the top 10 journals in the field. Hence, sustainability is only a niche topic in PE and VC research between the 1960-2020 period. This is a similar finding as for other sustainability-related topics in finance. For instance, Diaz-Rainey et al. (2017) found that most of the finance journals have been quiet about climate-related finance research. Consequently, they call this ignorance 'stranded research'. Only very recently, some of the top finance journals picked up the topic and only in 2020 The Review of Financial Studies issued a special issue on climate finance (Baldauf et al., 2020; Barnett et al., 2020; Engle et al., 2020; Hong et al., 2020).

Though the number of sustainability-related academic publications in PE and VC research as well as in finance and accounting increased recently, it is still astonishing that most publications cannot be found in finance and accounting journals. As Carè and Weber (2023) claim "there is not much finance in climate finance." Much of the climate finance research can instead be found in journals that address climate and sustainability research, such as *Nature* and *Nature Climate Change* (Ameli et al., 2021; Battiston et al., 2017; Bauer et al., 2018; Campiglio et al., 2018; Fankhauser et al., 2021; Semieniuk & Holden, 2022; Semieniuk et al., 2022).

One of the reasons for the latter phenomenon could be that finance research tries to exclude all variables that seem external. Financial models focus on financial data in an isolated way that looks at other variables rather as confounding variables or noise that should be eliminated. Consequently, the research ignores external impacts, such as sustainability and climate change, that are here to stay instead of being unsystematic and short-term. For instance, modern portfolio theory (Markowitz, 1991) addresses only the mix of risks inside a portfolio and excludes external risks. Consequently, Lukomnik and Hawley (2021) claim that portfolio theory does not address systematic risks, such as sustainability and climate change. Therefore, finance research that addresses these systematic risks is often not accepted in conventional finance journals and in VC and PE research.

This is particularly problematic for PE and VC research because these types of capital often finance companies with future-oriented business strategies. If investors only focus on internal financial figures, strategies, and

products and services, systematic external risks and opportunities are not considered. Ignoring factors, such as climate change and related policies and regulations, and social issues, such as equity and diversity will create major issues, both in PE and VC research and professional practice. For instance, technologies that could address climate change might be underestimated, with the result that firms addressing the problem do not get financing. Another example is equity and diversity. It is well-known that private equity struggles with diversity and ignoring this problem might create additional risks.

Furthermore, similar to general institutional investing, PE and VC needs to include ESG and sustainability to consider all possible risks and to be transparent. Currently, investors do not want to invest in black boxes anymore. They want to know what they are investing in to manage their risks and to avoid unforeseen issues related to sustainability, climate-change, equity and diversity (Amel-Zadeh & Serafeim, 2018). Consequently, more research is needed about these topics, including ways to report about the performance of investment regarding sustainability aspects.

Hence, similar to other finance and accounting research, sustainable PE and VC research needs to analyze the connection between sustainability performance and financial performance, also called the business case for sustainability or materiality. This research needs to address both financial risks and opportunities of sustainability or non-sustainability. In addition, research needs to address the sustainability case of PE and VC. This research addresses the impact of this type of finance on sustainable development (Weber & Feltmate, 2016). Again, both positive and negative impacts need to be analyzed. The research in the field needs to stop operating in an isolated way and instead consider systematic impacts on and of PE and VC.

6. Conclusion and Future Direction of Research

With investment in private securities growing at twice the rate as public securities during the latter part of the period being studied, private capital investment (PCI) is not just becoming increasingly popular from a financial standpoint, but interest in sustainability integration is also growing in the PCI field. Conventional research on sustainability has focused on public markets and this results in gaps in the potential for private markets to influence sustainability policies and practices.

This study shows that PCSI, i.e., PCI literature with sustainability foci, is still a small fraction of the literature at 0.9%. This indicates significant potential for more research in the private capital space related to sustainability. A science-practice gap may exist which will need to be filled as uptake of ESG in the industry increases.

From a regional, authorship, and publication standpoint, this paper demonstrates that the United States is a clear category leader in the conventional PCI space with almost three times the number of publications than the next in rank, the United Kingdom. However, despite the United States having a clear dominance in PCI work, when looking at the research output from its top 30 academic institutions in this sector, none of the United States-based institutions produced literature with sustainability linkages. This highlights that dominance in conventional literature about PCI does not, by default, lead to the same in the sustainable investment literature. This is furtherevidenced by the data which showed that some of the top scholars address sustainability issues, but most of them do not. In addition, PCSI literature is only present in three of the top 10 journals with the second most voluminous journal on PCI not containing a single article with sustainability topics.

Looking at the future direction of research, it would be worthwhile to study whether the advent of a new climate and ESG-friendly administration in the U.S. will cause American institutions, authors, and publications to produce more work in PCSI. For example, in June 2021 John Kerry, United States Special Presidential Envoy for Climate, singled out private equity's role in climate action.

'Entrepreneurship', 'innovation', and 'corporate governance' prevailed as the most common keywords in the literature. This indicates that important PCSI research can be conducted around these topics in future studies. The following questions can be addressed: How is sustainability integration within PCI impacted due to differing character traits of portfolio company entrepreneurs? Are there any linkages between conventional PCI innovation processes and sustainability-related innovation? What part of corporate governance is attributed to traditional financial practices and what part is attributed to sustainability and ESG frameworks?

Finally, the bibliometric analysis presented in the study included a basic bigrams study of words associated with 'theory'. Agency theory, institutional theory and signaling theory exhibited a high prevalence in the PCI literature with over 100 mentions. Thus, theoretical linkages within PCI scholarship are in some senses linked to the importance of relationships, networking, communication, and power structures in PCI scholarship. A significant finding was that agency theory does not appear a single time in the sustainability-related papers and this provides an important area for further research. The simple reason for this is that, when speaking to PCI

Partners and leadership teams, the importance of the Limited Partner (LP) to General Partner (GP) agency relationship seems to be one of the most important drivers of sustainability integration in PCI. Therefore, studying agency effects within the PCSI literature could prove to be an important theoretical contribution along with stakeholder and legitimacy theory. In line with this, a theoretical framework was proposed for future work looking at vertical and lateral relationships around agency, legitimacy and stakeholder theories which can seek to explain sustainable investment behaviour by private capital investors with respect to asset owners, employees, communities, portfolio companies, suppliers, and the environment.

With sustainability and ESG integration becoming agnostic to public versus private markets, it is an exciting time to be studying the private capital investment space which seems to be experiencing a 'science-practice gap' between academia and industry. Private equity and venture capital continue to grow, and with this, the importance of sustainability and ESG integration within the private investment space is also growing. With limited time available for progress toward achieving the sustainable development goals (SDGs) in 2030, there will soon be a dire need for high quality research in the private capital investment space to inform decision making for greater contributions to sustainable development -science must keep up with practice.

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