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**The Performance Effects of Syndicated
Investments: Evidence from a Meta-Analysis**

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Abstract

Equity syndication is the joint investment of multiple equity investors in the same firm and it can be considered as a core mechanism of entrepreneurial finance. Venture capitalists, business angels, corporate investors, and private equity funds frequently decide to co-invest with the aim of diversifying risk, enhancing screening quality, pooling complementary expertise, and strengthening governance mechanisms. The empirical evidence on the performance consequences of syndication is dispersed and inconclusive, even though the concept of equity syndication is largely employed. While several studies associate co-investment with improved exit outcomes, growth, and innovation, others emphasize coordination frictions, incentive dilution, and intra-syndicate conflicts that may limit value creation. This thesis conducts a quantitative meta-analysis in order to estimate the average effect of equity syndication on firm performance and to explore the sources of heterogeneity in prior findings. Across Web of Science, Scopus, and ProQuest, the literature search has initially identified more than 2,200 unique records after removing duplicates. Following it was applied a structured inclusion and exclusion criteria and full-text screening, and 66 empirical studies were retained, generating 137 effect-size estimates spanning the period 1970–2023 and multiple geographical settings. Effect sizes were standardized using partial correlation coefficients and transformed into Fisher's Z values in order to ensure comparability across heterogeneous empirical specifications. A random-effects meta-analysis was implemented in Stata to account for between-study variability. To address dependence among multiple estimates extracted from the same article, multilevel mixed-effects meta-regression models were estimated, incorporating contextual moderators.

The findings reveal a small but statistically significant positive average association between syndication and firm performance. However, substantial heterogeneity persists across studies. Moderator analyses indicate that early-stage focus does not significantly alter the relationship, whereas contextual dimensions play a more relevant role. In particular, studies conducted in the American context and those covering the period surrounding the 2007-2008 global financial crisis report systematically smaller syndication–performance effects. These results suggest that macroeconomic constraints moderate the benefits of collaborative investment structures. This research provides a comprehensive assessment of the performance implications of equity syndication and clarifies the contextual conditions under which its effects are amplified or attenuated.

Table of Contents

<i>Abstract</i>	2
<i>Table of Contents</i>	4
<i>List of Tables</i>	6
<i>List of Figures</i>	6
<i>1. Introduction</i>	7
<i>2. Theoretical Background</i>	9
2.1. Financing Decisions and the Need for External Capital	9
2.1.1 Growth, investment opportunities and capital constraints	9
2.1.2 Internal and external financing	10
2.1.3 Financing decisions over the firm life cycle	11
2.2. Types of Investors in Entrepreneurial Finance	13
2.2.1 Business Angels	13
2.2.2 Venture Capitalists	15
2.2.3 Private Equity	17
2.3. Syndicated Investments: Structure and Implications	18
2.3.1 Syndicate structure	19
2.3.2 Antecedents of syndication	21
2.3.3 Reasons of syndication	22
2.3.4 Possible disadvantages of syndication	24
2.4 Firm performance and measures of success	25
<i>3. Methodology: Meta-Analysis</i>	27
3.1 Overview of Methodological Approaches	27
3.1.1 Meta-Analysis as a Quantitative Research Method	27
3.1.2 Meta-Analytic Approaches	28
3.2 Methodology Adopted	34
3.2.1 Definition of the Research Question	34
3.2.2 Query definition	34
3.2.3 Database research and first results	36
3.2.4 Studies' evaluation with inclusion and exclusion criteria	37
3.2.5 Meta-Analytic Database	40
3.2.6 Effect size Computation	49

3.2.7 Meta-Analytic Model.....	49
3.2.8 Robustness Analysis	54
4. Results	56
4.1 Descriptive overview.....	56
4.2 Overall Meta-Analytic Effect.....	57
4.2.1 Forest plot	58
4.3 Publication Bias.....	61
4.4 Multilevel meta-regression	62
4.4.1 Baseline Mixed-Effects Meta-Regression.....	62
4.4.2 Moderating Role of Early-Stage Firms	65
4.4.3 Moderating Role of Geographical context.....	66
4.4.4 Moderating Role of American context.....	68
4.4.5 Moderating Role of Temporal context: 2007 crisis.....	69
4.4.6 Moderating Role of American context and 2007 crisis.....	70
4.5 Robustness Analysis.....	72
5. Conclusion	73
5.1 Summary and Interpretation of Findings.....	73
5.2 Contributions to the Literature	75
5.3 Study Limitations.....	77
5.4 Directions for Future Research	78
Acknowledgements	80
Bibliography.....	81
Appendix	88

List of Tables

Table 1: Detailed number of databases results	37
Table 2: Articles included in the meta-analysis.....	40
Table 3: Coding and frequencies of Syndication and Success proxies	47
Table 4: Variable Summary.....	47
Table 5: Meta commands	51
Table 6: Descriptive statistics of the main variables	56
Table 7: Random-effects meta-analytic estimate of the relationship between syndication and performance	57
Table 8: Baseline Mixed-Effects Meta-Regression.....	64
Table 9: Moderating Role of Early-Stage Firms	65
Table 10: Moderating Role of Geographical context.....	67
Table 11: Moderating Role of America context.....	68
Table 12: Moderating Role of Temporal context: 2007 crisis.....	70
Table 13: Moderating Role of America context and 2007 crisis.....	71
Table 14: Robustness Test.....	72
Table 15: Codebook	88

List of Figures

Figure 1: BAN growth in Europe 1994-2024.....	15
Figure 2: Screening steps.....	38
Figure 3: Time Span of Measurement Periods in the Analyzed Articles	45
Figure 4: Frequency of Variables Across the Studies	48
Figure 5: Forest plot	60
Figure 6: Funnel plot	61
Figure 7: Syndication proxy	63
Figure 8: Performance proxy.....	63

1. Introduction

One of the fundamental determinants of firm growth and survival is represented by access to external equity financing, particularly for entrepreneurial ventures operating under conditions of high uncertainty, information asymmetry, and limited internal resources. In corporate finance is emphasized by theoretical contributions how asymmetric information between firms and investors shapes financing choices and capital structure decisions (Myers & Majiluf, 1984). Similarly, the economics of small business finance highlights the central role played by private equity and specialized investors in supporting firms that are unable to rely exclusively on traditional debt markets (Berger & Udell, 1998). Within this context, venture capitalists, business angels, corporate venture capital units, and private equity investors do not only provide capital, but also managerial expertise, governance mechanisms, and strategic networks that may influence firm development trajectories (Gompers P. , 1995).

A distinctive organizational feature of entrepreneurial finance is equity syndication, defined as the joint investment of multiple investors in the same firm. From a theoretical standpoint, syndication can be interpreted as a cooperative arrangement through which different decision makers share risk and jointly participate in investment outcomes (Wilson, 1968). In the venture capital literature, syndication has been explained through complementary screening advantages, risk diversification motives, improved monitoring capacity, and enhanced value creation through pooled expertise (Brander, Amit, & Antweiler, 2002). The selection hypothesis suggests that multiple investors improve project evaluation and reduce adverse selection, while the value-added hypothesis emphasizes the benefits of combined post-investment support and certification effects (Brander, Amit, & Antweiler, 2002).

At the same time, collaborative investment structures may generate inefficiencies. The involvement of multiple investors can create coordination frictions, conflicts of interest, and incentive dilution in monitoring activities. Free-riding behaviour and divergent exit preferences may reduce the overall effectiveness of governance and value creation (Brander, Amit, & Antweiler, 2002). As a consequence, the impact of syndication on firm performance is theoretically ambiguous. Some empirical studies document a positive effect on growth, exit likelihood, innovation, and valuation, while others detect limited or even negative consequences depending on context and measurement choices, resulting in heterogeneous findings.

The increasing volume of empirical research in entrepreneurial finance has therefore produced a fragmented body of evidence and differences in geographical setting, institutional environment, time period, investor composition, and performance proxies contribute to inconsistent results across studies.

Meta-analysis provides a structured statistical approach to synthesize quantitative evidence from independent studies, allowing the estimation of an overall effect while accounting for heterogeneity (Borenstein, Hedges, Higgins, & Rothstein, 2009). In economics and management research, meta-regression techniques further enable the identification of moderating factors that explain cross-study variability (Stanley & Doucouliagos, 2012).

The primary aim of this thesis is to provide a comprehensive quantitative assessment of the relationship between equity syndication and firm performance. Specifically, the study addresses the following research question: What is the average effect of equity syndication on corporate success, based on existing empirical evidence? To answer this question, a meta-analytic methodology is adopted in order to aggregate effect sizes reported in prior studies and to examine whether contextual dimensions—such as firm stage, geographical environment, and macroeconomic conditions—systematically influence the estimated relationship.

The thesis is structured as follows. Chapter 2 offers a theoretical background by discussing financing decisions across the firm life cycle, the role of different equity investors, and the economic rationale underlying syndication, together with the analysis of the different type of performance. In Chapter 3 is reported the presentation of the methodological approach, with a description of the literature search strategy, study selection process, effect-size computation, and the statistical models employed, including random-effects meta-analysis and multilevel meta-regression techniques. Chapter 4 presents the empirical findings, including the overall pooled effect, the assessment of heterogeneity and publication bias, and the analysis of moderating factors. As reported in the results, syndication has on average a positive and statistically significant effect on firm performance. The pooled effect size is small but precisely estimated and robust with high heterogeneity across studies, which is consistent with common findings in management and finance research. The final chapter concludes by discussing theoretical implications, methodological contributions, limitations, and avenues for future research.

All three authors contributed equally to the design of the research, data collection and analysis, and the writing process.

2. Theoretical Background

2.1. Financing Decisions and the Need for External Capital

Financing is the process of raising money that allows companies to access capital to carry out various operations, such as starting a business, making an acquisition, investing, and supporting growth. This process is characterized by significant challenges, especially for startups, which are uncertain and lack an established reputation. Companies must evaluate various financing options, balancing the advantages and disadvantages of each to determine the most suitable path to pursue (Gould, 2011).

Financing decisions are a central component of companies' strategic and operational choices, as the availability of financial resources directly impacts investment capacity, growth, and long-term performance.

2.1.1 Growth, investment opportunities and capital constraints

Throughout their life cycle, companies undertake activities closely tied to their growth ambitions, hence their need for financing. Businesses and entrepreneurs aim to grow and maintain their competitiveness over time, and to do so they must make investments to expand production capacity, introduce technological innovations, enter new markets, or improve operational efficiency. These investments represent both short- and long-term strategic choices, aimed at strengthening competitive positioning in the market and ensuring the sustainability of the company's strategy over time (Higgins, 1977).

These investment processes often require significant financial resources in the initial phase, while the associated economic benefits tend to be manifested only in later phases and be spread out over time. Therefore, there is a time gap between immediate costs and future returns, which is a key factor in a company's capital needs. This gap is particularly significant in contexts where growth requires large-scale upfront investments, making financing through internally generated resources alone difficult (Carpenter & Petersen, 2002).

This dynamic is particularly evident in very young firms, which often have limited internal resources, but in reality, capital needs are not unique to any specific type of firm. Even more mature and growing companies may encounter limitations in their ability to self-finance when investment opportunities expand rapidly or when cash flows are insufficient to support the intensity of required investments (Carpenter & Petersen, 2002).

The gap between desired investments and self-financing explains why access to capital plays a key role in determining the development trajectories of firms.

2.1.2 Internal and external financing

Firms can decide to finance their activities and investments by using two broad categories of financial resources: internal financing and external financing (Myers & Majluf, 1984).

Internal financing includes all resources generated directly by the company's value-generating operating activities. The revenues from these activities are then reinvested within the company itself. The main forms of internal financing include retained earnings and cash flows generated by current operations. Internal financing is typically the preferred financing source for companies because it allows them to support investments while avoiding a number of costs and risks associated with external financing, like the costs associated to dilution of control, information asymmetry and transaction costs (Myers & Majluf, 1984).

Internal financing, however, also presents some limitations. It prevents companies from overcoming cash flow constraints, limiting their ability to finance large-scale projects. Furthermore, the volatility of cash flows generated by operating activities can make internal financing an uncertain and unstable source (DeAngelo, DeAngelo, & Whited, 2011).

When internal resources are insufficient to meet a firm's financing needs, external financing is necessary. This includes two main categories: debt and equity.

Debt financing involves contractual obligations to creditors, who provide capital in exchange for future repayment and often a predetermined interest payment (Myers & Majluf, 1984). Debt therefore allows for the provision of financial resources without changing the firm's ownership structure, allowing existing shareholders to maintain control. However, it involves rigid contractual clauses related to principal repayment and interest payments, which must be met regardless of the firm's financial performance. This rigidity makes debt a risky source of financing if cash flows are uncertain, as it increases the firm's exposure to financial stress during periods of economic difficulty (DeAngelo, DeAngelo, & Whited, 2011).

Equity financing, on the other hand, involves issuing equity capital to external investors. Unlike debt, it does not involve predefined repayment obligations and offers greater financial flexibility. Equity investors participate in the firm's financial results, sharing both profits and losses. For this reason, equity financing is suitable for investments characterized by high uncertainty or returns that occur over the long term. However, issuing equity capital dilutes ownership and control of the firm, as new investors acquire rights to future cash flows and,

in many cases, voting rights and a role in the firm's strategic decisions (Frank & Goyal, 2003).

Companies must choose the financing structure that best suits the characteristics of the projects being financed and their own financial situation.

There is a theory that brings these considerations together to create an effective synthesis: pecking order theory. According to this theory, firms tend to follow a hierarchy in their financing choices, favoring internal financing first, then debt, and, only as a last resort, equity, considered the most costly of all (Myers & Majiluf, 1984). This hierarchy reflects a general preference for funding sources that allow for greater continuity in management and less exposure to external constraints. However, pecking order theory is not a rigid rule, but rather an observed trend (DeAngelo, DeAngelo, & Whited, 2011).

2.1.3 Financing decisions over the firm life cycle

Corporate financing decisions must be interpreted as the result of a dynamic process; they evolve over time, taking into account the situation and context in which they operate. Financial needs, available sources of capital, and the conditions for accessing financing change as a company moves through the various stages of its development. Therefore, it is important that financial decisions are consistent with the company's life cycle at all stages (Berger & Udell, 1998).

Early stage

For companies in the early stages of their life cycle, financing decisions are influenced by a high degree of uncertainty. At this stage, the company is often subject to limited operational growth, incomplete accounting information, and a business strategy still being defined. These characteristics make it very difficult for external financiers to correctly assess the company's risk profile and future prospects, increasing the uncertainty associated with financing.

From a financial perspective, early-stage companies are generally characterized by negative or highly volatile cash-flows. In the absence of stable cash-flows, debt financing becomes difficult to sustain, as the company is unable to guarantee compliance with regular repayment commitments (Berger & Udell, 1998). Consequently, firms in this phase prefer equity financing, which is the most suitable method for withstanding the uncertainty and long-term returns typical of early stages, as it does not involve pre-established repayment obligations (Berger & Udell, 1998).

Growth stage

Companies that survive the initial difficulties of the early stage then enter a growth phase, during which their financial profile gradually begins to change. Revenues increase and cash-flows become more stable, improving the company's ability to meet its financial obligations and reducing the uncertainty perceived by external investors.

In this phase, companies choose to utilize a broader range of financing options, introducing debt as a complementary source to equity. Equity, in fact, continues to be used to finance investments characterized by greater uncertainty or long-term returns, while debt is increasingly used, as the company grows, to support operational expansion and increased production capacity. Companies do not follow a rigid financial structure but adapt their financing choices to the investment opportunities. There is therefore greater financial flexibility, but also increasing complexity in financing decisions, as the optimal path to follow is not unique (Berger & Udell, 1998).

Maturity stage

In mature firms, financial conditions are generally more stable. Cash-flows are more predictable, the risk profile is better known to the market, and the firm already has a consolidated history and reliable information accessible to external investors. These characteristics allow the firm to use debt as a safer, more accessible, and less costly form of financing. During this stage, debt becomes a central component of the firm's financial structure (Berger & Udell, 1998).

For more mature firms, financing decisions are no longer primarily oriented toward raising resources to support growth, but rather toward optimizing the financial structure. The level of debt and equity is monitored and managed to balance financial flexibility, risk sustainability, and cash flow distribution. Debt is used more strategically, also taking into account market conditions and marginal investment opportunities. In this context, financial structure management becomes an integral part of value creation strategies and is no longer just a simple response to financing constraints (DeAngelo, DeAngelo, & Whited, 2011).

Overall, the analysis of financing decisions throughout the company life cycle highlights that there is no optimal financial structure that applies to all companies and all time periods. Financing choices evolve as a function of uncertainty, the ability to generate cash flows, and the level of information available in the market. Understanding this dynamic is essential to

correctly interpreting companies' financial decisions and the differences that can be observed between young, growing, and mature companies.

2.2. Types of Investors in Entrepreneurial Finance

In entrepreneurial firms, access to finance is one of the most critical constraints, and investors play a fundamental intermediary role in providing capital enabling firm creation, growth, and survival (Gompers P. , 2004). Business Angels (Bas), Venture Capitalists (VCs) and Private Equity (PE) investors provide financial resources, each characterized by distinct investment horizons, incentives and value creation strategies, with VCs being the most relevant provider of capital in relation to syndicated investments.

2.2.1 Business Angels

Business Angels (BAs) are high-net-worth individuals who commit their capital in start-ups or seed stage, contributing with time, expertise, and network. The investments are made outside of family relationships and are motivated by financial gain expectations (Arundale & Mason, 2025). Pre-start up, start up and seed stage represent the main fields in which angels invest, with estimated investments to be 20 to 40 times higher than those of venture capital funds.

Across 39 European countries, the visible European angel investment market grew from €764 million in 2019, before the COVID-19 pandemic, to €1,220 million in 2024, although this represents a 2.8% decline from the investments recorded in 2023. European angel investments are outpaced by those in the United States, which reached nearly 27.8 billion USD in the same year (EBAN Statistics Compendium 2024: European Early Stage Market Statistics, 2025). Due to its informal and fragmented nature, the business angel investment market is difficult to quantify, since a large part of the investments is not publicly disclosed. As a result, a significant percentage of angel investments is not accounted for in angel associations.

Business angel decision-making is a sequential, multi-stage process, typically involving an initial screening phase, a more detailed evaluation or due diligence stage, and finally a stage focused on negotiating the terms and conditions of the investment, including firm valuation (Arundale & Mason, 2025). BA investment decisions are often less formalized compared to those of institutional investors (Kerr, Lerner, & Schoar, 2014). Additionally, BA tend to be hands-on investors actively monitoring after the investment providing mentoring and

strategic guidance. They are also generally more patient compared to other investors, often willing to accept higher risks associated with early-stage companies. The active involvement reflects the personal nature of angel investing, where investors rely heavily on direct interaction, trust-building, and repeated engagement with entrepreneurs rather than on highly standardized contractual mechanisms (Arundale & Mason, 2025).

In order to manage the investment risk level, (Mason & Harrison, 2002) explain the prudent investment principles. A limited percentage of personal capital is allocated to angel investing, and it is diversified across a number of different investments due to the skewed returns and a few successful ventures, implying avoiding concentrating capital in a few projects. Moreover, BAs invest mainly locally, operationalized as a one-hour commute, to maintain close contact with portfolio firms and facilitate intensive post-investment involvement. Another central feature of angel investing is geographic proximity (Mason & Harrison, 2002). It enables more effective monitoring, frequent interaction with entrepreneurs, and timely provision of strategic advice. Time constraints and the non-professional nature of angel investing lead BAs to prioritize geographical proximity and familiar sectors (Arundale & Mason, 2025). Finally, a statistical rather than emotional approach is required for successful angel investing, whereby individual investment outcomes are evaluated as part of an overall portfolio strategy rather than on a deal-by-deal basis. This portfolio logic reflects the high failure rates of early-stage ventures and the necessity of assessing performance at the aggregate portfolio level rather than through individual successes or failures.

Empirical evidence further shows that the business angel investments' performance is characterized by a highly asymmetric return distribution (Mason & Harrison, 2002). Most deals generate low or negative returns, while only a small fraction produces exceptionally high gains.

Apart from their stand-alone activities, a growing number of business angels invest through formalized angel investment groups, which enable them to pool capital, share due diligence efforts, and improve deal screening quality (Kerr, Lerner, & Schoar, 2014). Individuals decide to cooperate by sharing practices aimed at achieving a common goal, through formal or informal organizational structures, believing that this is the most effective way to reach outcomes in the interest of the whole group (Arundale & Mason, 2025). By pooling knowledge, expertise, and funds, business angel groups are able to increase the efficiency of investment screening and selection, enhance post-investment support, reduce transaction

costs through more efficient due diligence processes, and enable larger initial and follow-on investments.

As of 2024, 339 active Business Angel Networks operate across the 39 countries considered, as shown in *Figure 1*, which illustrates the growth of BANs in Europe from 1999 to 2024 (EBAN Statistics Compendium 2024: European Early Stage Market Statistics, 2025).

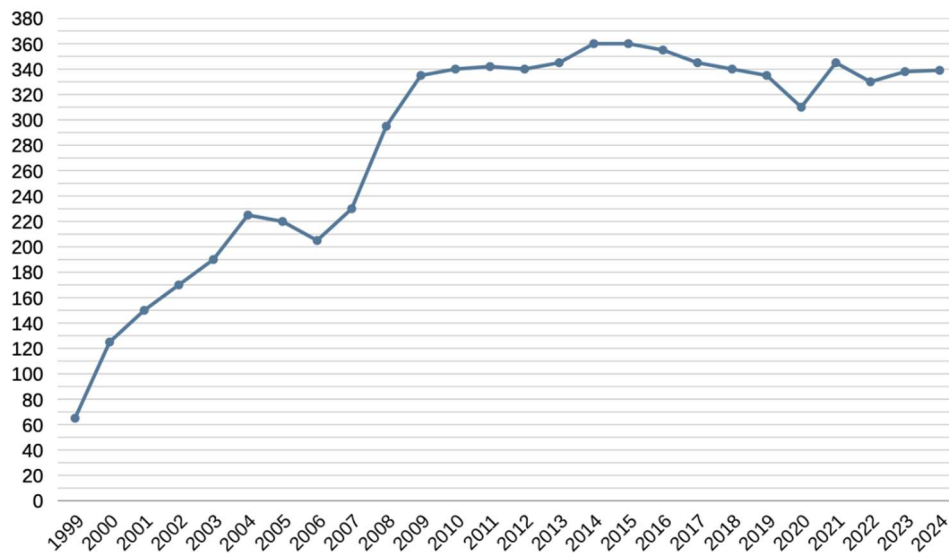


Figure 1: BAN growth in Europe 1994-2024

Because business angel groups are based on collective action, their investment decision-making process differs from that of independent angels (Arundale & Mason, 2025). The angel investment groups follow semi-formalized evaluation processes, including collective pitching sessions, internal voting mechanisms, as well as joint due diligence activities, while preserving individual investment autonomy (Kerr, Lerner, & Schoar, 2014).

2.2.2 Venture Capitalists

Venture Capitalists (VC) are professional financial intermediaries providing equity financing to young, innovative, and high-growth firms characterized by uncertainty and limited access to traditional sources of capital (Gompers P. , 2004). Unlike business angels, VCs are professional investors who operate through more formal and complex contracts, employing scouting, structured screening, entrepreneurial team meetings, extensive due diligence and deal structuring and closing (Kaplan & Strömberg, 2003).

Over the past decade, the early-stage financing ecosystem has undergone a substantial transformation, marked by the increasing prominence of venture capital. Although business angels were the key players in early-stage financing in 2013, holding a market share of 73%

and investing €554 million, early-stage venture capital invested only €200 million, reflecting 26% market share. Since then, the early-stage financing market has experienced a growth of almost 400%, and the early-stage venture capital segment has grown significantly. Thus, the importance and impact of venture capital in the early-stage financing environment have increased significantly, reaching a peak of 48% in 2022 (EBAN Statistics Compendium 2024: European Early Stage Market Statistics, 2025).

In VC investments, General Partners manage capital committed by Limited Partners, aiming at realizing capital gains through exit events such as initial public offerings (IPOs) and trade sales (Gompers P. , 2004). The governance structure includes board representation and, under specific circumstances, the right to intervene in management decisions. Additionally, the structure enforces incentive alignment by promoting entrepreneurship activity aimed at maximizing value through contingent rights and rewards. VC investments are typically staged (Kaplan & Strömberg, 2003) and temporary (Gompers P. , 2004). Staged financing allows VCs to closely monitor portfolio firms and to adjust their level of control in response to firm performance (Kaplan & Strömberg, 2003). Alongside staged financing, contingent control rights and active governance mechanisms help VCs to mitigate information asymmetries and agency problems. Intangibility of assets and intensity of R&D increase agency problems, leading to closer monitoring and shorter funding intervals, while greater asset tangibility reduces risk and allows longer refinancing periods. Given the close-end structure of VC funds, investments are usually exited within a finite time horizon, usually between four and six years (Gompers P. , 2004).

Beyond funding support, VCs contribute to value creation through supporting professionalization of portfolio firms, facilitating access to management talent, strategic partners, and external financing, and assisting in preparing the exit strategies. (Megginson & Weiss, 1991) state that VC involvement exerts a certification effect, hence signalling firm quality to the relevant external stakeholders, which increases the probability of success in follow-on financing and the outcome of exit.

Venture capital investments are often undertaken jointly with other investors through syndication, which allows venture capitalists to diversify risk investing in a larger number of projects. Additional screening through external validation, particularly in early-stage and technology-intensive ventures, is a major benefit that venture capitalists seek when co-investing (Gompers P. , 2004).

VC organizations differ substantially in their objectives and investment practices in fact while independent VC (IVC) primarily pursues financial returns and is characterized by

strong incentive alignment, intensive screening, and active monitoring of portfolio firms aiming at maximize the net capital, corporate VC (CVC) combines financial objectives with strategic goals related to innovation and technological development, leading to distinct governance practices and a generally higher tolerance for failure (Dushnitsky & Lenox, 2005). Bank-affiliated venture capital funds (BVC), by contrast, tend to adopt more conservative investment strategies, emphasizing financial monitoring and risk mitigation, often targeting more mature ventures (Hellmann, Lindsey, & Puri, 2004). Finally, governmental venture capital (GVC) supports early-stage firms and stimulate innovation-driven entrepreneurship in pursuit of social and policy objectives; however, its effectiveness often depends on co-investment with private venture capitalists (Brander, Du, & Hellmann, 2014).

2.2.3 Private Equity

Since the mid-1990s, the private equity industry has experienced significant growth (Gompers, Kaplan, & Mukharlyamov, 2016). Private Equity (PE) are professional financial intermediaries that invest equity capital in mature firms typically through leveraged buyouts, growth equity investments and management buyouts. This focus on established companies contrasts with venture capital, which primarily targets early-stage firms characterized by higher levels of uncertainty (Kaplan & Strömberg, Leveraged Buyouts and Private Equity, 2008). Given the fund's nature, PE firms must exit portfolio companies within a finite time horizon. The exits, which occur through trade sales, secondary buyouts, or initial public offerings, place strong emphasis on measurable performance improvements and favourable market valuation at exit.

Beyond the financial investor role, PE are interpreted as a temporary governance structure designed to restructure firms prior to exit (Liu, Purda, & Zhu, 2020). Private equity investing is characterized by a model of active ownership and strong governance involvement. By acquiring controlling equity positions, PE investors gain the authority to shape strategic direction, financial policies, and top management decisions (Kaplan S. , 1989). Compared to publicly listed firms, the governance and incentive regimes in which private equity-owned companies operate reflects elements of more concentrated control, monitoring, and alignment in decision-making involving management and their ownership structure (Liu, Purda, & Zhu, 2020).

PE funds are organized as closed-end limited partnerships, similar to VC structures, but applied to later-stage investments. Capital is raised from Limited Partners (LPs), as pension

funds or insurance companies, and General Partners (GPs) are responsible for investment decisions, monitoring, and value creation (Gompers, Kaplan, & Mukharlyamov, 2016).

PE compensation structure aligns General Partners with investor performance. Indeed, private equity fund partners' compensation schemes creates strong incentives to generate high returns both through direct performance-based rewards and reputational effects that facilitate the raising of subsequent funds (Gompers, Kaplan, & Mukharlyamov, 2016). Indeed, there are empirical evidence on performance which assets the impact of PE investors in value-enhancing activities.

(Kaplan, Sensoy, & Strömberg, 2009) distinguishes three mechanisms of value creation. The first one, which is financial engineering, aligns managerial incentives through substantial equity participation and the disciplinary role of leverage. Governance mechanism involves control rights and active board involvement enabling close monitoring. Finally, in operational engineering, industry-specific knowledge and managerial expertise of PE firms develop improve the efficiency of their portfolio companies.

The exit strategy is one of the significant factors that affect the PE financial returns and various factors, as firm-specific characteristics, market conditions, and specialization, can directly or indirectly affect the financial result (Rigamonti, Cefis, Meoli, & Vismara, 2016). Initial Public Offering (IPO) can be often viewed as the most prestigious and value-maximizing exit but it is dependent on market conditions and reserved for the highest-quality portfolio companies (Cumming & MacIntosh, 2002).

The extensive use of leverage represents a core characteristic of private equity transactions. In buyouts, debt serves both as a source of capital and as disciplinary governance device. The free cash flow theory (Jensen M. , 1989) states that financial leverage constrains managerial discretion by committing firms to fixed debt payments, thereby limiting inefficient investment behavior and reducing the risk of value-destroying overinvestment.

2.3. Syndicated Investments: Structure and Implications

The term syndication typically refers to a form of cooperation among multiple economic agents through which a financing, investment or content distribution operation is jointly structured and executed, allowing for the sharing of risks, resources and expertise (Steven A. Dennis, 2000).

In a financial context, a syndicate can be defined as a group of different individual decision makers that take a common decision on an investment and will jointly receive a payoff to be

shared among them (Wilson, 1968). (Brander, Amit, & Antweiler, 2002) implies also that in venture capital syndication two or more VCs invest in the same company over its lifespan. They can invest in the same investment round or at different point in time. (Sophie Manigart, 2002).

Investors in syndication sign formal contractual structures in which the terms of the investment between VCs that participate and entrepreneurs are defined. The interests and the opportunities of participation in this type of investment are expressed by both the venture being financing and the VC firms themselves. (Jääskeläinen & Mikko, 2012).

The academic literature documents that syndication is common across private markets, in venture capital empirical evidence shows that more the 70% of the investments are done in the form of syndication, with an higher probability to find syndication increasing with the deal size and the investment stage (Brander, Amit, & Antweiler, 2002). North America accounts for the largest share of global syndication activity, driven by United States in which about the 90% of the deals in VC industries are carried out as syndication investments and followed by Europe. Asia-Pacific region represents also a lower but important percentage of this type of investment.

2.3.1 Syndicate structure

A syndicate represents the outcome of the decision to co-invest and constitutes the organizational vehicle through which venture capitalists provide ventures with the financial, human, and social resources that initially motivated syndication. Since a syndicate typically exists for several years until the venture is exited, it requires continuous coordination and interaction not only among the participating VC firms but also with the venture. For this reason, issues related to the structure, composition, and internal dynamics of syndicates are considered at least as important as the initial decision to syndicate. However, while the literature has devoted substantial attention to the decision to syndicate and to partner selection, the structuring and internal functioning of syndicates have received comparatively limited scholarly attention.

Most existing research on syndicates draws on the alliance literature and focuses on the selection of syndication partners, emphasizing the role of prior relationships, similarity, and network position. In line with studies on strategic alliances, lead investors tend to prefer partners with whom they have direct or indirect prior ties, as these relationships increase trust and reduce uncertainty. Additionally, VCs are more likely to syndicate with partners that are similar in terms of investment focus, experience and past success, as well as with

firms occupying central or high-status positions in the syndication network. More recent contributions highlight the importance of social conditions in partner selection, showing that shared educational and professional backgrounds among VC professionals influence syndication patterns and that syndication invitations may resemble a form of social exchange or gift. Regardless of whether partner selection is driven primarily by deal-specific contributions or relationship-specific considerations, a VC firm's ability to attract syndication partners and to receive invitations to join syndicates depends on its characteristics and perceived opportunities as a partner. Consequently, the composition of syndicates reflects the needs, opportunities, and strategic positions of the participating VC firms (Jääskeläinen & Mikko, 2012).

Despite the relevance of syndicate composition, only a limited number of studies have examined how the size and structure of syndicates affect governance, involvement, and performance. While empirical research has documented associations between syndicate composition and outcomes such as venture involvement, governance arrangements, performance, internationalization, and exit, these aspects are often treated as control variables rather than as focal mechanisms of value creation. A more coherent stream of research has focused on syndicate dynamics at the termination stage of investments. These studies suggest that larger syndicates may suffer from coordination problems, free-riding, and escalation of commitment, reducing their ability to terminate poorly performing ventures or to achieve successful exits in the absence of a clearly dominant lead investor. At the portfolio level, evidence also indicates that VC firms involved in larger syndicates may experience higher failure rates, further underscoring the importance of understanding syndicate dynamics.

These findings point to several important research gaps. First, despite the centrality of syndicate composition and internal dynamics, there is little direct evidence on the specific mechanisms through which syndication affects venture and VC firm performance, and on how the roles and contributions of individual syndicate members shape these mechanisms. Second, if partner selection is a key determinant of syndicate formation, then the desirability of a VC firm as a syndication partner directly affects its opportunities to syndicate. How these opportunities interact with firm-level needs and how they influence the strategic use of syndication remain underexplored. Third, the emphasis on partner selection implies that VC firms may actively manage their portfolio of syndication relationships as part of their broader strategy. However, the extent to which VC firms engage in such partner portfolio management has not been systematically examined (Jääskeläinen & Mikko, 2012).

The distinction between lead and non-lead investors further enriches the analysis of syndication. While most studies adopt the perspective of a VC firm deciding whether to syndicate or invest alone, the formation of a syndicate necessarily requires other VC firms willing to participate. Joining a syndicate—particularly as a non-lead investor—offers specific operational advantages. Non-lead investors can expand their portfolios while committing substantially fewer managerial resources, as the lead investor typically assumes responsibility for monitoring, governance, and coordination with the venture. This allows non-lead VCs to leverage their managerial capacity and increase portfolio size efficiently. In addition, syndication invitations constitute an important source of deal flow, extending the opportunity set of invited VC firms and reducing screening costs, as proposed investments are pre-screened by the lead investor. While these benefits suggest that the availability of potential syndication partners is generally not a constraint, more critical questions concern how VC firms gain access to preferred partners and how participation in syndicates shapes future syndication opportunities. Ultimately, these issues converge on the problem of partner selection, which lies at the heart of syndicate formation and evolution (Jääskeläinen & Mikko, 2012).

2.3.2 Antecedents of syndication

When studies analyze venture capital syndication, they usually focus on its direct benefits, such as risk sharing, improved deal flow, superior investment selection, and enhanced value creation. These positive outcomes can be better understood by investigating the antecedents of syndication.

From a functional point of view, the necessity of syndication comes from the role of venture capitalists as informed financial intermediaries operating in an environment characterized by high uncertainty, asymmetric information, and agency problems. Syndication investments can be interpreted as a vehicle for VC firms that helps to share information, skills, and monitoring capabilities, which improves the analysis of ventures before investment and facilitates more effective monitoring and involvement after investment. From this perspective, syndication improves the efficiency of the intermediation process by reducing information and agency costs and increasing the likelihood and potential magnitude of successful investment outcomes.

In addition to this functional point of view, syndication is also driven by strategic motivations linked to the competitive nature of the venture capital industry. Venture capital funds have finite lifetimes, and their ability to raise future funds and their possibility to have

higher returns depend on their realized performance relative to other VC firms. This creates strong incentives for investors to structure their investment activities, including syndication decisions, in ways that maximize both absolute and relative performance.

Syndication can be seen as a vehicle that allows VC firms to access higher-quality deals, share both financial and strategic risks, and leverage the reputation and networks of syndicate partners. It becomes a strategic tool that helps VC firms to improve their competitive position, improve their curricula, and ultimately secure their survival and growth in the market for venture capital (Jääskeläinen & Mikko, 2012).

2.3.3 Reasons of syndication

Continuing the analysis from the antecedents that has been examined, venture capital syndication is explained in the literature through a variety of motivations that operate both at the venture level and at the VC firm level. At the venture level, two main categories of motivations emerge.

First, syndication is often a necessity dictated by information asymmetries and agency problems between ventures and investors. Studies on contracting suggest that syndication, or a commitment to syndication, can serve as a mechanism to mitigate moral hazard and asymmetric information, ensure credible commitment to both the continuation and abandonment of ventures, protect intellectual property, and align the interests of financial and strategic investors (Jääskeläinen & Mikko, 2012).

In addition, syndication facilitates more robust investment selection, as multiple independent VCs evaluate the same project before investment or before the successive steps of the investments. According to the selection hypothesis, joint evaluation allows investors to learn from each other's perspectives, leading to more accurate and complete assessments than those conducted by a single VC (Lerner, 1994). From this perspective, syndication primarily reflects the functional antecedent of venture capital, as it improves the efficiency of financial intermediation by reducing information and agency costs.

A second set of venture-level motivations relates to the characteristics and financing needs of the venture itself. In many cases, the capital requirements of high-growth ventures are too large relative to the financial resources of individual VC firms, making syndication a necessary condition for participating in the deal (Brander, Amit, & Antweiler, 2002). Moreover, syndication allows VCs to reduce their exposure to venture-specific, non-systematic risk without decreasing expected returns, as diversification can be achieved by investing in a larger number of companies (Sophie Manigart, 2002). Syndication also

contributes to the mitigation of agency problems and affects the allocation of control rights within the venture, which is a key issue in venture capital financing (Brander, Amit, & Antweiler, 2002). While these motives mainly reflect functional considerations, they may take on a strategic dimension when syndication is repeatedly used to compensate for limited selection or value-adding capabilities at the VC firm level.

In addition venture-specific considerations, syndication is also driven by motivations at the VC firm level that are more clearly linked to strategic antecedents. VC firms use syndication as part of their overall investment strategy to leverage and acquire key resources such as capital, expertise, market-specific knowledge, and deal flow (Jääskeläinen & Mikko, 2012). With syndication, VC firms can participate in larger investments, extend their selection and value-adding capabilities through partners, and gain access to pre-screened deal flow via syndication invitations from other VC firms. In addition, syndication may involve strategic behavior such as collusion, where VCs improve their bargaining position by contracting together rather than competing (Brander, Amit, & Antweiler, 2002).

Syndication also plays an important role in the management of external perceptions and interorganizational relationships, which further emphasizes its strategic nature. VC firms have been shown to engage in window-dressing behavior by associating themselves with successful ventures or exits in order to enhance their perceived performance (Lerner, 1994). In this perspective, syndication allows VCs to invest in later-stage ventures that are closer to exit, even when much of the value has already been created. In addition, associations with high-status syndication partners contribute positively to reputation and legitimacy, which are particularly important for attracting future funding from limited partners and establishing long-term competitive positioning (Jääskeläinen & Mikko, 2012).

Finally, the literature suggests that the relative importance of these motivations is contingent on firm-specific and contextual factors. Empirical evidence shows that the prominence of financial, selection, value-adding, and deal flow motives varies depending on the investment stage, size, specialization, reputation, and competitive environment of the VC firm (Jääskeläinen & Mikko, 2012). This contingency helps explain the inconclusive findings in the literature regarding the dominance of specific motivations. Overall, existing research highlights the need to move beyond a simple listing of syndication motives and to adopt a more cause-based approach that distinguishes between functional and strategic antecedents, while situating syndication within the broader strategy and context of individual VC firms.

2.3.4 Possible disadvantages of syndication

Despite the documented benefits and analyzed reasons of venture capital syndication, the literature also highlights several potential disadvantages that may negatively affect the efficiency of the investment and the governance of the portfolio company.

One important potential disadvantage regards coordination problems among syndicate members. When multiple investors are involved, decision-making processes tend to become more complex and slower, particularly when investors have different backgrounds in terms of experience, strategic objectives, risk preferences, or investment horizons. These types of coordination frictions may obstruct the venture's ability to respond promptly to changing market conditions and can reduce organizational flexibility at critical stages of firm development.

A second potential problem relates to free-riding incentives in monitoring and value-adding activities. In syndicated investments, each venture capitalist may rely on other syndicate members to provide monitoring, strategic advice, and operational support. As a result, individual investors may reduce their own effort, leading to a sub-optimal aggregate level of involvement. Although syndication is often justified as a mechanism to pool expertise, the presence of free-riding incentives can weaken the overall effectiveness of investor engagement, particularly when responsibilities are not clearly allocated among syndicate members.

Syndication may also underline conflicts of interest between different investors in the same group. Differences in bargaining power, reputation, or ownership stakes can lead dominant investors, often the lead venture capitalists, to pursue strategies that maximize their private benefits rather than the joint value of the investment. These conflicts are especially salient in decisions regarding follow-on financing, exit timing, or exit mode, where investors' payoff structures and reputational concerns may diverge. Such intra-syndicate conflicts can ultimately spill over into the relationship with the entrepreneurial firm, increasing governance frictions.

Another limitation emphasized in the literature is the dilution of individual incentives. Because the returns from value-enhancing activities are shared among all syndicate members, each investor internalizes only a fraction of the benefits generated by their own effort. Even in the absence of explicit free-riding, this partial internalization of returns may reduce the optimal level of monitoring and advisory effort compared to a non-syndicated investment, where incentives are fully aligned with individual outcomes.

Finally, syndicated investments are often associated with an higher complexity of the contracts and transaction costs. The necessity to coordinate multiple investors requires more detailed contractual arrangements, including the weighted allocation of control rights, voting mechanisms, and dispute resolution procedures. These more complex contracts increase negotiation costs and may reduce efficiency, particularly in smaller or early-stage investments where flexibility and speed are critical (Douglas Cumming, 2007).

2.4 Firm performance and measures of success

The measurement of firm performance is a central concept in business and strategic management, as it allows organizations to assess the direction of their activities and the effectiveness and efficiency of managerial decisions (Ebrahim Mohammed Al-Matari, 2014). Performance measurement refers to the evaluation of how organizational actions contribute to desired outcomes and to the translation of complex organizational realities into interpretable and communicable indicators that support decision-making and continuous improvement (Neely, Gregory, & Platts, 1995) (Lebas, 1995). Moreover, firm performance is closely linked to firm value and shareholder wealth, as sustained performance over time enhances investor confidence, facilitates access to capital and supports long-term growth. In this context, effective corporate governance plays a key role in shaping firm performance and overall organizational well-being (Ebrahim Mohammed Al-Matari, 2014).

Due to the increasing complexity of modern organizations, firm performance is widely recognized as a multidimensional construct encompassing different but complementary dimensions. Financial performance represents the most traditional dimension and captures a firm's ability to generate profits and create value through accounting-based indicators (Venkatraman & Ramanujam, 1986). Market performance reflects external stakeholders' evaluations and forward-looking expectations (Tobin, 1969), while operating performance concerns the efficiency and quality of internal processes (Kaplan & Norton, 1996). In entrepreneurial contexts, additional dimensions such as successful exit, innovation and survival are frequently adopted to capture long-term outcomes under conditions of uncertainty (DeTienne, 2010) (Schumpeter, 1934).

Company performance cannot be interpreted independently of its life cycle phase, as objectives, observable results and criteria change over time (Berger & Udell, 1998). In the early stages, characterised by high uncertainty and negative cash flows, traditional financial measures are of little use. In fact, in this context, investors focus primarily on the survival of

the company and its ability to seize future opportunities (Gompers P., 1995; Berger & Udell, 1998). In the growth phase, operational and market performance indicators, such as revenue growth and resource efficiency, become more important, as they reflect the ability to scale the business model (Berger & Udell, 1998). Finally, in more mature phases, the assessment of success shifts towards financial performance and the possibility of a successful exit, which is particularly relevant among late-stage and private equity investors (Kaplan & Strömberg, 2008).

Similarly, investors' objectives also vary throughout the life cycle of the company: business angels and early-stage venture capitalists favour continuity and development of the business project, while later-stage investors place greater emphasis on measurable financial returns (Gompers P., 1995; Kaplan & Strömberg, 2008). It follows that the impact of syndication on performance cannot be considered uniform, making it appropriate to consider different dimensions of performance separately.

3. Methodology: Meta-Analysis

3.1 Overview of Methodological Approaches

3.1.1 Meta-Analysis as a Quantitative Research Method

Meta-analysis is a statistical method widely used in scientific research to quantitatively combine and synthesize the results of independent empirical studies addressing the same topic. It arises from the need to provide a structured synthesis of empirical evidence from multiple studies, overcoming the information limitations of individual contributions, such as small samples or inaccurate results, and enabling a comprehensive assessment of the findings produced by the literature (Paul & Barari, 2022).

Historically, meta-analysis has been developed and applied in medical, health, and psychological research since the 1970s and 1980s. In these contexts, the presence of numerous studies based on small samples and often conflicting results made it difficult to draw reliable conclusions. Only later this approach was adopted in economics, management, and finance, in response to the growing availability of quantitative empirical evidence (Geyer-Klingenberg, Hang, & Rathgeber, 2020).

Unlike narrative reviews, which are mostly based on a qualitative analysis of studies, meta-analysis uses comparable quantitative measures, called effect sizes. These measures allow for the aggregation of results from articles with different contexts and heterogeneous empirical designs. This allows for a coherent synthesis even when there is significant variability among the studies analysed.

The primary objective of meta-analysis is twofold. First, it aims to estimate an average effect that reflects the overall evidence produced by the empirical literature on a given relationship. Second, it improves the precision of the estimates compared to those obtained from individual studies. The process of aggregating results reduces the uncertainty associated with small sample sizes or statistically weak results and highlights relationships that would have been difficult to identify from studies considered alone (Stanley & Doucouliagos, 2012). Therefore, this type of analysis helps strengthen the robustness of the conclusions drawn and allows for a rigorous approach to the complexity that characterizes many economic and financial studies.

3.1.2 Meta-Analytic Approaches

Meta-analysis consists of several steps, which involve theoretical and operational choices that significantly influence the final results. As emphasized in the methodological literature, meta-analysis does not represent a rigid set of standardized procedures or a univocal practice guideline, but rather a structured decision-making process that must be adapted to the nature of the research question and the characteristics of the available empirical literature (Borenstein, Hedges, Higgins, & Rothstein, 2009) (Geyer-Klingeberg, Hang, & Rathgeber, 2020).

Definition of the research question

A first step can be identified: defining the research question. This step represents the starting point for all meta-analyses. The research question can focus on estimating a direct mean effect, when aiming to quantify the overall strength of a relationship between two variables; analysing moderation effects, when attempting to explain the variability of results observed across different studies; or examining more complex relationships that include mediating mechanisms, requiring more sophisticated models and greater homogeneity of measures. This first step is crucial and must be clearly defined from the outset, as it determines subsequent choices regarding effect size and the meta-analytic method adopted (Borenstein, Hedges, Higgins, & Rothstein, 2009) (Stanley & Doucouliagos, 2012).

Literature review

The second macro-step consists of the literature review and identification of studies relevant to the analysis. In this phase, more restrictive selection strategies can be adopted, for example, limiting articles published exclusively in peer-reviewed journals, or a more inclusive approach that also considers working papers and unpublished contributions. The methodological literature highlights that overly selective strategies can amplify the risk of publication bias, while more inclusive approaches allow for the full exploitation of the available information base (Stanley & Doucouliagos, 2012). In this step, it is important to track the selection criteria applied through clear and detailed documentation of the process, for example, with standardized flowcharts such as the PRISMA flow diagram (Moher, Liberati, Tetzlaff, & Altman, 2009).

Choice of effect size

Effect size is a quantitative measure of the magnitude of a phenomenon used to answer a research question of interest and to enable meaningful comparisons between studies, regardless of sample size (Kelley & Preacher, 2012). Meta-analyses can rely on statistical measures, such as correlation coefficients or partial correlations, which facilitate comparability between heterogeneous studies but provide limited information on the economic significance of the effects. Alternatively, they can rely on economic measures, such as elasticities, abnormal returns, or regression coefficients, which allow for a more direct interpretation of the results but require greater homogeneity in the empirical specifications of the primary studies (Borenstein, Hedges, Higgins, & Rothstein, 2009) (Stanley & Doucouliagos, 2012). Each study provides a point estimate of the effect and an estimate of its sample variance, which in modern meta-analysis frameworks is treated as known and used to determine the weight assigned to each observation in the aggregation process.

Data coding

After identifying studies and choosing an effect size measure, it is necessary to extract the data and key characteristics of the primary studies. The data must be coded and entered into a well-structured database. Clear and consistent coding procedures are essential for comparing studies and ensuring the reliability of subsequent analyses (Borenstein, Hedges, Higgins, & Rothstein, 2009).

Aggregation of effect sizes

An additional step concerns the method of aggregating effects. The literature distinguishes between a common-effect model, a fixed-effects model, and a random-effects model, which differ in the assumptions made about the underlying true effects across studies. Consider a set of K independent studies, each providing an estimate $\hat{\theta}_j$ of a study-specific effect θ_j , with associated estimated variance $\hat{\sigma}_j^2$. The basic model can be written as

$$\hat{\theta}_j = \theta_j + \varepsilon_j, j = 1, \dots, K,$$

where $\varepsilon_j \sim \mathcal{N}(0, \hat{\sigma}_j^2)$. In all cases, the overall effect is estimated as a weighted average of the observed effect sizes,

$$\hat{\theta}_{pop} = \frac{\sum_{j=1}^K w_j \hat{\theta}_j}{\sum_{j=1}^K w_j},$$

with weights w_j depending on the adopted model.

Under the *common-effect model*, a single true effect is assumed to underlie all studies, such that $\theta_j = \theta$ for all j . Observed differences across studies are therefore attributed exclusively to sampling error, and the pooled effect coincides with this common parameter. In practice, inverse-variance weights are used, $w_j = 1/\hat{\sigma}_j^2$, an approach that is appropriate only when a high degree of homogeneity across studies can reasonably be assumed.

The *fixed-effects model* relaxes this assumption by allowing each study to have its own true effect size θ_j , which is treated as fixed rather than randomly drawn. In this case, inference is restricted to the set of studies included in the meta-analysis, and the parameter of interest is the weighted average of the study-specific true effects, typically approximated using inverse-variance weights.

Finally, the *random-effects model* assumes that true effect sizes vary across studies because they are drawn from a broader population of effects. This framework can be expressed as:

$$\hat{\theta}_j = \theta + u_j + \varepsilon_j,$$

where $u_j \sim \mathcal{N}(0, \tau^2)$ captures between-study heterogeneity. The target parameter is the mean effect in the population of studies, which is estimated using weights that account for both within-study variance and between-study variability,

$$w_j = \frac{1}{\hat{\sigma}_j^2 + \hat{\tau}^2}$$

Given that economic and financial research is typically characterized by substantial heterogeneity across studies, the literature generally favours random-effects models, as they provide a more realistic and conservative synthesis of empirical evidence (Geyer-Klingenberg, Hang, & Rathgeber, 2020) (StataCorp. 2025. Stata 19 Meta-Analysis Reference Manual . College Station, TX: Stata Press.).

Heterogeneity

Effect sizes of individual studies may be subject to variability due to differences in the samples studied. This is a natural phenomenon, but when this variability exceeds the sample size, heterogeneity between studies comes into play, requiring dedicated study (Deeks, Higgins, & Altman, 2017). Heterogeneity can be due to various causes, and its assessment is performed using indicators that allow for the quantification and interpretation of its impact (Borenstein, Hedges, Higgins, & Rothstein, 2009).

A useful tool for visualizing heterogeneity is the *Forest Plot*. The Forest Plot is a graph that shows, in a first section, the effect sizes of each study with their corresponding confidence intervals. The weight of each study is proportional to the size of the square drawn on the reference line, while the confidence interval is represented by the width of the lines crossing each square. At the bottom of the graph, the overall effect size is shown, represented by a diamond, also with a confidence interval. Measures of heterogeneity such as I^2 and H^2 , and tests of homogeneity and significance are usually also reported.

Publication Bias

Publication bias occurs when selected studies systematically differ from observed studies. This can occur, for example, when smaller studies with non-significant results are excluded from publication. This results in a distortion of meta-analytic results and an overestimation of the average effect.

To identify such biases, both graphical tools and statistical tests can be used. These include the *Funnel Plot*, that is a scatterplot used to assess skewness in the distribution of effect sizes. The shape of the scatterplot should resemble a symmetrical inverted funnel, in the absence of publication bias. (Stanley & Doucouliagos, 2012).

Meta-analytic methods

A crucial step concerns the choice of meta-analytic method. The literature distinguishes three main approaches: traditional meta-analysis, meta-regression analysis, and meta-analytic structural equation modelling (MASEM), each of which addresses different research objectives and presents specific information requirements (Geyer-Klingenberg, Hang, & Rathgeber, 2020).

Traditional meta-analysis is the most widespread approach and is the starting point for most meta-analytic applications. It consists of aggregating the effect sizes of individual studies to estimate a weighted average effect. This approach aims to synthesize the available empirical evidence and provide a comprehensive assessment of the strength and direction of a relationship between variables. Traditional meta-analysis is a useful tool when the literature contains a sufficient number of comparable studies, but it does not necessarily require a high level of standardization of empirical specifications, making it suitable for contexts characterized by methodological heterogeneity (Hunter & Schmidt, 2004).

Meta-regression analysis can be seen as an extension of the traditional approach. It introduces variables, called moderators, to analyse the origins of the heterogeneity of empirical results.

In this setting, the estimated effect size from each study is expressed as a function of observed study characteristics:

for fixed effect meta-regression: $\hat{\theta}_j = \mathbf{x}_j\boldsymbol{\beta} + \varepsilon_j$ (Greenland & Robins, 1985);

for random effect meta-regression: $\hat{\theta}_j = \mathbf{x}_j\boldsymbol{\beta} + u_j + \varepsilon_j$ (Berkey, Hoaglin, Mosteller, & Colditz, 1995);

where $\mathbf{x}_j$ is a vector of moderators, $\boldsymbol{\beta}$ is the associated coefficients, u_j a study-specific random effect capturing residual heterogeneity, and ε_j the sampling error.

Through meta-regression, it is possible to assess whether and to what extent certain study characteristics, such as geographical context, analysis period, or sample type, influence the estimated effect size. This approach is particularly useful for fragmented empirical results, where discrepancies cannot be explained solely by sampling error. Meta-regression analysis therefore allows us to move from a purely descriptive synthesis to a more interpretive analysis (Hunter & Schmidt, 2004).

Meta-analytic structural equation modeling (MASEM) represents the most advanced approach considered and allows testing complex theoretical models using aggregated data. Specifically, MASEM allows for the simultaneous estimation of multiple relationships between variables and the assessment of complex causal structures based on meta-analytic methods. However, this method requires a high degree of standardization of the measures used in primary studies and very rich information, conditions that are unlikely to be met in empirical studies in economics and finance. For this reason, although MASEM offers considerable theoretical potential, its use remains limited (Hunter & Schmidt, 2004).

Multilevel meta-regression

An important methodological step to consider is managing dependencies between observations. When multiple estimates are available from the same study, treating observations as independent may lead to biased standard errors and compromise statistical inference. For this reason, the literature suggests adopting strategies such as selecting a single representative estimate or using *multilevel meta-analytic models*, which take into account the hierarchical structure of the data and improve the robustness of the results (Hunter & Schmidt, 2004).

In the three-level random-intercepts meta-regression model, individual effect sizes $\hat{\theta}_{ij}$ are modelled as:

$$\hat{\theta}_{jkr} = \mathbf{x}_{jkr}\boldsymbol{\beta} + u_j^{(3)} + u_{jk}^{(2)} + \varepsilon_{jkr}$$

where: $j = 1, 2, \dots, M, k = 1, 2, \dots, m_j$ and $r = 1, 2, \dots, m_{jk}$,

$u_j^{(3)} \sim N(0, \tau_3^2), u_{jk}^{(2)} \sim N(0, \tau_2^2)$ and $\varepsilon_{jkr} \sim N(0, \sigma_{jkr}^2)$, with σ_{jkr}^2 's being the known sampling variances. The random intercepts $(u_j^{(3)}, u_{jk}^{(2)})$ and the sampling error (ε_{jkr}) are independent. τ_3^2 and τ_2^2 are the random-intercepts variances at the third and second levels, respectively (Goldstein, Yang, Omar, Turner, & Thompson, 2000).

This allows the total variance of the estimated effect sizes to be decomposed into within-study and between-study components.

Moderator analysis

Once a multilevel meta-regression framework is established, a natural next step is to introduce moderator variables. Moderators represent contextual or methodological characteristics of the primary studies that may affect the strength or direction of the estimated relationship, allowing part of the observed heterogeneity across studies to be explained rather than treated as purely random variation.

Within the meta-analytic process, it is essential to track and explicitly disclose all methodological decisions made to ensure the replicability and credibility of meta-analytic results (Borenstein, Hedges, Higgins, & Rothstein, 2009).

Robustness analysis

Another important methodological step in the meta-analytic process concerns robustness analyses, or sensitivity analyses. Meta-analysis, in fact, is not limited to estimating an average effect, but requires that the results obtained be stable and not influenced by the weighting of certain elements (Borenstein, Hedges, Higgins, & Rothstein, 2009).

In particular, it is appropriate to assess whether the aggregate estimate is strongly dependent on individual empirical contributions, especially when high levels of heterogeneity between studies are observed. A useful tool for this assessment is sensitivity analysis, which allows us to verify how much the overall estimate varies with changes in the set of studies considered or the assumptions adopted in the model.

The goal of this procedure is to test stability by providing an indication of its reliability with respect to potentially influential observations. This helps ensure the transparency and

credibility of the entire meta-analytic process (Borenstein, Hedges, Higgins, & Rothstein, 2009).

3.2 Methodology Adopted

3.2.1 Definition of the Research Question

The literature has paid considerable attention to the role of syndication in corporate financing and development processes, analysing its effects in very different contexts, samples, and empirical approaches. However, as previously noted, existing studies addressing this topic present heterogeneous and sometimes conflicting results, making it difficult to draw unequivocal conclusions about the overall impact of syndication on corporate performance (Geyer-Klingenberg, Hang, & Rathgeber, 2020).

In light of these considerations, this research aims to answer the following research question: *“What is the average effect of syndication on corporate success, based on existing empirical evidence?”*

To answer this question, it is necessary to integrate the findings of independent studies and provide a comprehensive quantitative synthesis of the literature, consistent with the principles of meta-analysis applied to economics and management sciences (Paul & Barari, 2022).

3.2.2 Query definition

In order to answer to the defined research question, a computer-based literature search was conducted across several databases for all years available to ensure broad coverage of studies relevant to the research question.

This extensive search strategy addresses a central methodological principle in meta-analysis: reducing the risk of upstream selection bias. The validity of a meta-analysis depends directly on the completeness of the study collection, as the method cannot correct for systematic omissions ex post (Borenstein, Hedges, Higgins, & Rothstein, 2009).

The risk of publication bias and selection bias is particularly relevant in economic contexts, where non-significant results may remain unpublished, and a broad search reduces this structural risk (Stanley & Doucouliagos, 2012).

The collection of studies was performed on three different databases through a search query that included variations of keywords of syndication and venture capital. The selection of the

databases was made after reviewing previous meta-analyses and choosing the most frequently used sources.

The bibliographic search strategy was developed through an iterative and progressive process of refining the query, aimed at identifying relevant scientific contributions on the topic of syndication and co-investment in the financial sector, maintaining a balance between the breadth of the search and the relevance of the results.

The research was initially launched with a broad exploratory query designed to extensively map the existing literature. In this preliminary phase, the query combined terms related to forms of collaborative investment (*syndication, co-investment, partnership*), start-ups and new businesses, and economic and financial outcomes in terms of performance, productivity and growth, within the context of early-stage finance and investment. The initial query was as follows:

("syndicat" OR "consortium" OR "partnership" OR "co-investment*" OR "joint venture")
AND ("startup*" OR "start-up*" OR "start up*" OR "new venture*" OR "emerging
compan*" OR "emerging firm*" OR "emerging business*" OR "venture*" OR "business")
AND ("productivity" OR "performance*" OR "efficiency" OR "effectiveness" OR "output*" OR "result*" OR "return*" OR "valuation" OR "growth" OR "scalability")
AND ("finance" OR "fund*" OR "venture capital" OR "angel investment*" OR "early-stage
investment*" OR "seed capital")*

Although this initial approach provided a very broad overview of the field of research, the results returned by the main bibliographic databases were only partially relevant to the specific objectives of the thesis, and in some cases potentially led to the exclusion of studies that would have been of interest in the research process.

For this reason, the query was progressively refined and restructured by eliminating certain overly generic constructs (such as those directly related to performance), revising terms relating to target companies, such as eliminating the term start-up, which would have narrowed the scope of the investigation too much, and focusing more on investment mechanisms rather than company results. In particular, different terminological variants for the concept of co-investment were tested, the weight of ambiguous terms such as “consortium” was reduced, and the scope was broadened to include equity-based investments, including actors such as venture capital, business angels and private equity.

Following this iterative process, the final query was defined, deemed the most appropriate to represent the phenomenon under study and to ensure a good compromise between completeness and relevance of the selected literature. The final query adopted for the collection of articles is as follows:

("syndicat" OR "co-invest*" OR "coinvest*" OR "co invest*") AND ("financ*" OR "fund*" OR "venture capital*" OR "angel investment*" OR "business angel*" OR "angel investor*" OR "early-stage investment*" OR "seed capital" OR "private equity" OR "equity" OR "entrepreneurial financ*").*

3.2.3 Database research and first results

The search query was applied to three different bibliographic databases, *Web of Science*, *Scopus* and *ProQuest*, selected following a preliminary analysis aimed at identifying the most comprehensive sources best suited to the objectives of this research. These databases are widely recognised in the literature for their broad disciplinary coverage and the reliability of the publications indexed, particularly in the fields of economics, management and innovation studies.

Since each database has specific characteristics in terms of structure, indexing criteria and query tools, the query was appropriately accompanied by the application of dedicated filters for each platform. In particular, filters relating to source type, subject area and language were used in order to obtain more targeted, consistent and comparable results across the different databases.

Web of Science

The Web of Science search was restricted to published articles, published in English in the research area of Business Economics. The research yielded a total of 1,230 records.

Scopus

In Scopus, the research was restricted to published journals articles written in English and classified under the subject areas of Economics, Econometrics and Finance, Business Management, Accounting and Social Sciences. It led to the inclusion of 1,042 articles.

ProQuest

The ProQuest filters were applied to select English peer-reviewed journal articles, categorized as academic sources. A comprehensive subject filter was adopted to restrict the research to publications focused on economic, financial, and entrepreneurial themes, such as innovation, venture capital investment, entrepreneurship and business, while explicitly excluding studies centred on political, social, cultural, environmental, and historical topics, as well as qualitative case studies and policy-oriented analyses not directly related to the economic and financial dimensions of the research. The search resulted in a total of 824 articles included.

Table 1 provides an overview of the detailed number of results, from the number of total articles without the application of the filters, to the final number of articles.

Table 1: Detailed number of databases results

DATABASE	Number of total articles	Number of total articles after the application of filters
Web of Science	7,772	1,230
Scopus	1,788	1,042
ProQuest	19,552	824

After the first extraction of the articles from the three databases, the total number of studies considered was 3,096.

870 of the contributions identified were duplicates across the various databases analyzed; therefore, following a careful screening phase the unique identification of articles was carried out on the basis of the DOI. As a result, the final number of articles included in the analysis was 2,226.

3.2.4 Studies' evaluation with inclusion and exclusion criteria

After obtaining the initial number of articles and collecting them in an Excel database, several hierarchical screening steps were applied to identify the final set of contributions used for the analysis, as summarized in *Figure 2*.

Since meta-analysis is a process that requires explicit and replicable methodological decisions (Borenstein, Hedges, Higgins, & Rothstein, 2009), the adoption of structured criteria is necessary to ensure conceptual homogeneity across studies, limit biases resulting

from incompatible empirical designs, and enable the replicability of the procedure. Consequently, rigorous screening represents an ex-ante control mechanism.

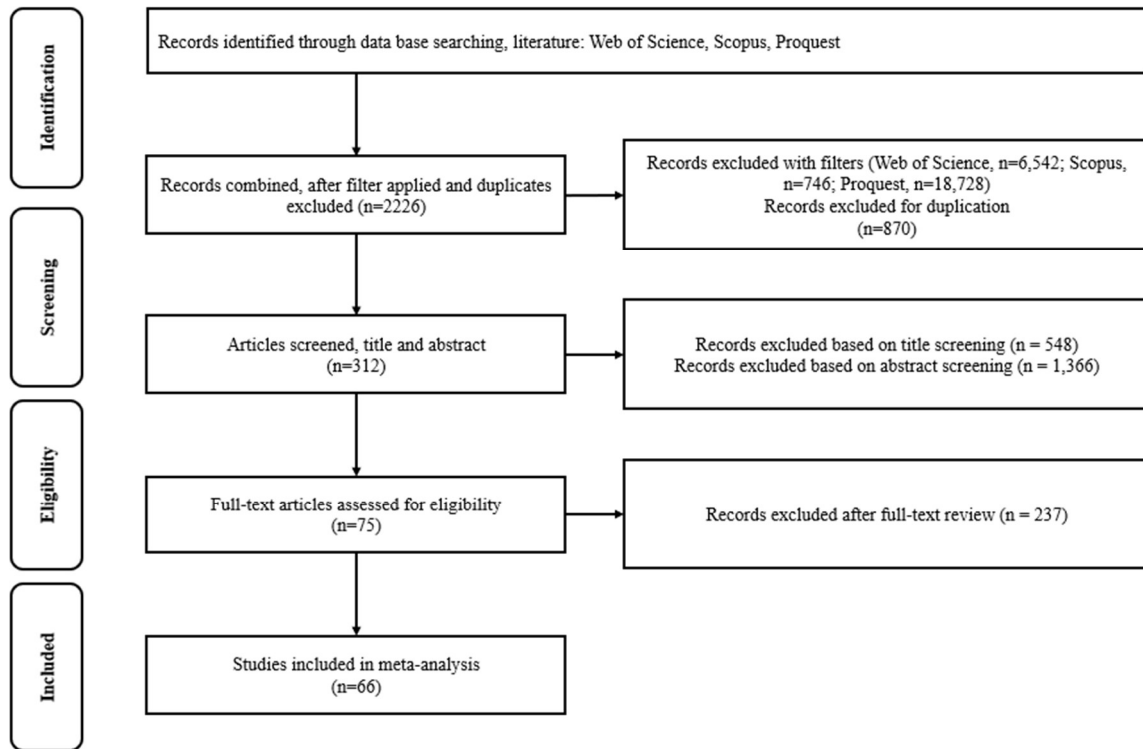


Figure 2: Screening steps

First screening step

The first screening step consisted of high-level analysis based on the reading of the titles and abstracts, with the aim of verifying the relevance of the articles to the research question. The screening was conducted sequentially, starting from the title to assess the overall consistency of each contribution; if the title was relevant, the abstract was read subsequently in order to obtain an overview of the article's content and assess its actual relevance.

This step led to the exclusion of 1,914 articles, of which 548 were excluded based on the title and 1,348 on the abstract, reducing the sample to 312 articles still to be eligible for the analysis.

The reasons for exclusion in this first phase are mainly attributable to the absence of an explicit focus on syndication as the central object of analysis. Numerous contributions, in fact, despite including the term in the search query or referring to generic forms of financial collaboration, were actually focused on different areas, such as syndicated loans, project financing or, more generally, macroeconomic issues, without analysing syndication among investors as an active phenomenon relevant to the growth and success of companies.

In other cases, syndication was treated in a marginal or purely descriptive manner, without constituting the focus of empirical analysis, or was considered exclusively from the point of view of financial intermediaries, such as banks or institutional investors, rather than from the perspective of the funded companies. Additional articles were excluded because they focused on contexts that were not consistent with the objectives of the research, such as specific economic crises, restricted historical periods, or particular sectors.

Second screening step

After this initial phase, a second screening step was carried out with the aim of assessing the suitability of the remaining articles. To this end, all 312 remaining articles were read in full, with a focus on trying to understand whether they could actually be useful in answering the research question.

This second screening phase led to the final inclusion of 75 articles, excluding a further 237. The reasons for exclusion in this second stage were attributable to a lack of substantial consistency between the content of the articles and the research question. In particular, contributions in which syndication, although present in the context of analysis, did not represent the central variable of interest or was not analysed in relation to its effects on the performance and success of the financed companies were excluded.

Studies focusing on forms of debt syndication, such as syndicated loans or bank syndications, as well as those focusing on equity crowdfunding, project financing or other forms of financing not consistent with the scope of syndication between venture capitalists and business angels, were not taken into consideration. Additional articles were excluded because they focused on the effects of syndication on investors, financial intermediaries or relational networks, rather than on the direct effects of syndication on businesses.

Finally, contributions that analysed syndication exclusively in terms of the formation, probability of occurrence or structure of investment alliances, without providing robust quantitative empirical evidence on the impact of syndication on business performance, were excluded. Studies of a predominantly qualitative nature were also excluded, as they did not provide comparable and extractable quantitative data necessary for inclusion in the meta-analysis.

The final number of articles was further reduced to 66 during the subsequent phase of quantitative data collection and extraction. In particular, a further eight articles were excluded because the numerical information reported was not compatible with the requirements necessary for estimating the regression models adopted in this study. In some

cases, the data were not sufficiently detailed or comparable, while in others, the dependent and independent variables considered in the studies were not consistent with those required by the empirical approach of the analysis. Consequently, although these contributions were thematically relevant, they were not suitable for inclusion in the final meta-analysis.

3.2.5 Meta-Analytic Database

The 66 articles included have been examined in detail and relevant characteristics and quantitative data have been extracted, aiming at constructing a structured database suitable for the subsequent meta-analytic analyses and moderator examinations, as reported in the Codebook in Appendix A.

As a first step, a set of fundamental descriptive characteristics of the studies has been recorded, including the article title, authors, DOI, journal of publication, geographical focus, period covered by the analysis (start and end year), and associated sample size. *Table 2* provides an overview of the characteristics of the studies included in the analysis.

Table 2: Articles included in the meta-analysis

	(Author, year)	Title	Sample size	Period considered	Geography
1	(Amore, Murtinu, & Pelucco, 2025)	Family firms in entrepreneurial finance: The case of corporate venture capital	8286	2000 - 2017	America
2	(Muhammad & SERVE, 2025)	Performance of government venture capital (GVC): an Asian perspective	4682	1991 - 2017	Asia
3	(Xia, Hua, Wang, & Peng, 2025)	Leading or facilitating? —The appropriate role of governmental venture capital in China	39634	2007 - 2021	Asia
4	(Dahya & Wu, 2024)	Social capital, syndication, and investment performance: Evidence from PE investing in LBOs	444	1991 - 2004	Worldwide
5	(Ge, Xue, & Zhang, 2025)	Syndicate partner composition of governmental venture capital firms: Evidence from China	6327	1995 - 2020	Worldwide
6	(Laachach, 2024)	Comparing Radical and Incremental Innovation in Venture Capital Syndication: Exploring the Influence of R&D Intensity and Sector-Specific Effects	62	2019 - 2021	Africa
7	(Laachach & Ettahri, 2023)	The effects of organizational learning on innovation and performance of venture capital backed firms: the moderating effect of syndication	78	2018 - 2023	Africa
8	(Yi, Wang, Lyu, & Xia, 2023)	Does venture capital help to promote open innovation practice? Evidence from China	4955	2014 - 2018	Asia

9	(Hirschmann & Fisch, 2023)	IPO performance of portfolio ventures funded by impact investors versus venture capital investors	6796	2007 - 2022	Worldwide
10	(Kirihata, 2023)	The impact of mixed syndication between government and private venture capital on investees in Estonia	612468	2006 - 2015	Europe
11	(Kang, Li, & Oh, 2022)	Venture Capital Coordination in Syndicates, Corporate	10954	1995 - 2015	America
12	(Alperovych, Groh, & Quas, 2020)	Bridging the equity gap for your innovative companies: The design of effective government venture capital fund programs	3041	1995 - 2011	Europe
13	(Khurshed, Mohamed, Schwienbacher, & Wang, 2020)	Do Venture Capital Firms Benefit from International Syndicates?	3309	1996 - 2009	Asia
14	(Nguyen & Vu, 2021)	Does Venture Capital Syndication Affect Mergers and Acquisitions?	809	1990 - 2017	America
15	(Stanfield, 2020)	Skill, syndication, and performance: Evidence from leveraged buyouts	1378	1993 - 2017	America
16	(Hammer, Janssen, & Schwetzler, 2021)	Cross-border buyout pricing	1149	1997 - 2010	Worldwide
17	(Liu, Purda, & Zhu, 2021)	Institutional Influence on Syndicate Structure and Cross-Border Leveraged Buyouts	3699	1986 - 2018	Worldwide
18	(Zhang, 2018)	Gain or pain? New evidence on mixed syndication between governmental and private venture capital firms in China	1005	1995 - 2011	Asia
19	(Kang S. , 2019)	The impact of Corporate Venture Capital Involvement in Syndicate	840	2001 - 2013	America
20	(Jiang, Yang, Yang, & Huang, 2019)	Venture Capital and Corporate Innovation Input from the Perspective of Syndicated Investment	208	2012 – 2017	Asia
21	(Wang & Jiang, 2018)	Effect of Power Source Mismatch on New Venture Performance	1172	2006 – 2014	Asia
22	(Bringmann, Vanoutrive, & Verhetsel, 2018)	Venture capital: The effect of local and global social ties on firm performance	51	2001 – 2008	Europe
23	(Christopoulos, Koeppl, & Köppl-Turyna, 2022)	Syndication networks and company survival: evidence from European venture capital deals	26048	2000 – 2017	Europe
24	(Di Lorenzo & Sabel, 2024)	Corporate Venture Capital and Startup Outcomes: The Roles of Investment Timing and Multiple Corporate Investors	1280	2004 – 2015	Europe
25	(Makarevich, 2018)	Performance feedback as a cooperation “switch”: A behavioral	9837	1970 – 2003	America

		perspective on the success of venture capital syndicates among competitors			
26	(Chahine, Saade, & Goergen, 2018)	Foreign Business Activities, Foreignness of the VC Syndicate, and IPO Value	1086	1995 – 2011	America
27	(Bonini, Capizzi, & Zocchi, 2019)	The performance of angel-backed companies	377	2008 – 2012	Europa
28	(Falconieri, Filatotchev, & Tastan, 2019)	Size and diversity in VC syndicates and their impact on IPO performance	1424	1985 – 2012	America
29	(Shin, 2019)	Network advantage's effect on exit performance: examining venture capital's inter-organizational networks	1137	1990 – 2010	America
30	(Tykvová, 2018)	Legal framework quality and success of (different types of) venture capital investments	8063	2000 – 2013	Worldwide
31	(Ter Wal, Alexy, Block, & Sandner, 2016)	The Best of Both Worlds: The Benefits of Open-specialized and Closed-diverse Syndication Networks for New Ventures' Success	6744	2005 – 2011	America
32	(Chemmanur, Hull, & Krishnan, 2016)	Do local and international venture capitalists play well together? The complementarity of local and international venture capitalists	1757	1989 – 2008	Worldwide
33	(Hahn & Kang, 2017)	Complementary or conflictory?: the effects of the composition of the syndicate on venture capital-backed IPOs in the US stock market	188	2001 – 2010	America
34	(Cumming, Grilli, & Murtinu, 2017)	Governmental and independent venture capital investments in Europe: A firm-level performance analysis	37048	1991 – 2010	Europa
35	(Colombo & Murtinu, 2017)	Venture Capital Investments in Europe and Portfolio Firms' Economic Performance: Independent Versus Corporate Investors	4459	1992 – 2010	Europa
36	(Hua, Wang, & Wang, 2016)	The innovation and performance impacts of venture capital investment on China's small- and medium-sized enterprises	721	2005 – 2014	Asia
37	(Croce, Grilli, & Murtinu, 2013)	Venture capital enters academia: An analysis of university-managed funds	26	1973 – 2010	Worldwide
38	(Bertoni & Groh, 2014)	Cross-Border Investments and Venture Capital Exits in Europe	3199	1994 – 2004	Europa
39	(Kong, Nitani, & Riding, 2016)	Cross-border VC investment in Canadian firms: implications for exit patterns	2444	1999 – 2011	America

40	(Espenlaub, Khurshed, & Mohamed, 2014)	VC Investments and Global Exits	4033	1990 – 2010	Europa
41	(Dai & Nahata, 2016)	Cultural differences and cross-border venture capital syndication	6433	1996 – 2009	Worldwide
42	(Grilli & Murtinu, 2014)	Government, venture capital and the growth of European high-tech entrepreneurial firms	249	1993 – 2010	Europe
43	(Das, Jo, & Kim, 2011)	Polishing Diamonds in the Rough: The Sources of Syndicated Venture Performance	81989	1980 – 2003	America
44	(Clarysse, Bobelyn, & Del Palacio Aguirre, 2013)	Learning from Own and Others' Previous Experience: The Contribution of the Venture Capital Firm to the Likelihood of a Portfolio Company's Trade Sale	2112	1982 – 2009	Europe
45	(Devigne, Vanacker, Manigart, & Paeleman, 2013)	The role of domestic and cross-border venture capital investors in the growth of portfolio companies	2379	1994 – 2004	Europe
46	(Tian, 2011)	The Role of Venture Capital Syndication in Value Creation for Entrepreneurial Firms	10668	1980 – 2005	America
47	(Mahto & Khanin, 2013)	Speed of Venture Financing for Emerging Technology-Based Entrepreneurial Firms as a Function of Founder Reputation	140	1996 – 2001	America
48	(Guo & Jiang, 2013)	Venture capital investment and the performance of entrepreneurial firms: Evidence from China	3766	1998 – 2007	Asia
49	(Chahine, Arthurs, Filatotchev, & Hoskisson, 2012)	The effects of venture capital syndicate diversity on earnings management and performance of IPOs in the US and UK: An institutional perspective	274	1996 – 2006	Worldwide
50	(Smolarski & Kut, 2011)	The impact of venture capital financing method on SME performance and internationalization	36	2002 – 2002	Europe
51	(Nahata, 2011)	Venture capital reputation and investment performance	11327	1991 – 2006	America
52	(Popescu & Xu, 2011)	Comanagers, Information, and the Secondary Market Liquidity of Initial Public Offerings	2701	1993 – 2005	America
53	(Tagliatalata & Barontini, 2025)	Prior co-investments and exits: a study on European venture capital syndicates	753	2000 – 2009	Europa
54	(Giot & Schwiendbacher, 2007)	IPOs, trade sales and liquidations: Modelling venture capital exits using survival analysis	931	1980 – 2003	America
55	(Wiltbank, 2005)	Investment practices and outcomes of informal venture investors	70	1985 – 2005	America

56	(Hochberg, Ljungqvist, & Lu, 2007)	Whom you know matters: Venture capital networks and investment performance	6164	1980 – 2003	America
57	(Brander, Amit, & Antweiler, 2002)	Venture-capital syndication: Improved venture selection vs. The value-added hypothesis	393	1992 – 1998	America
58	(Lehmann, 2006)	Does venture capital syndication spur employment growth and shareholder value? Evidence from German IPO data	107	1997 – 2002	Europe
59	(Lin, Li, Peng, & Zhang, 2017)	Venture capital reputation and portfolio firm performance in an emerging economy: The moderating effect of institutions	519	2009 – 2013	Asia
60	(Bacon-Gerasymenko, 2019)	When do organisations learn from successful experiences? The case of venture capital firms	131	2006 – 2011	Europe
61	(Hill, Maula, Birkinshaw, & Murray, 2009)	Transferability of the venture capital model to the corporate context: implications for the performance of corporate venture units	66	1999 -2001	Worldwide
62	(Yang, Hu, Wu, & Xie, 2018)	Do Better-Networked Venture Capital Firms Always Enjoy Higher Investment Performance? The Contingent Role of China's Institutional Changes	6498	2008 – 2014	Asia
63	(Bubna, Das, & Prabhala, 2020)	Venture Capital Communities	58126	1985 – 2006	America
64	(Huyghebaert, Leuven, & Priem, 2016)	Syndication of European Buyouts and its Effects on Target-Firm Performance	849	1999 – 2009	Europe
65	(Xue, Dang, Shi, & Gu, 2019)	Information Sharing and Investment Performance in the Venture Capital Network Community: An Empirical Study of Environmental-Social-Governance Start-Ups	227	2000 – 2017	Asia
66	(Alvarez-Garrido, 2023)	Move-in Ready or Fixer-Upper? VC Specialization and Start-up Innovation	908	1996 – 2006	Worldwide

Manual coding has been developed to account for variable effects, as well as for moderator and control variables (Paul & Barari, 2022). The data extracted from the analyzed articles cover the period from 1970 to 2023, with most observations concentrated between the early 1990s and 2015, as illustrated in Figure 3. To account for potential structural changes over time, a binary variable was constructed to indicate whether a study considers the period surrounding the 2007-2008 global financial crisis. The variable enables subsequent analyses to assess whether and to what extent the relationship between syndication and performance is influenced by this event.

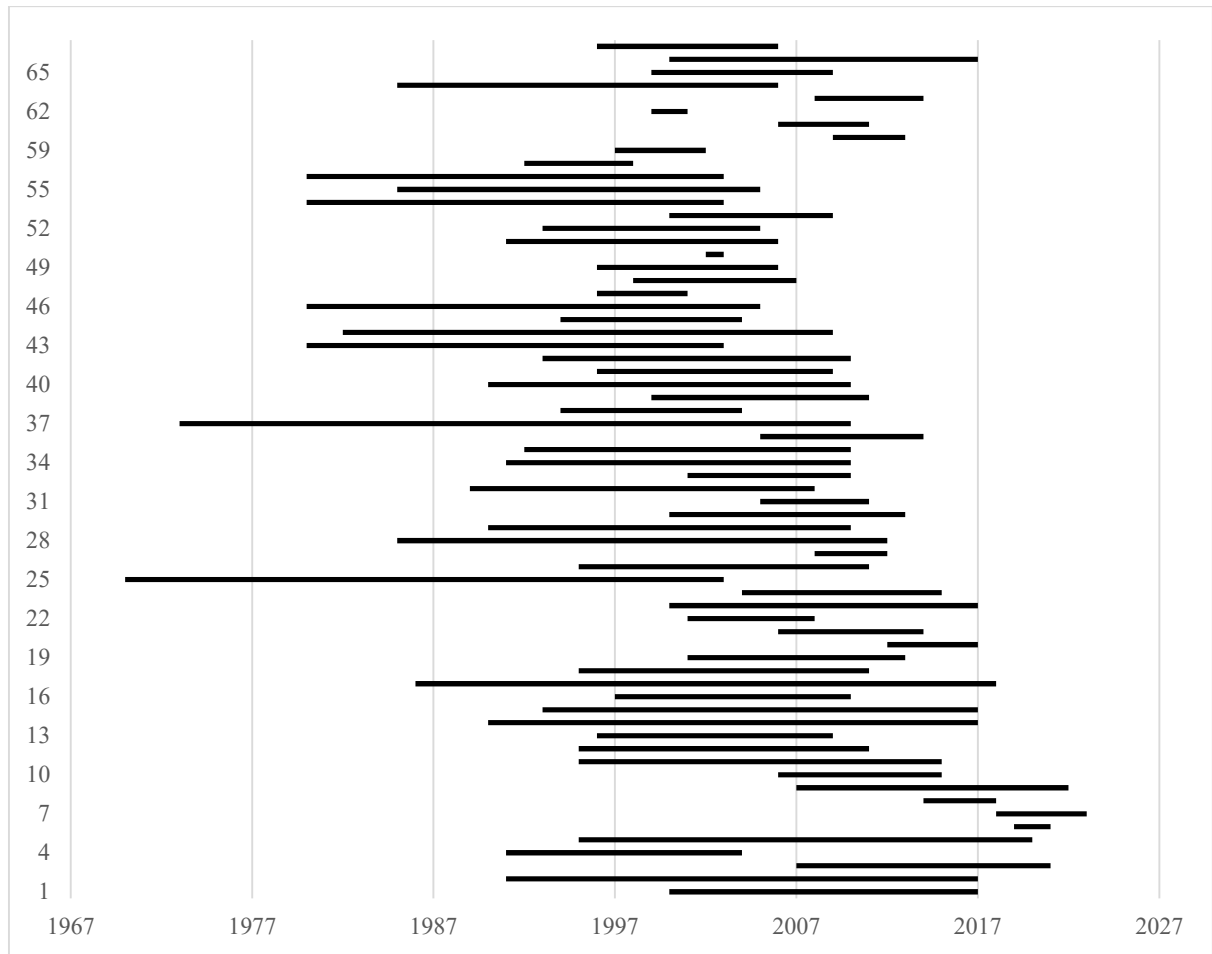


Figure 3: Time Span of Measurement Periods in the Analyzed Articles

In some cases, a single article reported more than one observation of the correlation between syndication and firm performance, all of which were included in the database, resulting in a total of 137 observations.

In line with the approach suggested by the meta-analytic literature, it was therefore decided to retain in the database all effect sizes consistent with the inclusion criteria, even when multiple estimates were derived from the same contribution.

Indeed, selecting a single representative estimate per study can result in a loss of information and introduce elements of arbitrariness in the coding phase (Hunter & Schmidt, 2004).

The formalization of hierarchical models proposed by Goldstein et al. (2000) provides the theoretical foundation for processing data organized at multiple levels, distinguishing between-study variability from within-study variability. This approach allows for the retention of all relevant estimates (Goldstein, Yang, Omar, Turner, & Thompson, 2000).

Any discrepancies identified during the coding process were documented to ensure consistency in the dataset. In particular, the variables related to syndication and performance,

even though they were systematically examined across studies, were characterized by differences in their definition. To address this issue, those variables were classified into subgroups, with five categories identified for syndication and six for performance, in order to group together measures that capture conceptually similar constructs.

The heterogeneity of syndication has been accounted by identifying different dimensions, from its size to the structure and quality. The first subgroup, which is also the most frequent as it is shown in *Table 3*, captures the presence or absence of syndication. It is typically operationalized as a dummy variable, where 1 indicates that investment involves more than one investor and 0 is a single-investor deal. Beyond this initial distinction, multiple articles focus on the number of investors participating in a given deal. This measure aims to capture the intensity of collaborative investment, reflected by the number of investors involved in the syndicate. In addition to the quantitative consideration, the structure of syndicates has been emphasized by almost one-fifth of the studies. The measure is intended to capture heterogeneity in investor types of the syndication, such as governmental, private, corporate, or institutional venture capitalists, as well as domestic and international collaborations. Finally, a smaller yet still substantial share of studies conceptualizes syndication in terms of quality-related and network-based measures. Quality-related proxy emphasizes the capabilities, experience, and specialization of the investors involved in the syndicate, while network-based measure focuses on social embeddedness of syndication and its implications for information flows to access future investment opportunities. Examples of this proxy are closeness centrality, community membership, and intensity of repeated co-investments.

Moreover, the multiple proxies of firm performance identified in the literature have been grouped into coherent subcategories. A first and highly prevalent category captures successful exit outcomes, which commonly measures whether a firm achieves an exit through an IPO, acquisition, buyout, trade sale as well as the likelihood of exit. Alongside exit-based indicators, a large share of studies focus on operational performance, emphasizing firms' growth, profitability, and internal efficiency, for example measuring revenues, sales growth, ROA, ROE, ROS, EBITDA-based ratios, asset growth, and employment growth. Overall, these proxies aim to capture the firm's ability to generate sustainable economic value by improving its operating fundamentals over time. Some studies conceptualize performance in terms of innovation-related measures, reflecting the firm's technological output and innovative capacity as R&D expenditure, innovation inputs or patent counts. Other strands of the literature emphasize financial and market performance. While the first measure focuses on returns generated for investors as internal rates of return, abnormal

returns and exit multiples, the second one captures how firms are valued by capital markets and how investors perceive their growth prospects and risk profiles measuring valuation multiples, IPO underpricing, IPO premiums and Tobin's Q at different time horizons. As a final dimension, some studies conceptualize firm performance in terms of survival, focusing on the firm's ability to remain active and progressing through successive stages of external financing. Rather than capturing immediate value creation, survival-based performance measures the likelihood of obtaining follow-on funding, survival duration, time between financing rounds, and number of financing rounds completed.

Table 3: Coding and frequencies of Syndication and Success proxies

Syndication proxy	N	Performance proxy	N
Syndication (dummy)	60	Successful exit	59
Size of syndication	37	Operational performance	34
Structure of syndication	26	Innovation	13
Quality of syndication	8	Financial performance	12
Network/relational measures	6	Market performance	11
		Survival	8
Total	137	Total	137

Once the main qualitative effects of interest were identified and recorded, other study characteristics were coded in binary form to capture whether specific contextual dimensions were considered in the studies, primarily as control variables, as summarized in *Table 4*. An exception is the *early-stage* variable, which instead identifies studies that focus exclusively on firms at an early stage of development.

Table 4: Variable Summary

Variable	Role of the variable in the original study	Coding question
Early stage	Sample characteristic	Does the study focus exclusively on early-stage firms (e.g., start-ups)?
Geographical proximity	Control/Moderator variable	Does the study account for geographical proximity between investors, or between investors and firms?
Stage	Control/Moderator variable	Does the study consider the firm's general stage of development (beyond early-stage only)?
Investor experience	Control/Moderator variable	Does the study account for investors' experience or expertise?

Diversity of investors	Control/Moderator variable	Does the study consider the heterogeneity and the diversity within the investor syndicate?
Industry type	Control/Moderator variable	Does the study control for the industry or sector in which the firm operates?
2007	Sample characteristic	Does the study include the period surrounding the 2007–2008 global financial crisis?

Geographical proximity is the first binary variable accounted and it captures whether the literature considers the spatial closeness among investors or between investors and the focal firm. Closely related to contextual firm characteristics, the *early-stage* and *stage* indicators capture whether the firm's development stages play a role in shaping investment outcomes. While the first variable exclusively records the firm early stage of development, as start-ups, the second one captures the general firm's development stage. Focusing on investor-related characteristics, *investor experience* identifies whether expertise is considered and it accounts the investors' ability to select, monitor, and support portfolio firms. Along the same investor-related dimension, *investor diversity* refers to the heterogeneity within the syndicate, reflecting the presence of investors with different backgrounds and strategic objectives. Finally, *industry type* indicates whether the sector in which the target firm operates is taken into account in the empirical analysis. *Figure 4* illustrates the frequency with which the variables described above are considered across the analyzed articles.

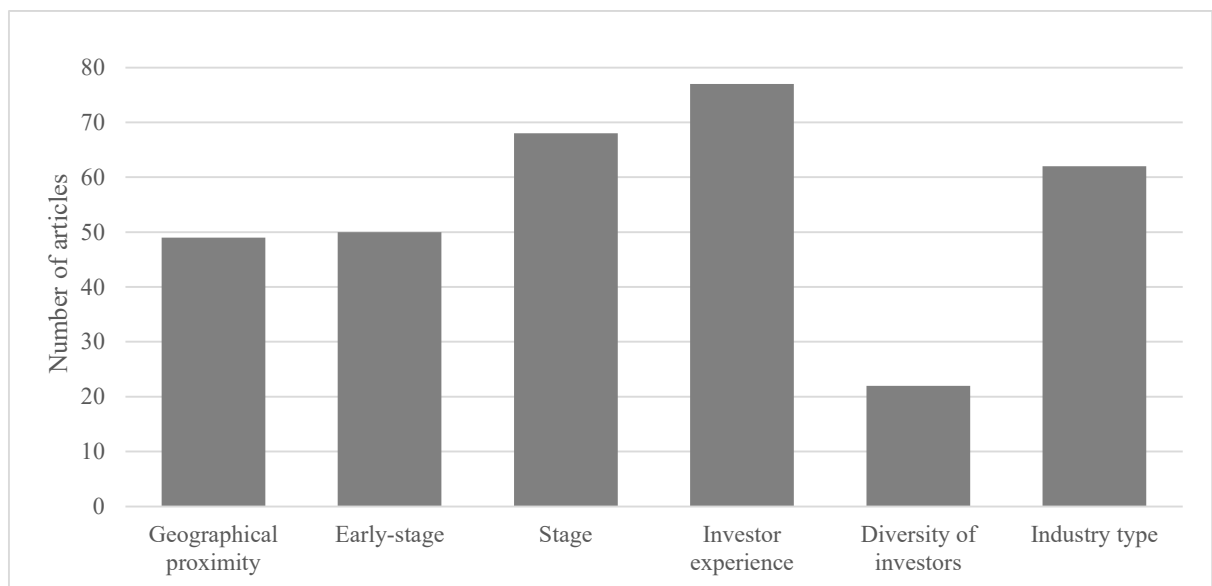


Figure 4: Frequency of Variables Across the Studies

Along with the qualitative characteristics, several quantitative values have been extracted and recorded in the database. These include the *beta coefficient*, which reflects the magnitude

and direction of the relationship between syndication and firm performance; the *regression t-statistic*, capturing the statistical significance of the estimated coefficient; *standard errors*, when reported in the articles, which measure the precision of the coefficient estimates; and *p-values*, indicating the probability of observing the estimated effect under the null hypothesis.

3.2.6 Effect size Computation

All extracted information was used to compute the correlation coefficient r , which served as the standardized effect size in the meta-analysis. The partial correlation coefficients were obtained to make sure that the results are comparable despite the differences in the specifications of the studies. The following formula was applied to compute the partial correlation coefficient (r) (Stanley & Doucouliagos, 2023):

$$r = \frac{t}{\sqrt{t^2 + d_f}}$$

The choice to use partial correlations as a measure of effect size responds to the need to make empirical results from highly heterogeneous econometric models comparable. To aggregate empirical evidence with different specifications and measurement scales, it is necessary to standardize the estimates. The adoption of a common metric allows for the synthesis of the relationships estimated in different contexts, preserving information on the strength of the association between syndication and performance (Hunter & Schmidt, 2004). Subsequently, the collected effect sizes were transformed into Fisher's Z values to address the skewness of their original distributions (Haslanger, Lehmann, & Seitz, 2023). This transformation yields effect sizes that are symmetrically distributed around the population parameter, thereby enhancing the reliability of their aggregation in the meta-analytic framework.

$$z = \frac{1}{2} \ln \left(\frac{1+r}{1-r} \right)$$

$$se_z = \frac{1}{\sqrt{n-3}}$$

3.2.7 Meta-Analytic Model

Although Meta-Analytic Structural Equation Modeling (MASEM) allows testing complex theoretical models by simultaneously estimating multiple relationships between variables, this approach requires a high degree of measure standardization and the presence of

correlation matrices comparable across studies (Hunter & Schmidt, 2004). The analysed dataset contains various types of performance and syndication measures; furthermore, homogeneous correlation matrices that allow for the reconstruction of a coherent structural model are not available. For this reason, applying MASEM would be methodologically inappropriate. The choice not to adopt this approach, therefore, stems from the structure of the available empirical evidence. Instead, it was employed the traditional meta-analysis along with the meta-regression to investigate sources of heterogeneity and the software Stata was used to calculate the results.

This software is widely used in economic and management literature for statistical analysis and meta-analysis, thanks to the high standards of transparency, reliability, and reproducibility of the analyses it guarantees. The command structure and detailed documentation make it particularly suitable for complex studies that require a high degree of standardization and traceability. Recent versions have introduced the “*meta*” suite, a framework dedicated to meta-analysis that covers all the main stages of the meta-analytical process, from the study of effect sizes to the estimation of pooled effects under different methodological assumptions, providing useful tools for interpreting the results. A distinctive feature of Stata's approach is the consistent management of analysis settings: once the dataset has been loaded and the specifications defined, these are automatically maintained throughout the various processing steps, ensuring consistency in the results. In addition, the “*meta*” suite provides numerous graphical tools that facilitate the synthesis and reading of data, helping to ensure methodological rigor and replicability of studies. Thanks to this tool, several meta-analytic models were analysed in order to assess the robustness of the results under different specifications. In *Table 5*, all the Stata commands used have been reported.

Table 5: Meta commands

COMMAND	PURPOSE
describe	Data inspection
summarize	Descriptive statistics
meta set z se_z, studylabel(num_articolo)	Declaration of meta-analysis data
meta summarize, random	Meta-analysis estimation
meta forestplot, random	Graphical synthesis
meta funnelplot, random	Publication bias assessment
graph export	Graphical output export
mixed z synd_structure synd_size operational_performance num_articolo:	Multilevel regression

Preliminary data inspection and preparation

Basic random-effects meta-analysis aims to provide an overall estimate of the effect that syndication has on company performance, using a random-effects meta-analysis.

The choice to adopt a random-effects specification, rather than a fixed-effects one, reflects a theoretical assumption about the nature of the estimated parameter. The fixed-effect model assumes that all studies estimate a single common true effect and that observed differences are attributable exclusively to sampling error (Greenland & Robins, 1985). Conversely, the random-effects model introduces a component of heterogeneity across studies, assuming that each contribution can estimate a distinct true effect distributed around an overall mean (Berkey, Hoaglin, Mosteller, & Colditz, 1995).

The random-effects model is appropriate when studies differ in institutional context, time period, sample characteristics, and operationalization of variables. In this paper, the included studies cover different geographical contexts, extended historical periods, and heterogeneous measures of syndication and performance. Therefore, assuming a single common true effect would be methodologically inconsistent with the empirical structure of the data. Adopting the random-effects model, therefore, appears to be a choice consistent with the nature of the evidence analyzed (Borenstein, Hedges, Higgins, & Rothstein, 2009). From an operational point of view, the analysis consists of different fundamental steps. Prior to the declaration of the meta-analytic structure, preliminary descriptive checks are conducted using the standard Stata commands “*describe*” and “*summarize*”. The “*describe*” command is used to inspect the structure of the dataset, including variable types,

storage formats and labels, allowing to verify the consistency of effect-size variables and their associated precision measures. The “*summarize*” command is instead employed to obtain basic descriptive statistics, such as means, standard deviations and ranges, providing an initial assessment of the distribution and variability of the effect sizes before aggregation.

Declaration of the meta-analytic structure

After these first passages, the data are declared as meta-analysis data using the “*meta set z se_z, studylabel(num_articolo):*” command, which allows Stata to recognize the structure of the dataset by specifying the variables containing the effect sizes and the related precision measures. This step is necessary to correctly define the methodological framework within which the subsequent analyses will be conducted.

Model 0 – Random-effects meta-analysis (overall effect)

Then, the “*meta summarize, random*” command is used to produce a statistical summary of the set of declared studies, combining individual estimates into a single analytical framework consistent with the specified model. This command allows the information contained in the dataset to be aggregated and the overall structure of the meta-analysis to be described, including the distribution of effect sizes and statistics useful for assessing variability between studies.

This specification represents the baseline model (Model 0), which provides the overall average effect of syndication and serves as the reference point for all subsequent meta-regression analyses.

Heterogeneity assessment and Forest Plot

In this sense, basic random-effects meta-analysis serves as an introduction, laying the methodological foundations for subsequent in-depth analyses and for the systematic exploration of sources of heterogeneity through meta-regression models. (StataCorp. 2025. Stata 19 Meta-Analysis Reference Manual . College Station, TX: Stata Press.)

Within this model, graphical representation tools are used to support the initial descriptive analysis. In particular, the “*meta forestplot, random*” command is used to construct the forest plot, a graph that allows for the estimation of the effects of each individual study and their heterogeneity to be visualized graphically, providing a concise and immediate representation of the empirical evidence of the meta-analysis.

Publication bias and Funnel Plot

The “*meta funnelplot, random*” command is then used to generate the funnel plot, the graphical tool for analysing publication bias, based on the relationship between effect size and study precision. The graphs obtained are then exported using the “*graph export forestplot*” and “*graph export forestplot*” commands to ensure the reproducibility and integration of the graphical representations in the analysis work. Overall, this first model serves to provide in-depth analysis and systematic exploration of the sources of heterogeneity in regression models. (StataCorp. 2025. Stata 19 Meta-Analysis Reference Manual . College Station, TX: Stata Press.)

Both graphical analyses are based on the random-effects specification defined in Model 0.

Model 1 – Baseline multilevel meta-regression

The adoption of a multilevel meta-regression is a direct consequence of the structure of the constructed database. Traditional meta-regression models assume independence between observations (Berkey, Hoaglin, Mosteller, & Colditz, 1995). However, when multiple effect sizes come from the same study, this assumption is violated, as the estimates share common data, specifications, or contexts (Hunter & Schmidt, 2004). Ignoring this dependence would result in underestimating standard errors and potentially weakening inferential reliability.

To manage this hierarchical structure, a multilevel meta-regression model was therefore adopted. Compared to a traditional meta-analysis, which does not allow for the inclusion of explanatory moderators, and compared to a single-level meta-regression, which would ignore the dependence between observations, the multilevel model allows for the preservation of all available information, correction for intra-study correlation, and a consistent estimate of the role of theoretically grounded moderators.

This analysis is implemented using random effects, estimated in Stata using the “*mixed z synd_structure synd_size operational_performance || num_articolo:*” command, which allows for the explicit representation of the hierarchical structure of the data and the dependence between observations belonging to the same study. This approach is particularly necessary in a meta-analysis context, as the same article may contribute multiple effect sizes, violating the assumption of independence of observations.

The mixed command allows for specifying a random intercept at the study level, identified by the grouping variable, which captures the unobserved heterogeneity between articles and allows each study to have its own mean level of the estimated effect. In this way, multilevel regression provides consistent estimates and correct inferences even in the presence of intra-

study correlation, improving the interpretability and robustness of empirical results (StataCorp. 2025. Stata 19 Meta-Analysis Reference Manual . College Station, TX: Stata Press.).

This specification corresponds to Model 1, which represents a baseline multilevel meta-regression without the inclusion of moderator variables.

Model 2 – Multilevel meta-regression with moderators

Once the baseline multilevel model is defined, it is extended by incorporating moderator variables in order to further investigate potential sources of heterogeneity. Moderators are included as additional explanatory variables, allowing the estimated effect of syndication to vary systematically across different contexts. Formally, this is implemented by extending the baseline specification with moderator variables, while retaining the same random-effects structure at the study level. Different model specifications are estimated by including alternative sets of moderators in separate regressions, in order to avoid overfitting and to assess the robustness of the results across different contextual dimensions.

Examples of the commands implemented in Stata are as follows:

```
“mixed z synd_structure synd_size operational_performance earlystage || num_articolo:”,  
“mixed z synd_structure synd_size operational_performance America || num_articolo:”,  
“mixed z synd_structure synd_size operational_performance 2007 || num_articolo:”.
```

This approach enables to assess whether the inclusion of moderators significantly improves model fit and explains part of the between-study variability. Hierarchical data dependence and conditional relationships are accounted for simultaneously through the inclusion of moderation effects within a multilevel model.

3.2.8 Robustness Analysis

To verify the reliability of the main result, a Robustness test can be conducted. In this case, a leave-one-study-out test was performed, a test typically used in meta-analytic literature to assess whether the overall estimate is disproportionately influenced by a specific study (Borenstein, Hedges, Higgins, & Rothstein, 2009).

In highly heterogeneous contexts, it is useful to conduct a sensitivity analysis to verify that the average result is not influenced by some studies with very large or very small effects.

Furthermore, since the dataset contains multiple observations per study, the influence of the study as the primary unit of analysis, rather than the individual observation, was assessed. The test consists of recalculating the random-effects model 66 times, temporarily excluding one study each time and observing, for each iteration, how the overall estimate changes. In practice, the implementation was performed in Stata using a “*foreach*” loop applied to the study's identification variable. For each variable value, the “*preserve*” command temporarily saved the dataset in memory, the “*drop if num_articolo == s*” command excluded all observations associated with the study in question, and the model was recalculated using “*meta summarize, random*”. The new estimate was saved in a matrix and subsequently transformed into a variable to analyze the distribution of the obtained estimates. Finally, the “*restore*” command restored the original dataset before moving on to the next iteration.

All commands used have been reported in a .do file to ensure traceability and replicability of the analysis. The complete script is provided in Appendix B.

4. Results

4.1 Descriptive overview

An initial descriptive analysis was performed to summarize the main characteristics of the dataset and the variables employed in the meta-analysis. As *Table 6* reports the descriptive statistics, the final sample includes 137 effect-size observations drawn from 66 primary studies, with an average of approximately two estimates per study, ranging from a minimum of one to a maximum of six observations per study.

Table 6: Descriptive statistics of the main variables

Variable	Mean	Std. Dev.	Min	Max
# article			1	66
# observation	2	1,27	1	6
earlystage	0,37	0,54		
hightech	0,08	0,28		
linearity	0,52	0,50		
geographicproxy	0,36	0,48		
investor_experience	0,56	0,50		
stage	0,50	0,50		
diversity	0,16	0,37		
syndication	0,44	0,50		
syndication_structure	0,19	0,39		
syndication_size	0,27	0,45		
synd_quality	0,06	0,24		
network	0,04	0,21		
successful_exit	0,43	0,49		
financial_performance	0,09	0,28		
market_performance	0,08	0,28		
operational_performance	0,25	0,43		
innovation	0,09	0,29		
survival	0,06	0,24		
Asia	0,18	0,39		
America	0,34	0,47		
Africa	0,04	0,19		
Europe	0,26	0,44		

2007	0,68	0,47
------	------	------

4.2 Overall Meta-Analytic Effect

In order to quantify the overall relationship between syndication and firm’s performance, effect sizes and their corresponding standard errors were first declared and the pooled effect was obtained under a random-effects specification. The corresponding results are reported in *Table 7*.

Table 7: Random-effects meta-analytic estimate of the relationship between syndication and performance

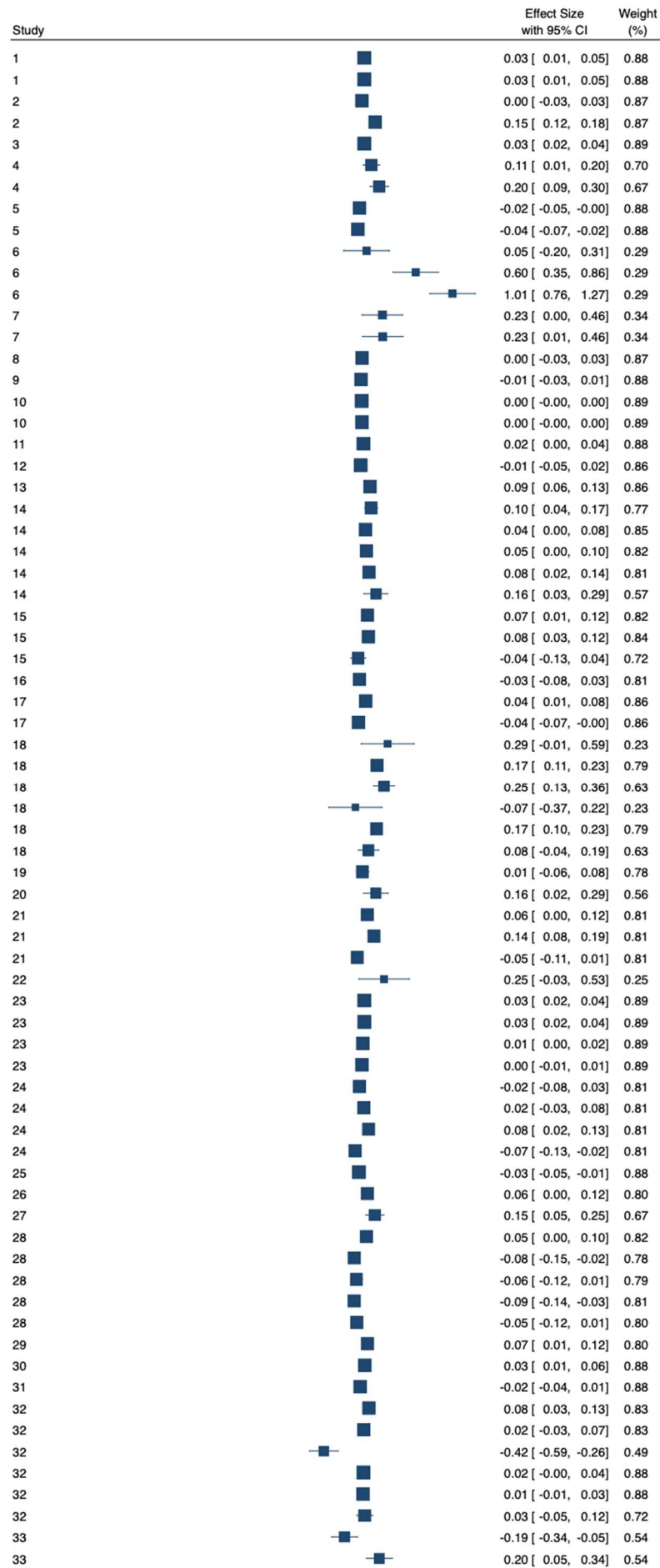
Effect-size label:	Effect Size		
Effect size:	z		
Std. Err.:	se_z		
Study label:	num_articolo		
Meta-analysis summary	Number of studies =		137
Random-effects model	Heterogeneity:		
Method: REML	tau2 =		0.0081
	I2 (%) =		99.06
	H2 =		105.86
	Effect Size	[95% Conf. Interval]	
theta	0.045	0.029	0.062
Test of theta = 0 : z = 5.33			Prob > z = 0.0000
Test of homogeneity: Q=chi2(136) =2554.84			Prob > Q = 0.0000

The random effects meta-analysis shows a positive and statistically significant effect, which indicates a positive average relationship between syndication and performance across the studies considered. The estimated effect size ($\theta = 0.045$) is characterized by a small but precise effect, which is typical of management and economics meta-analysis. The precise effect is shown by the 95% confidence interval [0.029, 0.062] that lies entirely above zero, and the null hypothesis of no effect is rejected ($p < 0.001$). Moreover, the heterogeneity analysis reveals variability between studies ($\tau^2 = 0.0081$, $I^2 = 99.06\%$), indicating that observed variation in effect sizes reflects differences across studies rather than sampling error. Consistently, the test of homogeneity rejects the hypothesis of a common underlying effect ($Q = 2554.84$, $p < 0.001$). The findings demonstrate that although the average effect

of syndication on performance is positive, its magnitude varies across empirical contexts, motivating further analyses.

4.2.1 Forest plot

The forest plot in *Figure 5* presents the individual effect-size estimates with their confidence intervals, together with the pooled estimate. The results show substantial dispersion across studies, with effect sizes ranging from negative to positive values and several confidence intervals overlapping zero. A non-negligible number of observations are clustered around small positive values, which contributes to the positive pooled effect reported at the bottom of the plot. The spread in both the direction of individual effects visually confirms the presence of heterogeneity between studies, in line with the high I^2 value reported in the meta-analytic summary.



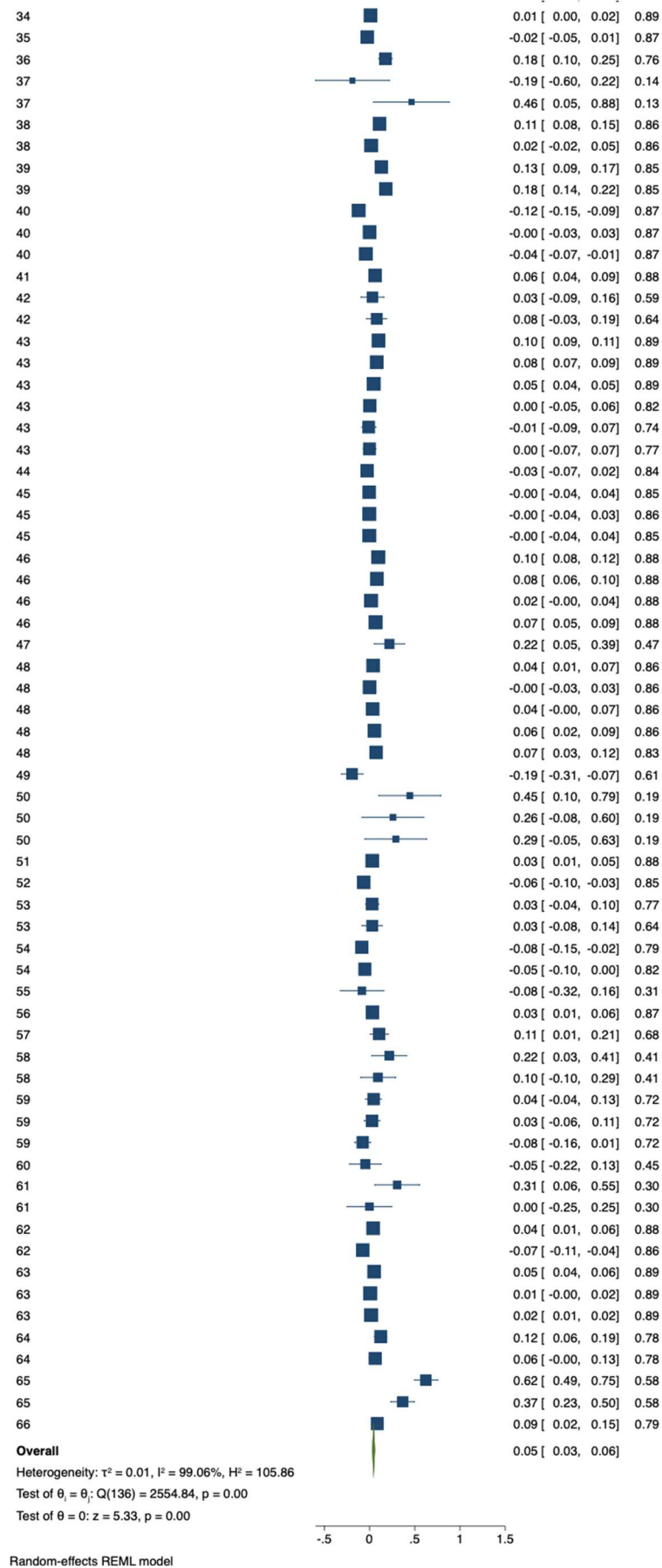


Figure 5: Forest plot

4.3 Publication Bias

The presence of potential publication bias was assessed with the funnel plot.

The distribution of effect sizes, as shown in *Figure 6*, is centered around the pooled random-effects estimate, marked by the vertical line, with a higher concentration of observations with smaller standard errors. The shaded contours indicate regions of statistical significance, and a substantial share of observations falls in regions corresponding to non-significant or marginally significant results ($p > 10\%$ and $5\% < p < 10\%$). The studies with larger standard errors primarily drive the asymmetry in the funnel plot. Although some asymmetry is visible among observations with higher standard errors, the contour pattern does not suggest a clear missing area of non-significant results. As a consequence, the funnel plot does not provide evidence of selective publication based on statistical significance, and the dispersion of effect sizes is consistent with the level of heterogeneity reported in the meta-analysis summary and forest plot.

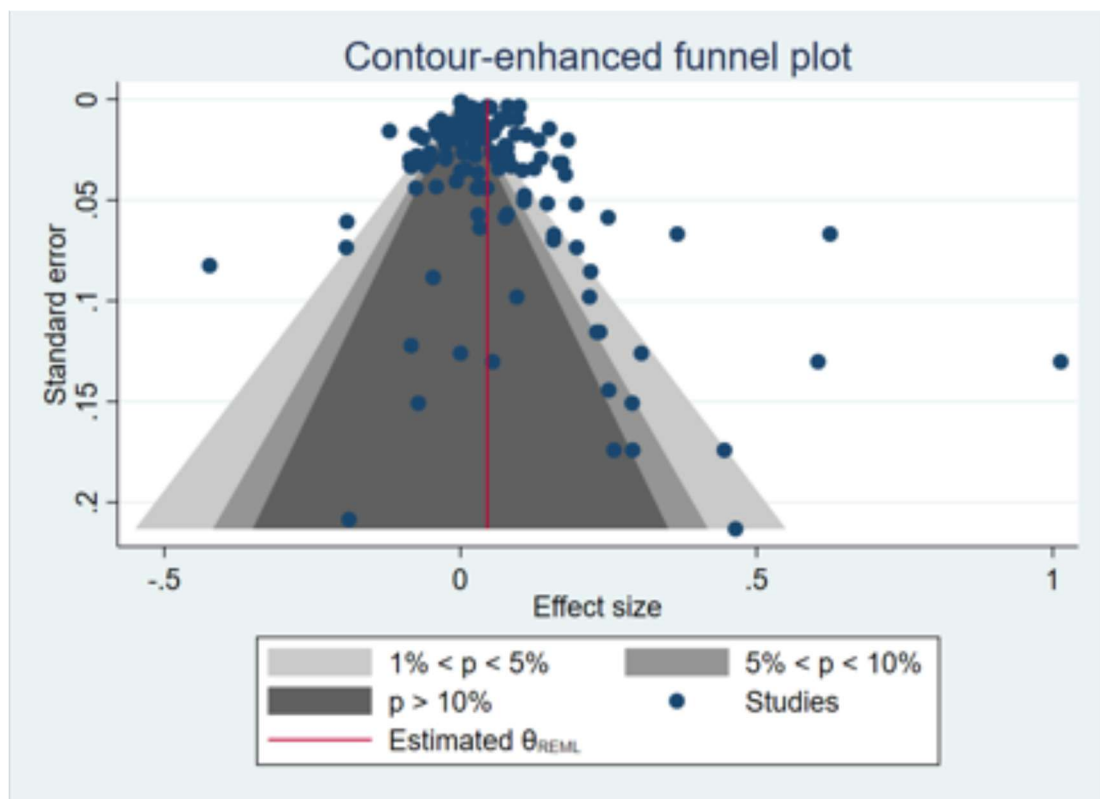


Figure 6: Funnel plot

4.4 Multilevel meta-regression

4.4.1 Baseline Mixed-Effects Meta-Regression

The baseline mixed-effects meta-regression model is specified as:

$$z_{ij} = \beta_0 + \beta_1 \text{synd_structure}_{ij} + \beta_2 \text{synd_size}_{ij} + \beta_3 \text{operational_performance}_{ij} + u_j + \varepsilon_{ij}$$

where z_{ij} is the standardized effect size reported in study j , $u_j \sim N(0, \tau^2)$ captures between-study heterogeneity, and $\varepsilon_{ij} \sim N(0, \sigma^2)$ represents within-study variability.

The selection of variables included in the baseline specification was based on the frequency with which the different proxies appear in the analyzed studies. Specifically, the baseline model includes the most recurrent proxies in the literature, so as to base the analysis on measures sufficiently represented in the constructed dataset.

The methodological literature on meta-regression emphasizes that moderating variables should be observed in a sufficiently large number of studies to avoid unstable estimates or those strongly influenced by a few contributions (Stanley & Doucouliagos, 2012). For this reason, to ensure the robustness of the estimates, a minimum threshold of 10 articles was also introduced. This threshold is defined with reference to the number of studies and not the number of observations, since in meta-analysis, the study represents the independent unit of information.

Applying this criterion to the syndication variables, the presence of syndication, chosen as the baseline proxy for syndication, syndication size, and syndication structure are sufficiently represented, all exceeding the established threshold. Conversely, the measures relating to syndication quality and network relations appear a number of times below the minimum threshold.

The same procedure was applied to the performance proxies. Among these, successful exit is the most widespread measure and is therefore included in the baseline, while operational performance appears in 18 articles and 34 observations, also exceeding the established minimum threshold. Conversely, the other performance measures appear in a more limited number of studies and are therefore not considered separately in the main specification.

Figures 7 and Figure 8 provide a graphical representation of the frequency with which the different syndication and performance proxies appear in the analyzed articles and in the coded observations.

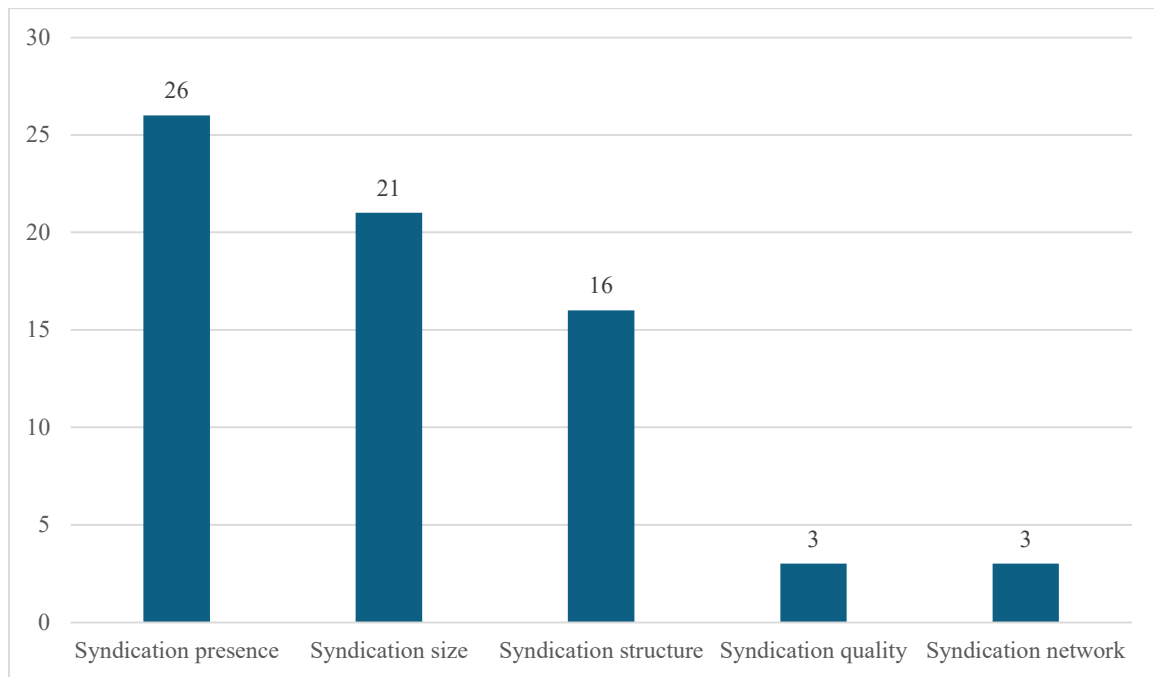


Figure 7: Syndication proxy

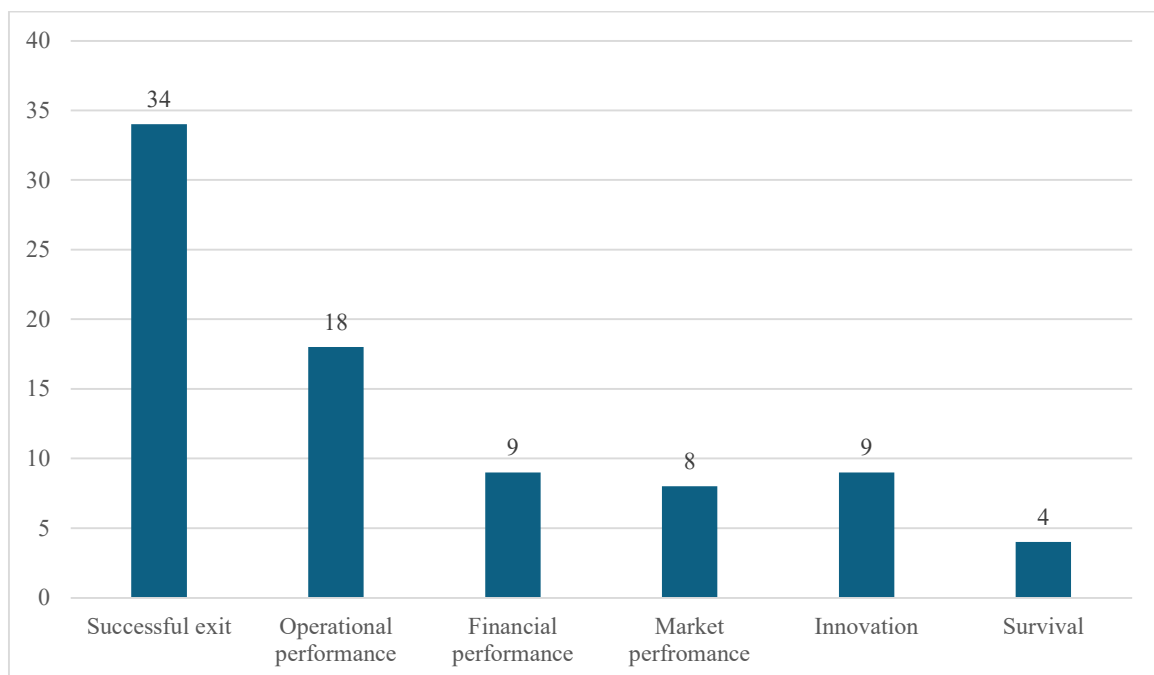


Figure 8: Performance proxy

As shown in *Table 8*, none of the syndication- or performance-related coefficients are significant and they all have a negative and small effect in magnitude, since all coefficients are negative with a p-value higher than 10%. This means that syndication structure and size and operational performance do not have a systematic influence on explaining the overall variance of the reported effect sizes. In contrast, the intercept is positive and statistically

significant (coef. = 0.086, $p < 0.001$), which reflects a positive association between syndication and performance when moderators are evaluated at zero.

The presence of heterogeneity between studies is once again confirmed by the likelihood-ratio test comparing the mixed model to a linear one ($\chi^2 = 12.45$, $p = 0.0002$).

However, the lack of statistically significant variables and the persistence of heterogeneity motivate the introduction of additional contextual variables in subsequent models, which aim to assess whether firm-level, geographical, or temporal factors help explain the residual cross-study variation observed here.

Table 8: Baseline Mixed-Effects Meta-Regression

Performing EM optimization:

Performing gradient-based optimization:

Iteration 0: log likelihood = 67.631187

Iteration 1: log likelihood = 67.632259

Iteration 2: log likelihood = 67.632259

Computing standard errors:

Mixed-effects ML regression Number of obs = 137

Group variable: num_articolo Number of groups = 66

Obs per group:

min = 1

avg = 2.1

max = 6

Wald chi2(3) = 1.60

Log likelihood = 67.632259 Prob > chi2 = 0.6600

	z	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
synd_structure		-.0376323	.0409157	-0.92	0.358	-.1178257	.0425611
synd_size		-.0406698	.0364592	-1.12	0.265	-.1121285	.0307888
operational_performance		-.0054812	.0322095	-0.17	0.865	-.0686107	.0576483
_cons		.0858684	.0242113	3.55	0.000	.0384151	.1333217

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
num_articolo: Identity				
var(_cons)	.007712	.0027628	.0038214	.0155637
var(Residual)	.0159554	.0024552	.0118013	.0215719

LR t3st vs. linear model: chibar2(01) = 12.45

Prob >= chibar2 = 0.0002

4.4.2 Moderating Role of Early-Stage Firms

In the existing literature, it is often noted that early-stage firms face high levels of uncertainty and failure risk (Brander, Amit, & Antweiler, 2002) (Puri & Zarutskie, 2012). At the same time, however, some studies suggest that syndication represents a valuable tool in this type of context, thanks to improved screening, monitoring, and resource provision. Based on this information, we tested whether the firm's early stage moderates the effect of syndication on performance.

The model is extended by including an early-stage variable identifying whether the firms operate at an early stage:

$$z_{ij} = \beta_0 + \beta_1 \text{synd_structure}_{ij} + \beta_2 \text{synd_size}_{ij} + \beta_3 \text{operational_performance}_{ij} + \beta_4 \text{earlystage}_{ij} + u_j + \varepsilon_{ij}$$

Table 9 indicates that the early-stage moderator has a positive but statistically non-significant coefficient ($\beta = 0.038$, $p = 0.214$). The inclusion of this variable does not affect syndication structure and size and operational performance coefficients, which remain negative and non-significant, while the intercept remains positive and statistically significant (coef. = 0.074, $p = 0.004$). As a consequence, the relationship between syndication and performance does not differ systematically between early-stage and later-stage firms within the analyzed literature. Moreover, studies heterogeneity remains substantial since the estimated random intercept variance ($\tau^2 = 0.0069$) is comparable to that observed in the baseline model, which indicates that firm stage alone does not explain the residual cross-study variability.

Table 9: Moderating Role of Early-Stage Firms

Performing EM optimization:

Performing gradient-based optimization:

Iteration 0: log likelihood = 68.350237

Iteration 1: log likelihood = 68.353472

Iteration 2: log likelihood = 68.353472

Computing standard errors:

Mixed-effects ML regression

Number of obs =

136

Group variable: num_articolo	Number of groups =	66
	Obs per group:	
	min =	1
	avg =	2.1
	max =	6
	Wald chi2(3) =	3.24
Log likelihood = 67.047818	Prob > chi2 =	0.5180

	z	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
synd_structure		-.0432975	.0404456	-1.07	0.284	-.1225693	.0359744
synd_size		-.0457648	.0359406	-1.27	0.203	-.1162072	.0246775
operational_performance		-.0029512	.0319736	-0.09	0.926	-.0656183	.059716
earlystage		.0381928	.0307642	1.24	0.214	-.022104	.0984895
_cons		.0741271	.0255684	2.90	0.004	.024014	.1242402

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
num_articolo: Identity				
var(_cons)	.0068704	.0027159	.0031659	.0149094
var(Residual)	.0162435	.0025213	.0119828	.0220191
LR test vs. linear model: chibar2(01) = 9.53		Prob >= chibar2 = 0.0010		

4.4.3 Moderating Role of Geographical context

Given the limited explanatory power of the early-stage moderator, this model shifts the focus from firm-level characteristics to broader contextual dimensions of geographical location. It incorporates regional dummy variables capturing the geographical context of each study:

$$z_{ij} = \beta_0 + \beta_1 \text{synd_structure}_{ij} + \beta_2 \text{synd_size}_{ij} + \beta_3 \text{operational_performance}_{ij} + \beta_4 \text{Asia}_{ij} + \beta_5 \text{America}_{ij} + \beta_6 \text{Africa}_{ij} + u_j + \varepsilon_{ij}$$

Table 10 reports that none of the geographical dummies are statistically significant, with America's p-value being the lowest among other countries. In this model as well, the syndications and performance coefficients remain stable and non-significant, while the intercept is positive and significant (coef. = 0.107, p = 0.004). Despite the inclusion of

multiple regional controls, the estimated random intercept variance ($\tau^2 = 0.0070$) suggests that substantial heterogeneity remains unexplained.

Table 10: Moderating Role of Geographical context

Performing EM optimization:

Performing gradient-based optimization:

Iteration 0: log likelihood = 69.291738

Iteration 1: log likelihood = 69.293697

Iteration 2: log likelihood = 69.293697

Computing standard errors:

Mixed-effects ML regression Number of obs = 137

Group variable: num_articolo Number of groups = 66

Obs per group:

min = 1

avg = 2.1

max = 6

Wald chi2(3) = 5.11

Log likelihood = 69.293697 Prob > chi2 = 0.5299

z	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
synd_structure	-.0393897	.0401098	-0.98	0.326	-.1180035	.0392241
synd_size	-.0301141	.0366489	-0.82	0.411	-.1019447	.0417165
operational_performance	-.0076175	.0339856	-0.22	0.823	-.0742281	.058993
Asia	.0233673	.0514049	0.45	0.649	-.0773845	.124119
America	-.0557202	.0427049	-1.30	0.192	-.1394203	.0279798
Europe	-.0327621	.0463303	-0.71	0.479	-.1235679	.0580437
_cons	.1070603	.0372076	2.88	0.004	.0341347	.1799859

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
num_articolo: Identity				
var(_cons)	.0069916	.0026435	.0033323	.0146693
var(Residual)	.0158914	.0024445	.0117551	.0214831

LR test vs. linear model: chibar2(01) = 10.94

Prob >= chibar2 = 0.0005

4.4.4 Moderating Role of American context

The American context is particularly relevant given the maturity of its venture capital ecosystem in the United States and moreover, syndication is embedded in investor networks representing a core organizational feature of venture capital activity (Brander, Amit, & Antweiler, 2002). The degree of standardized syndication practices may affect the relationship between syndication and firm performance. The lower p-value and the larger size of the America dummy, although not significant, in the previous model, motivate the further analysis of America as a moderator that was conducted with the specific model:

$$z_{ij} = \beta_0 + \beta_1 \text{synd_structure}_{ij} + \beta_2 \text{synd_size}_{ij} + \beta_3 \text{operational_performance}_{ij} + \beta_5 \text{America}_{ij} + u_j + \varepsilon_{ij}$$

The results of *Table 11* exhibit that America dummy has a negative coefficient that increases in absolute magnitude compared to the previous model ($\beta = -0.050$) and the p-value remains non-significant but lower ($p = 0.157$). Consistent with the previous models, the coefficients of syndication and performance remain non-significant, while the intercept is positive and significant, and substantial between-study heterogeneity persists. Given the lower p-value of the America dummy, the next model introduces a temporal moderator to examine whether geographical and temporal factors jointly explain cross-study differences in effect sizes.

Table 11: Moderating Role of America context

Performing EM optimization:

Performing gradient-based optimization:

Iteration 0: log likelihood = 68.618401

Iteration 1: log likelihood = 68.619852

Iteration 2: log likelihood = 68.619852

Computing standard errors:

Mixed-effects ML regression Number of obs = 137

Group variable: num_articolo Number of groups = 66

Obs per group:

min = 1

avg = 2.1

max = 6

Wald chi2(3) = 3.65

Log likelihood = 68.619852

Prob > chi2 = 0.4551

	z	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
synd_structure		-.0367077	.0404234	-0.91	0.364	-.1159361	.0425206
synd_size		-.0333863	.0364356	-0.92	0.360	-.1047987	.0380261
operational_performance		-.0156597	.0327783	-0.48	0.633	-.0799039	.0485845
America		-.0495999	.0350619	-1.41	0.157	-.1183201	.0191202
_cons		.1022267	.0265464	3.85	0.000	.0501967	.1542568

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
num_articolo: Identity				
var(_cons)	.0073278	.0026967	.0035622	.0150739
var(Residual)	.0158884	.0024447	.0117519	.0214809

LR test vs. linear model: chibar2(01) = 11.63

Prob >= chibar2 = 0.0003

4.4.5 Moderating Role of Temporal context: 2007 crisis

In a post-2007 crisis context characterized by a continuous contraction in the supply of external finance and investment capital (Ivashina & Scharfstein, 2010), together with long-lasting macroeconomic disruptions following the global financial crisis (Reinhart & Rogoff, 2009), it is possible that the relationship between syndication and firm performance may be moderated by sustained capital scarcity and tighter financial conditions.

The model includes a dummy variable indicating whether the study explicitly considers the 2007 period:

$$z_{ij} = \beta_0 + \beta_1 \text{synd_structure}_{ij} + \beta_2 \text{synd_size}_{ij} + \beta_3 \text{operational_performance}_{ij} + \beta_4 2007_{ij} + u_j + \varepsilon_{ij}$$

As shown in *Table 12*, the coefficient associated with the 2007 dummy is negative and moderate in magnitude (coef. = -0.053), but it does not reach conventional levels of statistical significance ($p = 0.115$). Syndication and performance proxies' p-values remain higher than 10%, the intercept is positive and significant, and substantial unexplained between-study heterogeneity is observed. Although statistically non-significant, the negative sign and magnitude of the 2007 coefficient could imply some temporal shift in the

syndication–performance relationship. This motivates the joint inclusion of temporal and geographical moderators.

Table 12: Moderating Role of Temporal context: 2007 crisis

Performing EM optimization:

Performing gradient-based optimization:

Iteration 0: log likelihood = 68.802027

Iteration 1: log likelihood = 68.805445

Iteration 2: log likelihood = 68.805445

Computing standard errors:

Mixed-effects ML regression Number of obs = 137

Group variable: num_articolo Number of groups = 66

Obs per group:

min = 1

avg = 2.1

max = 6

Wald chi2(3) = 4.20

Log likelihood = 68.805445 Prob > chi2 = 0.3796

	z	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]	
synd_structure		-.0223376	.0410257	-0.54	0.586	-.1027465	.0580714
synd_size		-.0391754	.0356707	-1.10	0.272	-.1090886	.0307379
operational_performance		-.0008382	.0319196	-0.03	0.979	-.0633995	.0617231
2007		-.0527085	.0334835	-1.57	0.115	-.118335	.012918
_cons		.1162982	.0304683	3.82	0.000	.0565814	.176015

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
num_articolo: Identity				
var(_cons)	.0067497	.002689	.0030916	.0147365
var(Residual)	.0161829	.0025111	.0119392	.021935

LR test vs. linear model: chibar2(01) = 9.53

Prob >= chibar2 = 0.0010

4.4.6 Moderating Role of American context and 2007 crisis

The model simultaneously includes geographical and temporal moderators:

$$z_{ij} = \beta_0 + \beta_1 \text{synd_structure}_{ij} + \beta_2 \text{synd_size}_{ij} + \beta_3 \text{operational_performance}_{ij} \\ + \beta_5 \text{America}_{ij} + \beta_4 \text{2007}_{ij} + u_j + \varepsilon_{ij}$$

As reported in *Table 13*, both contextual moderators have a negative and significant effect. The America dummy is marginally significant at the 10% level ($\beta = -0.062$, $p = 0.072$), while the 2007 dummy is statistically significant at the 5% level ($\beta = -0.065$, $p = 0.052$). This result indicates that studies conducted in the American context and around the 2007 crisis tend to report systematically smaller syndication–performance effect sizes. In contrast, syndication structure, syndication size, and operational performance remain statistically non-significant and the intercept is positive and highly significant ($\beta = 0.144$, $p < 0.001$). Although the estimated random intercept variance is slightly lower compared to previous models ($\tau^2 = 0.0060$), cross-study variability remains unexplained. The joint specification thus suggests that geographical and temporal factors contribute to shaping the reported effect size, even though characteristics of the syndication remain unrelated to performance outcomes across studies.

Table 13: Moderating Role of America context and 2007 crisis

Performing EM optimization:

Performing gradient-based optimization:

Iteration 0: log likelihood = 70.374034

Iteration 1: log likelihood = 70.380404

Iteration 2: log likelihood = 70.380404

Computing standard errors:

Mixed-effects ML regression Number of obs = 137

Group variable: num_articolo Number of groups = 66

Obs per group:

min = 1

avg = 2.1

max = 6

Wald chi2(3) = 7.78

Log likelihood = 70.380404 Prob > chi2 = 0.1690

	z	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
synd_structure		-.0179678	.0401667	-0.45	0.655	-.096693 .0607575
synd_size		-.0299468	.0353354	-0.85	0.397	-.0992029 .0393093
operational_performance		-.0129241	.032238	-0.40	0.688	-.0761094 .0502612

America	-.0616621	.0342681	-1.80	0.072	-.1288263	.0055021
2007	-.0646166	.0332425	-1.94	0.052	-.1297706	.0005375
_cons	.143814	.0332919	4.32	0.000	.0785629	.209065

Random-effects Parameters	Estimate	Std. Err.	[95% Conf. Interval]	
num_articolo: Identity				
var(_cons)	.0060414	.0025917	.0026061	.0140054
var(Residual)	.0161624	.0025145	.0119146	.0219246
LR test vs. linear model: $\chi^2(01) = 7.88$		Prob >= $\chi^2 = 0.0025$		

4.5 Robustness Analysis

As can be seen from *Table 14*, the results show that the average effect, equal to 0.045 in the full model, varies between 0.037 and 0.049 when each study is excluded, thus remaining consistently positive and of similar magnitude across all iterations.

The limited range of variation indicates that no single study substantially alters the overall estimate. The positive relationship between syndication and performance does not appear to be driven by a specific empirical contribution and therefore represents a result robust to the potential influence of individual study contributions.

Table 14: Robustness Test

Variable	Obs	Mean	Std. Dev.	Min	Max
loo_1	66	.0453873	.0017206	.0372951	.0490929

5. Conclusion

5.1 Summary and Interpretation of Findings

The objective of this study is to provide a systematic quantitative synthesis of the relationship between equity syndication and business performance, integrating existing empirical evidence through a multilevel meta-analysis. The analysis was conducted on 137 effect sizes from 66 independent studies, allowing us to estimate an aggregate average effect and examine the main sources of variation in the results reported in the literature.

The random-effects meta-analysis shows a positive and statistically significant average effect of syndication on the performance of companies ($\theta = 0.045$, $p < 0.001$). Although the magnitude of the effect is small, the result indicates that, on average, syndicated investment transactions are associated with better company outcomes than non-syndicated ones. This evidence is consistent with the main theoretical arguments developed in the literature on venture capital syndication, according to which cooperation between investors can improve the selection of companies (Brander, Amit, & Antweiler, 2002), strengthen certification and reputation mechanisms (Lerner, 1994), and allow for the combination of complementary skills, resources, and networks (Jääskeläinen & Mikko, 2012).

Alongside the positive average effect, however, the analysis shows an extremely high level of heterogeneity (I^2 greater than 99%). In line with meta-analytical methodology (Borenstein, Hedges, Higgins, & Rothstein, 2009) (Geyer-Klingeberg, Hang, & Rathgeber, 2020), this heterogeneity should not be interpreted as instability of the phenomenon itself, but rather as a reflection of the marked diversity among the primary studies included in the analysis. The contributions considered differ in terms of geographical context, time period analysed, type of investors involved, measures adopted to operationalise syndication and performance, and econometric approaches used. This methodological and contextual heterogeneity generates a dispersion of effect sizes that exceeds sample variability alone and necessitates further investigation through explanatory models.

For this reason, a multilevel meta-regression baseline model was first estimated to verify whether the proxies of syndication size, syndication structure and operational performance were able to explain the variation in the observed effect sizes. The baseline results show that neither structural characteristics of syndication nor operational performance proxy are systematically associated with the variation in effect sizes, while the intercept remains positive and statistically significant. This suggests that the positive average effect emerging

from the meta-analysis is not driven by a specific operationalisation of syndication or performance, but represents an aggregate trend across the various studies considered.

The persistence of significant residual variability in the baseline motivated the introduction of theoretically grounded moderating variables. The selection of moderating variables derives directly from the theoretical lines discussed in the previous chapters.

Firstly, the early-stage variable was introduced to test whether the effect of syndication was more pronounced in companies in the early stages of development, characterised by greater uncertainty and information asymmetry (Puri & Zarutskie, 2012). In such contexts, complementarity between investors and the strengthening of monitoring mechanisms could theoretically amplify the impact on performance. However, the results do not show a statistically significant moderating effect, suggesting that the relationship between syndication and performance does not depend linearly on the stage of the company's life cycle.

Secondly, geographical variables were considered in order to capture institutional differences and differences in the maturity of venture capital markets. The literature highlights how the US market represents a highly developed context characterised by established syndication practices (Brander, Amit, & Antweiler, 2002). In models that include only geographical controls, the coefficient associated with the American context is negative but not statistically significant, indicating that the geographical dimension alone is not sufficient to robustly explain the variability of effect sizes.

Finally, a time variable relating to the 2007 financial crisis was introduced, in light of evidence that this event led to a significant contraction in the supply of capital and a change in the dynamics of financial markets (Ivashina & Scharfstein, 2010; Reinhart & Rogoff, 2009). Even when considered individually, the dummy variable relating to the post-2007 period has a negative but not statistically significant coefficient.

However, a more significant result emerges when the two contextual dimensions are considered together. In the model that simultaneously includes the American context and the post-2007 variable, both coefficients are negative and marginally significant, indicating that studies conducted in the United States and in the post-crisis period tend to report systematically lower effect sizes. This suggests that geographical and temporal factors may interact in shaping the estimated association between syndication and performance: in a mature and highly competitive ecosystem such as that of the United States, and under more restrictive macroeconomic conditions, the marginal benefit of syndication may be attenuated.

Overall, the results show that syndication is associated on average with better corporate performance, in line with the main theoretical arguments on risk sharing, improved screening and the integration of complementary skills. However, the high degree of heterogeneity observed is largely attributable to methodological, conceptual and contextual differences between the primary studies, rather than to a contradiction in the positive average effect.

The persistent residual variability also suggests that additional dimensions, such as investor quality, internal syndicate structure, and network relational dynamics (Jääskeläinen & Mikko, 2012), may represent central channels through which syndication affects performance. This confirms the multidimensional nature of the phenomenon and the need to interpret the relationship between syndication and performance in light of the interaction between micro-organisational mechanisms and the institutional context.

5.2 Contributions to the Literature

This study contributes to the literature on venture capital syndication and, more generally, on entrepreneurial finance from various theoretical and methodological perspectives.

Firstly, the main contribution lies in offering a systematic quantitative synthesis of a line of research characterised by heterogeneous and sometimes conflicting results. Although numerous studies have analysed the relationship between syndication and corporate performance, the literature has so far provided fragmented evidence, often limited to specific geographical contexts, time periods or types of investors. Through a meta-analytical approach, this work integrates this evidence and demonstrates that, on average, syndication is associated with better corporate performance. In this sense, the study empirically reinforces the theoretical arguments that identify syndication as a mechanism for improving screening, sharing risk and integrating complementary skills (Brander, Amit, & Antweiler, 2002) (Jääskeläinen & Mikko, 2012).

Secondly, the study contributes to the literature by clarifying the role of heterogeneity. The results show that the high variability in effect sizes does not stem from an absence of a systematic relationship between syndication and performance, but rather from the marked methodological and contextual diversity of the primary studies. This contributes to the theoretical debate by suggesting that syndication is not a universally effective or ineffective mechanism, but a phenomenon whose impact depends on the interaction between institutional characteristics, macroeconomic conditions and the structure of financial

markets. In this sense, the work fits into the contingent perspective of the literature, according to which the effects of forms of financial governance must be interpreted in light of the context.

A further contribution concerns the joint analysis of geographical and temporal factors. The results show that the US context and the period following the 2007 crisis are associated with lower effect sizes. This suggests that in mature financial ecosystems and under conditions of credit restriction, the marginal added value of syndication may be reduced. This evidence enriches the literature that has so far analysed institutional and cyclical dimensions separately, showing how they can interact in shaping the effects of cooperation between investors.

From a theoretical point of view, the study also contributes to the debate between the main explanations of syndication. The average positive effect is consistent with both the selection hypothesis and the value-added hypothesis (Brander, Amit, & Antweiler, 2002), but the absence of systematic effects linked to the simple size or structure of the syndicate suggests that the value of syndication does not depend mechanically on the number of investors involved, but rather on more complex qualitative mechanisms, such as the complementarity of skills and the quality of network relationships (Jääskeläinen & Mikko, 2012). In this sense, the paper calls for moving beyond a purely quantitative view of syndication and focusing more on its organisational and relational dimensions.

Finally, the methodological contribution is not insignificant. The use of a multilevel meta-analytic model allows for the dependence between observations from the same study to be taken into account, improving the robustness of inferences compared to traditional narrative syntheses. In a research field characterised by strong empirical heterogeneity, the adoption of quantitative synthesis tools helps to strengthen the cumulative nature of scientific knowledge (Geyer-Klingeberg, Hang, & Rathgeber, 2020).

Overall, this study contributes to the literature by demonstrating that syndication is, on average, a mechanism associated with value creation, but that this relationship is highly contingent and influenced by the institutional and macroeconomic context. In this way, the work provides a more solid basis for interpreting existing results and for guiding future research towards a more detailed analysis of the conditions under which cooperation between investors actually generates benefits for the financed companies.

5.3 Study Limitations

Despite the methodological rigor employed, this research presents some limitations that should be acknowledged when interpreting the results.

Firstly, as with any meta-analysis, the primary studies included determine the reliability of the aggregated result. This implies that, despite the structured screening procedure, any methodological weaknesses and inconsistencies present in the original contributions may inevitably be reflected in the pooled estimates. The reported coefficients of single observation may be influenced by differences in identification strategies, control variables, and model specifications and propagate into the meta-analysis. As reported in the methodological literature (Borenstein, Hedges, Higgins, & Rothstein, 2009), a meta-analysis aims to synthesize the findings of aggregate existing evidences, but systematic biases of primary studies cannot be corrected.

Second, the results show high levels of heterogeneity meaning that most of the variation between effect sizes can be explained by differences between studies rather than sampling error. High levels of heterogeneity are common in finance and management studies (Geyer-Klingenberg, Hang, & Rathgeber, 2020) but this indicates that the results should be interpreted as an average and not a universal parameter.

Third, the empirical models focus on linear associations between syndication and firm performance. Theoretically, it can be argued that there may be diminishing returns or costs associated with syndication (Jääskeläinen & Mikko, 2012). The available data does not permit a detailed investigation of non-linear relationships and interaction effects between syndication and the chosen moderators.

Fourth, the moderators included in the meta-regression are predominantly binary to ensure tractability and then applied consistency within the multilevel estimation framework implemented in Stata. The appropriate methodological specification necessarily reduces the complexity of contextual dimensions that may not fully capture the intensity of the moderators.

Lastly, the literature search applying the defined query was conducted across three different databases, Web of Science, Scopus and ProQuest, up to the end of May 2025. Although the search strategy was conducted to ensure broad article inclusion, it is not possible to exclude that papers published after this data or on different databases were not captured.

Nevertheless, these limitations do not affect the validity of the positive average effect established. The dataset is composed of 66 studies and 137 effect sizes, considering more

than five decades. The pooled effect size is statistically significant and robust to leave-one-study-out sensitivity analyses. Therefore, while the overall effect may be refined by future research, it appears unlikely that additional studies would overturn the general outcome of the syndication-performance relationship. The limitations indicate that the results should be interpreted from a contingent and context-sensitive perspective, in accordance with the broader debate in entrepreneurial finance.

5.4 Directions for Future Research

Possible future implications of this research could include strengthening the integration between financial governance theory and the empirical analysis of investor cooperation and understanding how syndication concretely impacts investment decisions.

A first line of research concerns clarifying the mechanisms through which syndication generates value. The literature has traditionally interpreted venture capitalist cooperation according to two main explanations: the selection hypothesis, which emphasizes improved screening, and the value-added hypothesis, which emphasizes post-investment contributions in terms of monitoring, expertise, and reputation (Brander, Amit, & Antweiler, 2002). The evidence of a positive average effect is consistent with both perspectives, but does not allow us to distinguish which of the two mechanisms prevails. Future research could more clearly separate the selection phase from the operational support phase, distinguishing between *ex ante* benefits, linked to the reduction of information asymmetry and the quality of the initial project assessment, and *ex post* benefits, linked to the ability to provide strategic support. A more detailed analysis of the investment timeline could help clarify whether investor cooperation has a greater impact during the entry phase or in the subsequent period, when the firm faces growth, consolidation, or exit decisions.

Another interesting perspective to explore concerns the relationship between investor cooperation and the development trajectories of innovative firms. The literature highlights that investors not only provide capital but also provide important resources of managerial expertise and access to strategic networks (Gompers P. , 1995). Some studies also show that the presence of venture capital can impact firms' innovation processes and technological growth (Hua, Wang, & Wang, 2016). Future studies could therefore explore whether and to what extent syndication amplifies its benefits through the combination of complementary skills among investors, examining whether the value created is manifested primarily along the financial dimension, for example, in terms of access to additional financing rounds; along the strategic dimension, through improved organizational and market decisions; and along

the strategic dimension, through improved organizational and market decisions. or along the innovative path, influencing the capacity for technological development and the generation of new knowledge.

Overall, the set of potential future research emerging from this work calls for a shift from identifying the average effect to a more nuanced understanding of the economic and organizational functions of investor cooperation. This shift requires a deeper understanding of the processes through which syndication impacts the financed companies, with the aim of clarifying not only whether it generates value, but also through which channels and at which stages of the entrepreneurial development process.

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Appendix

Appendix A - CODEBOOK

The codebook reports the variables used in the empirical analysis, as specified in the Stata do-file. The dataset is based on the source file db.xlsx and was analyzed using Stata. The effect size is extracted from primary studies in order to provide a standardized metric, allowing aggregation of effect sizes across studies and inclusion-exclusion criteria were applied. Only observations with values for effect size (z) were included and their corresponding standard error (se_z) were retained for the analysis, while observations were excluded whenever z was missing. The variables are as follows:

Table 15: Codebook

Variable name	Category	Type	Description	Coding
num_articolo	Identification	Discrete (integer)	Unique identifier assigned to each primary study included in the meta-analysis	Progressive numeric ID
num_osservazione	Identification	Discrete (integer)	Progressive identifier of the observation within the study, not unique at the overall level	Progressive within-study ID
DOI	Bibliographic	String	Digital Object Identifier of the primary study	Original DOI string
authors	Bibliographic	String	Authors of the primary study	Authors' name list
year	Bibliographic	Discrete (integer)	Year of publication	Four-digit year
title	Bibliographic	String	Title of the primary study	Full original title
journal	Bibliographic	String	Journal of publication	Full journal name

synd	Syndication	String	Syndication measure used in the study	Reported
synd_proxy	Syndication	String	Syndication proxies	Syndication category identified ¹
performance	Performance	String	Performance measure used in the study	Reported
performance_proxy	Performance	String	Performance proxies	Performance category identified ²
investor	Contextual	String	Investors type in the study	Reported
investor_proxy	Contextual	String	Investors proxies	Investors category identified ³
geography	Contextual	String	Geographical region of sample	Region or multi-country
country	Contextual	String	Specific country analyzed	Country name
earlystage	Contextual	Dummy (0/1)	Only early-stage firms	1 = Sample includes only early-stage firms; 0 = Mixed or later-stage firms
industry_type	Contextual	String	Industry classification	Reported
hightech	Contextual	Dummy (0/1)	High-tech only sample	1 = only high-tech firms; 0 = Otherwise

¹ Syndication proxies identified: Syndication Presence, Syndication Structure, Syndication Size, Syndication Quality, Syndication Network

² Performance proxies identified: Operational Performance, Financial Performance, Market Performance, Successful Exit, Innovation, Survival

³ Investor proxies identified: Business Angels (BA), Venture Capitalists (VC), Private Equity (PE)

regression	Methodological	String	Indicates use of regression analysis	Regression method name
linearity	Methodological	Dummy (0/1)	Indicates linear specification	1 = Linear model; 0 = Non-linear
model	Methodological	Dummy (0/1)	Effect type used	1 = Fixed-effect; 0 = Random-effect
data_structure	Methodological	Dummy (0/1)	Structure of dataset	1 = Panel data; 0 = Cross-sectional
start-year	Contextual	Discrete (integer)	First year of observation period	Four-digit year
end-year	Contextual	Discrete (integer)	Last year of observation period	Four-digit year
non considera 2007	Contextual	Dummy (0/1)	Proxy indicating whether the observation does not refer to data from the 2007-2008 crisis period onwards	1 = Observation refers to pre-crisis years; 0 = Observation refers to the 2007–2008 crisis period or subsequent
considera 2007	Contextual	Dummy (0/1)	Proxy indicating whether the observation refers to the 2007–2008 crisis period or subsequent years	1 = Observation refers to the 2007–2008 crisis period or subsequent years; 0 = Observation refers to pre-crisis years
N	Meta-analytic	Discrete (integer)	Sample size associated with the observation	Reported N
p_value	Meta-analytic	Continuous (numeric, float)	Reported p-value of the coefficient	Exact value
SE	Meta-analytic	Continuous (numeric, float)	Standard error of the coefficient	Reported SE

beta	Meta-analytic	Continuous (numeric, float)	Regression coefficient extracted from study	Reported beta
t_value	Meta-analytic	Continuous (numeric, float)	t-statistic	t-statistic computed from beta and SE
t_formula	Meta-analytic	Dummy (0/1)	t-statistic formula	1 = t-value computed through formula; 0 = t- value reported (not calculated)
df	Meta-analytic	Continuous (numeric, float)	Degrees of freedom	Reported or computed as N-1
r_corr	Meta-analytic	Continuous (numeric, float)	Correlation coefficient	Computed r
r	Meta-analytic	Continuous (numeric, float)	Correlation coefficient	Copied from the previous column
r_formula	Meta-analytic	Dummy (0/1)	Correlation coefficient formula	1 = r computed through formula; 0 = r reported (not calculated)
z	Meta-analytic	Continuous (numeric, float)	Fisher's Z- transformed effect size extracted or computed from primary studies	Converted from r
var_z	Meta-analytic	Continuous (numeric, float)	Variance associated with the Fisher's Z effect size	Computed as 1/(N-3)
se_z	Meta-analytic	Continuous (numeric, float)	Standard error associated with the Fisher's Z effect size	Computed as the square root of the variance

geographical_proximity	Contextual	Dummy (0/1)	Variable indicating whether geographical proximity between investors and firms is a moderator	1 = geographical proximity is a moderator; 0 = Otherwise
investor_experience	Investor	Dummy (0/1)	Variable indicating whether investor experience is a moderator	1 = investor's experience is a moderator; 0 = Otherwise
stage	Contextual	Dummy (0/1)	Variable indicating whether the firm age (early/late stage) is a moderator	1 = firm's stage is a moderator; 0 = Otherwise
diversity	Investor	Dummy (0/1)	Variable indicating whether diversity between investors inclinations is a moderator	1 = investors' diversity is a moderator; 0 = Otherwise
size	Syndication	Dummy (0/1)	Variable indicating whether firm size is a moderator	1 = firm size is a moderator; 0 = Otherwise
industry	Contextual	Dummy (0/1)	Variable indicating whether industry sector is a moderator	1 = industry sector is a moderator; 0 = Otherwise
VC	Investor	Dummy (0/1)	Venture Capital investors	1 = investors are VC; 0 = Otherwise
PE	Investor	Dummy (0/1)	Private Equity investors	1 = investors are PE investors; 0 = Otherwise
BA	Investor	Dummy (0/1)	Business Angels included	1 = investors are BA; 0 = Otherwise
syndication	Syndication	Dummy (0/1)	Proxy capturing the syndication presence	1 = syndication measured by its presence; 0 = Otherwise

synd_structure	Syndication	Dummy (0/1)	Proxy capturing structural characteristics of the syndicate	1 = Syndication measured by its structural characteristics (PE, GVC, family, etc.); 0 = Otherwise
synd_size	Syndication	Dummy (0/1)	Proxy measuring the size of the syndicate	1 = syndication considered as number or size of coinventors; 0 = Otherwise
synd_quality	Syndication	Dummy (0/1)	Quality dimension (reputation, experience)	1 = Syndication measured by its quality dimension; 0 = Otherwise
network	Syndication	Dummy (0/1)	Network dimension analyzed	1 = Syndication measured by its network dimension; 0 = Otherwise
successful_exit	Performance	Dummy (0/1)	Proxy indicating whether the performance refers to successful exit	1 = performance measured through IPO/M&A; 0 = Otherwise
financial_performance	Performance	Dummy (0/1)	Proxy indicating whether the performance refers to financial performance	1 = performance measured through ROA, ROI, etc.; 0 = Otherwise
market_performance	Performance	Dummy (0/1)	Proxy indicating whether the performance refers to market performance	1 = performance measured through market value, returns; 0 = Otherwise
operational_performance	Performance	Dummy (0/1)	Proxy indicating whether the performance refers to operational performance	1 = performance measured through operational performance measure; 0 = Other types of

				performance measures
innovation	Performance	Dummy (0/1)	Proxy indicating whether the performance refers to innovation level	1 = performance measured through the presence of patents/R&D; 0 = Otherwise
survival	Performance	Dummy (0/1)	Proxy indicating whether the performance refers to survival capability	1 = performance measured through the survival analysis; 0 = Otherwise
Asia	Contextual	Dummy (0/1)	Proxy indicating whether the sample refers to Asian countries	1 = Sample refers only to Asian countries; 0 = Otherwise
America	Contextual	Dummy (0/1)	Proxy indicating whether the sample refers to American countries	1 = Sample refers only to American countries; 0 = Otherwise
Europe	Contextual	Dummy (0/1)	Proxy indicating whether the sample refers to European countries	1 = Sample refers only to European countries; 0 = Otherwise

Appendix B – File .do Stata

For replicability purposes, the complete Stata script is reported below. The “.do” file contains all the commands used to perform the meta-analysis, from the import and cleaning of the dataset to the estimation of the pooled effect, robustness check and generation of graphical outputs.

```
*****
* Tesi – Meta-analisi e meta-regressione
*****

clear all
set more off
cd "~/Desktop/STATA"
capture log close
log using "analisi_meta.log", replace
import excel "db.xlsx", firstrow clear
describe
summarize
misstable summarize
drop if missing(z) | missing(se_z)
* -----
* MODELLO 0 – Effetto medio
* -----
meta set z se_z, studylabel(num_articolo)
meta summarize, random

* -----
* ROBUSTNESS TEST – Leave-one-study-out
* -----
levelsof num_articolo, local(studies)
local nstudies : word count `studies'
matrix loo = J(`nstudies',1,.)
local i = 1
foreach s of local studies {
    preserve
    drop if num_articolo == `s'
    quietly meta summarize, random
    matrix loo[`i',1] = r(theta)
    restore
    local ++i
}
svmat loo, name(loo_)
summ loo_1

* -----
* Grafici
* -----
meta forestplot, random
```

```
graph export forest_plot.pdf, replace
meta funnelplot, random
graph export funnel_plot.pdf, replace
```

```
* -----
* MODELLO 1 – Meta-regressione
* -----
mixed z synd_structure synd_size operational_performance || num_articolo:
* -----
* MODELLO 2A – Meta-regressione testing earlystage
* -----
mixed z synd_structure synd_size operational_performance earlystage || num_articolo:
* -----
* MODELLO 2B – Meta-regressione countries
* -----
mixed z synd_structure synd_size operational_performance Asia America Europe ||
num_articolo:
* -----
* MODELLO 2C – Meta-regressione America
* -----
mixed z synd_structure synd_size operational_performance America || num_articolo:
* -----
* MODELLO 2D – Meta-regressione 2007
* -----
mixed z synd_structure synd_size operational_performance considera2007 || num_articolo:
* -----
* MODELLO 2E – Meta-regressione America and 2007
* -----
mixed z synd_structure synd_size operational_performance America considera2007 ||
num_articolo:

log close
```