Spawning Butterflies — Value Flow across Startup Lifecycle Stages

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Abstract

Startup firms are dynamic entities that undergo fundamental transformations over their lifecycle. Such transformations are the result of value flow to newer firm related factors. However, startup valuation factors are often used fluidly in multi-stage empirical studies resulting in confounding results. The objective of this study is to disentangle determinants of startup valuation across the early-stages and late-stages of a startup's lifecycle. By doing so, the study identifies valuation factors that increase, decrease or maintain relevance across lifecycle stages. We conducted literature survey of entrepreneurship studies that analyzed startup valuation and its determinants and carefully classified these into early-stage and late-stage factors. By seeking stagewise interpretations, we introduce the 'relevance hierarchy' for valuation factors across lifecycle stages. We uncover persistent and volatile factors, i.e. some factors persistently affect firm valuation while others exhibit volatility in its effects. For practitioners, we derive a meta-model of startup valuation that is unique to the two lifecycle stages – early-stage and late-stage. The main contribution of this study is in conducting the literature review on startup valuation through the 'looking glass' of lifecycle stage and this vantage point will allow practitioners to develop focused models of valuation that avoid confounding effects.

Keywords: startup valuation; venture capital decision making; entrepreneurial firm performance; IPO valuation; new firm growth

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Introduction

As compared to public firms, investments in start-ups pose the most difficult challenges in valuation (Damodaran, 2009). The need to look beyond mainstream finance theories was observed in the study of venture capitalists' decision-making process by Silva (2004) and over time, this has led to huge diversity in explanatory constructs of firm performance (Bromiley, Rau, 2016). Such diversity in valuation factors and its varying influence across valuation rounds has motivated the need for further studies exploring comparative relevance and role of valuation factors across time (Colombo et al., 2023, Köhn, 2018).

Hand (2005) undertook one of the first studies in this millennium to assess how valuation factors vary in relevance across lifecycle stages of a startup. He empirically explored value relevance of 2 broad types of factors - financial and non-financial information of startup firms in pre-IPO and post-IPO periods

This seminal study established that financial and non-financial information are information substitutes in valuation, not complements. Figure 1 shows R2 for value relevance unique to non-financial information and financial information from Series A till post-IPO stages. The two factors demonstrate steep slopes of opposing polarity indicating information substitution when examining different funding rounds across a startup's lifecycle. Such inferences were reinforced by later studies too. Gompers et al. (2020) noted that 31% of early-stage VCs do not forecast company financials at all when they make an investment. Whereas, McCoy (2022) finds that financial factors such as revenue and revenue growth are highly relevant to valuation of late-stage Software-as-a-Service (SaaS) firms.

The purpose of this study, therefore, is to disentangle determinants of startup valuation across early-stages and late-stages of a startup's lifecycle. By doing so, the study broadens the study of valuation factors beyond the 2 broad types of factors - financial and non-financial information used by Hand (2005) in an attempt to identify valuation factors that increase, decrease or maintain relevance across lifecycle stages.

Problems of overlooking lifecycle stage in valuation studies

The problems of overlooking stage-wise-relevance of valuation factors are manifold. We use stage-wise-relevance to refer to the relevance of valuation factors across lifecycle stages. Firstly, academic studies that omit controlling for firm stage can often report confounding or oversized effects. Koenig & Tennert (2022) illustrated this with a direct comparison of regression coefficients with and without lifecycle stage fixed effects and found that effect sizes were consistently overestimated when not controlling for stage.

Secondly, valuation factors are frequently applied in different ways across multi-stage empirical studies. We find that across three studies examining venture valuation, Tumasjan et al. (2021) used social media sentiment, firm factors and VC factors to study effects, while controlling for deal, venture and market factors. Moghaddam et al. (2016) evaluated the effects of network factors controlling for firm-specific, transaction-specific and context-specific features. In Barick & Aithal (2023), we find firm factors and funding rounds information were used to examine venture valuation. This indicates variance in explanatory constructs and control variables used that requires a deeper investigation.

Finally, overlooking the stage-wise-relevance of valuation factors is related to the explosion in explanatory constructs, especially in the form of control variables. This can make data analysis cumbersome, unwieldy and confounding. The use of firm stage as a control variable in a large proportion of start-up valuation studies lends credence to the assertion that the relevance and role of valuation factors of start-ups vary by firm stage.

Research problem and research objectives

Recent literature review articles on startup valuation factors have concurred that identifying stage-wise-relevance of valuation factors across time periods is a critical research gap (Köhn, 2018, Berre, Le Pendeven, 2023). This study contributes to this research gap by conducting a literature survey of entrepreneurship studies that analyzed startup firm valuation (as dependent variable) directly or indirectly and examined determinants of startup value (as independent variables). In order to maintain recency in findings, only articles published in the last 10 years were considered. By doing so, the study explores the large diversity in startup valuation factors that have emerged in the last 10 years and disentangles their relevance on startup valuation across a startup's lifecycle.

The below research questions will be evaluated in this study:

1. What is the role and relevance of valuation factors across a startups' lifecycle stages?
2. Do valuation factors increase, decrease or maintain relevance across lifecycle stages?
3. Does the meta model for startup valuation vary across lifecycle stages?

This study has the following objectives:

1. To identify stage-wise-relevance of valuation factors as startups advance in their lifecycle stages.
2. To understand the 'relevance hierarchy' of valuation factors across a startups' lifecycle stages.
3. To develop focused models of valuation by firm stage that avoid confounding effects.

This paper is organized as follows. In the following section, we provide a detailed description of the methodology adopted when conducting this literature review. The subsequent sections summarize the

key findings from this study – What are the key determinants of startup valuation and what are its influences in early-stages and late-stages? What is the relevance of each valuation factor across lifecycle stages? What are the persistent and volatile factors influencing startup valuation across lifecycle stages? What are the theoretical contributions and future research directions identified in this study?

Methodology

Definition of startup lifecycle stages

Frameworks capturing a startups' lifecycle stages have been explored by academics and practitioners alike. One of the oldest is from Scott and Bruce (1987) who defined a five-stage model comprising of inception, survival, growth, expansion and maturity stages. A more recent model is the four-stage model comprising conception and gestation, infancy, adolescence and maturity (Detienne, 2010). Steve Blank, a serial entrepreneur-turned-academic and originator of the 'Lean Startup' movement, defines a 3-stage model comprising of search, build and grow.

For the purpose of this study, we follow the approach of Colombo et al. (2023) who used 2 stages namely – seed/start-up and scale-up/exit – to classify drivers of entrepreneurial venture valuations. Such a simplified two-stage model allows us to disentangle influence of valuation drivers across stages to the extent possible. The two-stages in this study are referred to as Early-stage and Late-stage. This is depicted in Table 1.

Study design

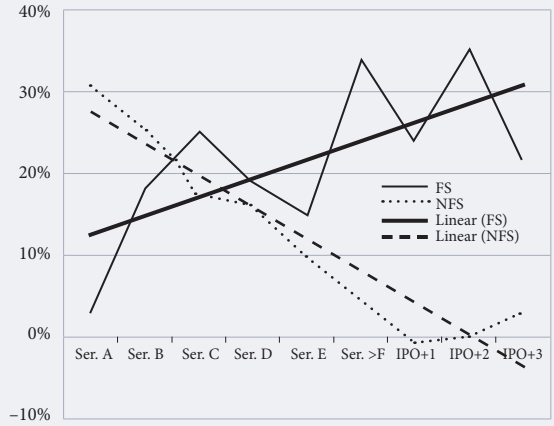
There is wide diversity in explanatory constructs used such as founder characteristics, investor characteristics, R&D investments, market conditions etc. This study reviewed articles published from 2015 – 2024 in peer-reviewed journals indexed in FT50, Web of Science, ABCD Journal List and Scopus. In order to maintain recency in findings, only articles published in the last 10 years were considered. Whitepaper publications from top VC houses such as Bessemer Venture Partners, Accel Partners were also considered to incorporate practitioner perspectives.

The review was conducted across three phases. Starting with 165 articles, the first phase carefully selected empirical studies that examined startup valuation (as dependent variable) directly or indirectly and evaluated determinants of startup valuation (as independent variables). At the end of first phase, 80 articles were taken forward to subsequent phases.

In the second phase, articles were classified into three groups based on lifecycle stage of firms selected for study. The three groups were categorized as early-stage studies, late-stage studies or mixed-stage studies. See Table 1 for early-stage and late-stage mapping.

In the third and final stage, all articles were read in detail to extract top determinants of startup valuation and to classify these determinants into early-stage valuation drivers and late-stage valuation drivers. This was quite straight-forward for articles grouped under early-stage studies and late-stage studies. For articles grouped under mixed-stage studies, we checked for key findings specific to firm stage. As firm stage is a commonly recurring control variable across many studies, authors report stage-specific findings whenever applicable, allowing us to classify these factor influences under early-stage valuation drivers or late-stage valuation drivers. However, we also find that many articles that dealt with mixed-stage studies did not report findings per stage. This may be due to similar factor influences across lifecycle stages. This aligns with the findings of this review too which show that value determinants across these two stages had overlaps. Finally, there were also studies where lifecycle stage was not used as a control variable and we omitted those studies from review. The study design is summarized in Figure 2.

Figure 1. **Value Relevance of Financial Statement Data (FS) and Nonfinancial Statement Information (NFS) in Investment Rounds in Pre-IPO and Post-IPO Periods**



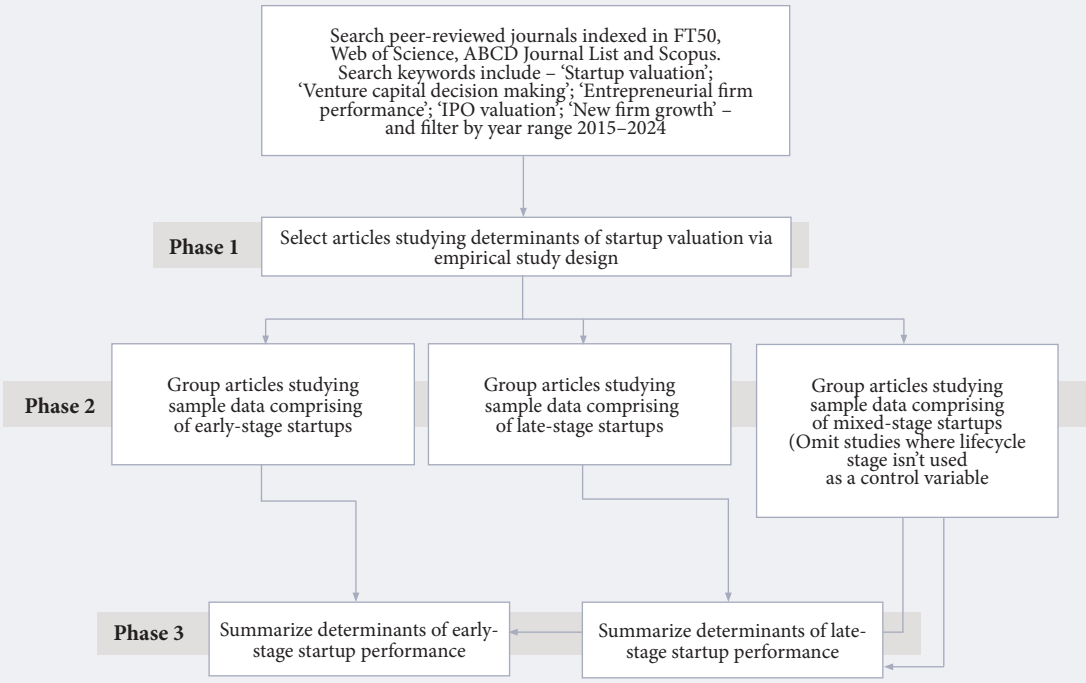
Source: authors.

Table 1. **Two-stage Lifecycle Model Used to Study Valuation Drivers of a Startup**

2-stage model used in this study	Mapping the popular 5-stage model (Scott and Bruce (1987))	Mapping valuation rounds observed in VC industry
Early stage	Inception	Pre-seed/Seed
	Survival	Series A
	Growth	Series B
Late stage	Expansion	Series C/D/E etc. (Pre-IPO)
	Maturity	IPO & post-IPO

Source: authors.

Figure 2. **Three-Phase Study Methodology**



Source: authors.

Thematic coding

This study closely follows literature survey studies by Berre & Le Pendeven (2023) and Colombo et al. (2023) and extends the observations based on lifecycle stage. During phase 3 of this study, we categorize empirical indicators of valuation drivers along 5 thematic lines; Entrepreneur Characteristics; Firm Characteristics; Market Conditions; Investor Characteristics; and Deal Conditions. This approach is similar to that followed by Berre & Le Pendeven (2023) for thematic categorization of startup valuation drivers. The Deal Conditions theme was expanded to include equity market conditions, regulations and institutional factors, following Colombo et al. (2023).

Figure 3 outlines the periodicity observed in early-stage and late-stage valuation drivers following this thematic coding. Periodicity indicates the frequency of that factor's significance in prior empirical studies, either as an independent variable or as a control variable. For example, in early-stage studies, Entrepreneur characteristics are most frequently found to be significant, indicating that it has a higher relevance to valuation than other factors in this stage. Thus Figure 3 gives us an early peek into the relative relevance of valuation factors which we will explore deeper in the *Discussion*.Section.

Not surprisingly, we find large diversity in empirical indicators categorized under the most recurring themes of - Entrepreneur characteristics, Firm characteristics and Investor characteristics. Hence, we further expand the five startup valuation themes into nine factors as shown in Table 2 - Founding team experience, Founding team traits, Management team experience, Firm's non-financial resources, Firm's financial resources, Market conditions, Venture Capital (VC) financing, Venture Capital's (VC) non-financial resources and Deal conditions. Such a classification allows us more flexibility in reporting the role and relevance of these valuation factors in subsequent section.

Key Determinants of Startup Valuation

We now delve into the role and relevance of each of these nine factors in detail.

Founding team experience

Role and relevance in early-stage valuation – Early-stage studies have used the following sub-factors to study founding team experience - Domain knowledge, Education and Social capital of founding team.

Domain knowledge represents tacit knowledge learned from prior working experiences. Tacit knowledge acquired by the team increases likelihood of discovering opportunities and acquiring resources required to address them. Hence entrepreneur experience has strong signaling effects to external stakeholders (Honoré, Ganco, 2023). Studies have found that such experience signals quality, commitment and legitimacy (Rocha, Grilli, 2024). Prior working

Table 2. **Map of Five Thematic Factors Found in Literature Review to an Expanded Set of 9 Factors for Detailed Discussions**

Expanded 9 factors used in this study for discussion	Empirical indicators
Entrepreneur characteristics	
Founding team experience (observable characteristics of founders)	Years of working experience, years of management experience, shared working experience of founding team, prior startup experience, multicultural experience of founders, highest level of education acquired, ranking of university attended, size of LinkedIn connections, multicultural experience of founders, City of birth/operation
Founding team traits (underlying characteristics of founders)	Openness to experience, conscientiousness, extraversion, agreeableness, and neuroticism, risk-taking behavior, innovativeness, pro-activeness, autonomy, competitive aggressiveness, absorptive capacity (typically measured via surveys with Likert-scale responses)
Management team experience (observable characteristics of Top Management Team, excl Founders)	Completeness of management team, work experience and education qualifications of top management team, team size
Firm characteristics	
Firm's non-financial resources	Number/age of patents, Citation count, employee count, business model, number of external alliances such as business incubator membership, industry alliances, GTM partners, university partnership, city of operation
Firm's financial resources	Revenues, revenue growth rate, capital investments received, R&D expenditure, ratios such as R&D/Assets, SGA/Sales, ROA
Market conditions	
Market conditions	Industry growth rate, industry lifecycle stage, financial ratios such as R&D/Sales, SGA/Sales
Investor characteristics	
VC financing	Amount of financing, stage of financing, equity dilution, previous investors in cap table
VC's non-financial resources	Past experience intensity, diversity of IPO experiences, number of prior syndicated IPOs, human/social capital of partners, patent activity in VC home country, domain specialization
Deal conditions	
Deal conditions	Total venture capital investments, FDI inflows, Country level indices such as corruption index, innovation index, infrastructure quality, economic uncertainty

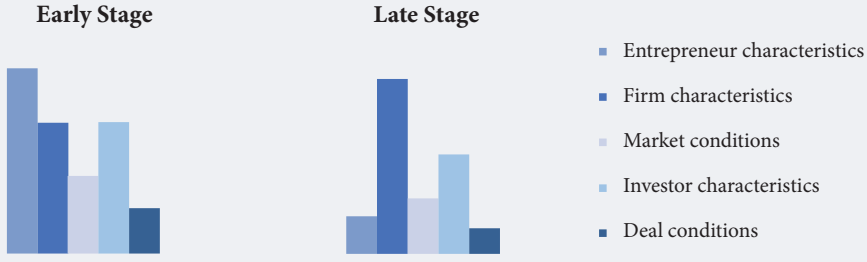
Source: authors.

experience also has strong signaling effects to internal stakeholders resulting in lower management churn (Chahine, Zhang, 2020). Overall, relevant industry and managerial experience improves valuation of a new venture since tacit knowledge thus acquired is considered to be unique and transferable to future endeavors (Dhochak, Doliya, 2020).

Education represents codified knowledge. For highly specialized domains, higher levels of educational qualification may even be a pre-requisite. In addition to technical knowledge, soft skills acquired during formative years of the entrepreneur are highly valuable. Social networks built during this period help in attracting talent, making early customer connects and securing institutional investment (Bublitz et al., 2018). It has been observed that founders' academic association help attract quality management talent, following '*a matching of equals among equals*' and generates higher valuation than peers (Wasserman, 2017; Bublitz et al., 2018).

Social capital represents a network of resources gained by the founding team via their social networks. In early stages of a startup, signaling value of founders' social capital assists in bootstrapping resources. Such resources include human capital, investor connects or advisory board members (Rocha, Grilli, 2024). Social capital works by reducing information asymmetry (Gompers et al., 2021). In the absence of operating history, early-stage startups heavily rely on their social networks to build trust and confidence.

Figure 3. **Periodicity of Valuation Factors Based on Thematic Coding**



Source: authors.

Geographically diverse social networks are valuable as it allows founders to judiciously explore a broader set of opportunities (Szymanski et al., 2021).

Role and relevance in late-stage valuation – Late-stage studies have used the following sub-factors to study founding team experience - Domain knowledge and social capital of founding team.

In late-stages, prior domain knowledge drives founders to set more ambitious goals for rapid growth of the firm. Domain specific experiences create a network of contacts (Montanaro et al., 2022). In late-stages where growth creates demand for massive resources, founders with domain experience find that they have better access to financial and social capital (Cotei et al., 2022). Founders with prior entrepreneurship experience are more likely to retain CEO role and secure favorable contracts from VCs (Nahata, 2019). Founders continue to remain top decision makers and reference points in late stages of a startup and this increases the possibility of replicating previous best practices.

By tapping social networks, founders continue to attract executive hires well into its later stages (Wasserman, 2017). The startup has now established product-market-fit and is racing to scale its investments and resources. Hence its core competencies now expand beyond technology and products to include operations, governance structures and smart financing. Social network of the founders plays a key role in attracting human capital across functional domains. It is found that prior networks of the founding team inform hiring decisions and composition of management team in later stages (Chahine, Zhang, 2020). Social capital of founding team helps to mitigate risks as well as to diffuse new ideas and information. (Zhang et al., 2023).

Firm's non-financial resources

A firm's non-financial resources are broadly classified into internal and network resources. Internal resources comprise of R&D, products, processes and business model developed by the startup. Network resources represent the network of external resources that allows the startup access to complementary resources, such as industry alliances or incubator membership.

Role and relevance in early-stage valuation – R&D is found to be intrinsic to technology startups. R&D helps nascent firms handle the liability of newness and establish legitimacy (Tumasjan et al., 2021). In high-tech firms' patents and trademark applications have high complementarity to VC funding (Zhou et al., 2016) In a study of startups across lifecycle stages, (Singh, Subrahmanya, 2022) found that resources invested in acquiring research capital (RC) and innovation capital have a positive relationship with sales growth and competitive advantage in later stages. Innovation is not restricted to technology and products. Business model innovation is a critical value driver. Early-stage firms with fluid business models can thrive during volatility and disruption and hence attract higher valuations (Gompers et al., 2021).

External tie-ups help a new venture access new technology and/or markets and increase its growth prospects (Dhochak, Doliya, 2020). Many studies have explored the influence of university alliances and found that university alliances, specifically when initiated by founders with higher educational qualifications, can result in higher revenues than peers (Keogh, Johnson, 2021). Furthermore, strong connections to entrepreneurial ecosystems such as business incubators provide the network environment to acquire and transform knowledge into firm outcomes (Vincent, Zakkariya, 2021). Business accelerators reduce uncertainty around nascent ventures and convince early customers. Social impact accelerators can have a snowball effect on customers and positively influence revenues (Kher et al., 2023). Reinforcing the effect of entrepreneurial ecosystems assert that startups outside of traditional venture capital hubs may have higher entry barriers (Gompers et al., 2021).

Role and relevance in late-stage valuation – Investments in R&D continue to be valued in late-stages as seen by its influence on IPO evaluations. This is especially true for technology intensive startups where innovation input of firms as indicated by R&D expenditures lead to higher innovation outputs as indicated by patents (Chemmanur et al., 2018, Chahine et al., 2022). Future investors or acquirers value the growth potential signaled via intellectual property rights, research and development activity due to its long-term potential (Cotei et al., 2022). Patents and trademarks continue to positively influence valuation (Shi, Xu, 2018, Fisch et al., 2022). Additionally, startups that maintain flexible business models via the comprehensiveness of product workflows have a strong positive relation to setting a differentiated strategy for the firm (Lee et al., 2023). Such scalable firms thus have larger potential business opportunities and are rewarded with higher valuations.

Network resources continue to be a key value determinant in the startup's late stages. Access to external resources determines the pace of growth as firms struggle to scale organically. External partnerships boost the comprehensiveness of the startup's offerings (Lee et al., 2023). Investments in social capital, for example, affiliation with prestigious universities, have spillover effects on higher human capital of the firm (Colombo et al., 2019). This is also true in the case of service providers to startups – lawyers, investment bankers, VCs, and board directors. Service providers tend to congregate geographically, motivating the startup to expand its geographic presence in later stages (Li et al., 2023). Such geographic colocation improves firm performance due to imperfect information of spillover effects (Boschma, 2015) and improved IPO and M&A outcomes (Ahluwalia, Kas-

sicieh, 2024). Interestingly, even non-core networks such as political affiliations serve to enhance the legitimacy and competitiveness of the firm, signaling that quantity of alliances matters (Gounopoulos et al., 2021, Moghaddam et al., 2016).

Firm's financial resources

The firm's financial resources are represented by assets reported in its financial statements. It includes tangible assets like revenue, physical assets, royalties, as well as intangible assets like R&D, and brand value.

Role and relevance in early-stage valuation - In the early stages, the firm's financial resources are insignificant and typically do not play a role in determining future valuation. In fact, Gompers et al. (2020) find that 31% of early-stage VCs reported that they do not forecast company financials at all when they make an investment. However, other studies have reported contradictory results. For example, Kalyanasundaram et al. (2021) argue that lack of revenue reduces life expectancy of survival stage startups and hence forms a key value determinant of the firm. In its early stages, a firm's financial resources are more often used as a proxy to assess market demand for its products and hence future potential. However, its use in traditional valuation methods like the Discounted Cash Flow (DCF) or Multiples method is generally avoided.

Role and relevance in late-stage valuation - By its later stages, the startup has sufficient operating history and a primary business model. The firm's financial resources become critical in its evaluations. Even though evaluation techniques as used for public firms may not be applied directly, the firm's financial resources take center stage in its valuations due to its influence on future growth and profits. Financial resources retain high levels of significance even when combined with other non-financial resources of the firm such as organizational reputation (Liu et al., 2020).

In this phase, leverage or debt is found to be negatively related to valuations (Somaya, You, 2024) while financial ratios such as Return on Assets (ROA) assume significance (Shi, Xu, 2018). Kalyanasundaram et al. (2021) note that a key result in growth stage is rapid scale-up and market expansion. Profitability metrics are often side-lined in this phase. However, as the firm matures, survival hinges on profitability. Attention is spent on volume growth to hit breakeven level of operations. Industry practitioners have evolved various approaches to assess the quality of the firms' financial resources. An example is the Rule of 40 (and its extensions) – which emphasizes that the sum of revenue growth rate and profit margin should exceed 40% for credible SaaS startups (Bessemer Venture Partners, 2024).

Intangible resources are also valued highly especially in technology-based startups, even if it doesn't have a direct impact on revenue today (Chemmanur et al., 2018). As accounting methods have evolved to assign value to intangible resources, R&D expenditures and SGA are found to be value accretive, especially during IPOs.

VC Financing

VC Financing refers to external capital received from institutional investors. Due to the lack of operating history of the funded firm, venture capital is most often not backed by collateral. Instead, in return for capital, investors receive an equity stake in the firm.

Role and relevance in early-stage valuation – External financing aids the pace of innovation in early-stage. Information asymmetries are highest in the earliest stages due to limited track record and future uncertainties. Working with the liability of newness, the startup tries to move fast and deliver credible products as fast as possible. Studies have found that the earlier startups receive VC investment, the higher the performance achieved (Nahata, 2019, Chemmanur et al., 2016). VC investment keeps up the growth momentum and allows the firm to move faster than firms that haven't raised external financing.

Studies have also shown that the quantum of financing received also plays a role in future valuations. (Barick, Aithal, 2023) conducted a study of startups that have achieved unicorn status and found that technology-based startups achieve unicorn status faster than non-tech startups due to their higher valuations and funding amounts. Funding received gives them an edge on innovation and skilled labor. For early-stage startups, having a higher capital at startup allows them to invest ahead of the curve and perform better in the face of external uncertainties (Fracasso, Jiang, 2022). In addition to early investments facilitated, financing rounds also confer reputational capital on the nascent firm. (Kleinert et al., 2020) tested the hypothesis that ventures that have raised prior institutional financing will be valued favorably. The effect of prior funding is most significant for seed stage firms due to its signaling effects.

The presence of certain types of institutional investors in the financing rounds also plays a role in startup valuation. This effect is particularly pronounced in the early stages. For example, corporate venture capitalists bring technology know-how in addition to financial resources. Li et al. (2023) find that corporate venture capitalists can mitigate the negative impact of technological novelty on high-tech startups' alliance formation. Overall, the quantum of financing received and the type of early-stage investor onboarded influence the path adopted by the startup and its future outcomes.

Role and relevance in late-stage valuation – Financing requirements in late stages far outweigh those in early stages. This is because financial resources are particularly versatile and are critical for rapid growth (Piaskowska et al., 2021). External financing facili-

tates investments in human capital, social capital and research capital (Singh, Subrahmanya, 2022). In fast-paced industries, timing is everything. The initialization, pace and chronology of actions affect the likelihood of entrepreneurial actions (Wood et al., 2021). Financing requirements continue to increase in the firms' late stages so much so that unavailability of adequate financing may cause the firm to lose its competitive edge or reverse its growth momentum.

Demand for high levels of VC financing in late stages is often driven by the pursuit of venture scale. Scale opens up larger business opportunities for the firm and improves capital efficiency. In the face of limited internal cash flows, scale is often financed by external capital. Furthermore, regulatory and governance burdens increase in this phase which in turn leads firms to seek higher valuations and higher capital inflows (Somaya, You, 2024).

Sustainable differentiation is built by the firm based on future bets placed (Göttel et al., 2024). Higher funding serves to signal the size and scale of these future bets. Hence studies have reported that exit outcomes are influenced by funding amount and duration of investment (Shuwaikh et al., 2024). Higher funding also increases the likelihood of IPO exit as VCs assist firms through the IPO process (Gounopoulos et al., 2021).

VC's non-financial resources

VC non-financial resources represent the additional resources employed by the VC firm as they take a more active role in their portfolio companies. These resources mainly include human and social capital of VC partners as well as functional support services.

Role and relevance in early-stage valuation – In the early stages, non-financial contributions of VCs – such as domain experience, entrepreneurial experience and reputation – help startups acquire valuable resources. Media prominence of VC firms helps in attracting human capital (Vanacker, Forbes, 2016). Corporate VCs help the firm to acquire complementary technology resources (Röhm et al., 2018).

Future financing rounds are also favorably influenced by the domain experience of VC partners (Kleinert et al., 2020). Overall, VC backed companies grew faster than PL (participative loans) backed firms due to unique non-financing contribution of VCs (Quas et al., 2021.

Role and relevance in late-stage valuation – The paramount non-financial resource of interest to later-stage investee firms is the reputation transfer from association with highly experienced VCs. Such reputation transfer enhancers include past experience intensity, diversity of IPO experiences, number of prior syndicated IPOs (Chahine et al., 2022). Nanda et al. (2017) finds that each additional IPO experience in VC firms' first 10 investments predicts an 8% higher IPO rate. Even highly innovative firms command a price premium, contingent on the existence of venture capital ownership and reputable underwriter endorsements (Shi, Xu, 2018).

VC firms offer further value enhancing services such as managing human capital issues (Gompers et al., 2021), coaching and networking services (Chahine, Zhang, 2020) and access to tacit knowledge and networks (Joshi, 2018). Further, diversity in institutional investors such as CVC investors or VC syndicates also act as value enhancers (Bayar et al., 2020; Shuwaikh et al., 2024). These studies confirm the sociological approach to financial market behavior (Chahine et al, 2022).

Market conditions

Market condition refers to the industry lifecyle in which the startup operates. Market condition acts as an externality impacting startup valuation.

Role and relevance in early-stage valuation – Venture capital partners rank industry lifecycle a close second in factors influencing early-stage valuation, directly after the firm's internal resources (Gompers et al., 2021). This is because a startup operating in early stages of an industry transformation can achieve substitution effects where it replaces incumbents with its novel technology and gains a significant share of the market. Studies find that startups accomplishing early-stage entry and sustained differentiation remain independent and are more likely to exit via IPOs (Bowen et al., 2023). Even though being the first-mover can often be a liability, ventures operating in nascent markets categorize and balance between legitimation and differentiation (McDonald, Eisenhardt, 2020) to maintain steady progress.

Industry forces and startup positioning within the industry value chain can determine opportunity size, profitability and hence valuations. A large opportunity size lowers uncertainty risk (Dhochak et al., 2024). Industry-wide ratios such as the Industry-market-to-book ratio can often find significance in regression analysis of valuation (Nahata, 2019). As a second-order effect, the economic scope of the opportunity also has a positive impact on alliance formation and growing the network of partners (Li et al., 2023). Thus, startups addressing opportunities in an industry that is rapidly growing are highly valued. Gompers et al. (2021) conducted a study of investments post COVID-19. Researchers find that the importance placed on industry has only increased and some industries benefit non-linearly due to external conditions.

Role and relevance in late-stage valuation – Industry type continues to remain a control variable in valuation studies of firms in the late stages; however, the firms' unique assets such as patents or Software-as-a-Service (SaaS) distribution model could allow it to grow faster than rates prevalent in the industry. Deep focus on a specific industry helps the firm to rapidly expand its portfolio of products or services (Lee et

al., 2023). In this phase, it is likely that firms expand their offerings across industry segments and reduce dependence on a single industry. The firm's technology can have complementary effects (incremental innovation) or substitution effects (disruptive innovation) (Bowen et al., 2023). Such effects are realized in the later stages via non-financial resources of the firm and determine its pace of growth within that industry.

Deal conditions

Deal conditions refer to the overall business environment in which the startup operates. This is conceptualized as an amalgamation of the social, cultural, economic, legal and political environments. However, studies have largely focused on the macroeconomic environment due to its first-order influence on valuation.

Role and relevance in early-stage valuation – Early-stage startups are sensitive to fluctuations in the macro environment, either positive or negative. High levels of capital inflows increase financing available to innovative, fast-paced firms. Foreign Direct Investment (FDI) also has spillover effects on entrepreneurial ventures via demand expansion, knowledge expansion and demand for intermediate inputs (Kim, 2019). Early-stage startups are particularly vulnerable to market shocks. Howell et al. (2020) find that early-stage VC activity declined by 38% in the first 2 months after COVID-19 reached the United States of America. This holds true for recessions overall, where VCs show unwillingness to finance innovation. It indicates cyclicality of VC and it is more pronounced in early-stage investments. Overall, entrepreneurial ecosystems thrive when stable macroeconomic environment prevails in the country of operation.

Role and relevance in late-stage valuation – During recessions, late-stage transactions do not see the steep fall that early-stage transactions do (Howell et al., 2020). This holds for dollar volume, number of deals or transaction size. Cotei et al. (2022) further confirm that startups that can build competitive advantage and can demonstrate innovative capabilities through the presence of intellectual property are more likely to have a successful exit, even in high policy uncertainty. However, due to the larger size of funding transactions in late stages, findings have been mixed with Shuwaikh et al. (2024) reporting that financial distress can impact late-stage valuations too.

Founding team traits

Role and relevance in early-stage valuation – Early-stage studies have used the following sub-factors to study founding team traits - Personality of the founding team, Entrepreneurial orientation and Absorptive capacity.

Entrepreneurship can be a lonely journey and personality traits such as extraversion help founders avoid social isolation in their early days. Founders who have more active interactions with peers, informal support networks, mentors and partners generally outperform their peers (Galloway, 2019). Openness as a personality trait contributes to rapid diffusion of new ideas (Zhang et al., 2023). Cultural experiences can also shape how entrepreneurs gather and process resources which can lead to wide variances in outcomes.

Another important factor in the establishment of startup firms is entrepreneurial orientation or motivation, which is supported by environment and business opportunities. Attitudes, behaviors, and unique processes differ from workers to managers to entrepreneurs (Murnieks et al., 2016; Santoso et al., 2022). Educational institutes have a key role in promoting entrepreneurial motivation (Yan et al., 2023). An entrepreneurially oriented individual who is able to explore and acquire knowledge creates entrepreneurial capital and improves innovation (Caputo et al., 2020). Gompers et al. (2021) noted that early-stage investors put more weight on the management team and assess soft information about founder traits via in-person meetings.

Finally, higher absorptive capacity in earlier stages allows firms to scale rapidly. VC investment in early stages helps firms gain and cement this capacity (Jeong et al., 2020). Management decisions that define the knowledge orientation of the firm change resource allocation and hence valuation of the firm. Management team sets processes to enable absorptive capacity and this dynamic capability allows the firm to excel differently as compared to firms receiving similar support (Vincent, Zakkariya, 2021). Startups that have corporate or university stakeholders strengthen their knowledge and resource base (Rocha, Grilli, 2024).

Role and relevance in late-stage valuation – In the late-stages, not many studies have explored founding team traits as an influencing factor. This could be because founder traits such as passion, tenacity, and customer orientation become ingrained in the culture of the firm as a whole (Murnieks et al., 2016) in its later stages and its influence can be observed via firm-level factors such as its processes, knowledge orientation or strategic decisions.

Management team experience

Role and relevance in early-stage valuation – In the early stages, the startup maintains a lean team with a fluid organizational structure. It is unlikely to have a strong management team outside of the founders. Hence this factor is not found relevant for early-stage assessments.

Role and relevance in late-stage valuation – In late-stages, team management consistently ranked high among all companies the VC firm would have liked to invest in. As a firm matures managerial capabilities evolve from addressing survival concerns to setting

up complex organization systems. Relevant experience of management team has a direct impact on the productivity and growth of firms (Chahine, Zhang, 2020). Top management team receives close attention during IPO valuations (Wasserman, 2017). Firms with a broad experience team secure milestones faster – be it funding milestones or performance milestones. Hence it is generally found that funds allocated to acquiring quality human capital surge in late stages (Singh, Subrahmanya, 2022). The increased allocation also helps to counter human capital risk, i.e.; the likelihood of critical employees leaving the firm.

Discussion

In the prior section, we provided a map of nine valuation factors and their distinct influences on early-stage and late-stage startup valuation. We now try to derive relative relevance of these valuation factors in each stage. Figure 3 gave us an early peek into the relative relevance of valuation factors based on frequency of that factor's significance in empirical studies. We now extend the same approach to all nine valuation factors discussed above.

The approach to deriving the relative relevance of valuation factors is as follows - once the factors influencing startup valuation are attributed to early-stage, late-stage or both, we determine the frequency of that factor's significance in empirical studies, either as an independent variable or as a control variable. We then arrange these factors in descending order of frequency. As the focus is on determining relative relevance, instead of absolute relevance we move away from the frequency distribution chart format in Figure 3 to a simple hierarchy. This allows us to synthesize the findings of literature map into a *'relevance hierarchy'*.

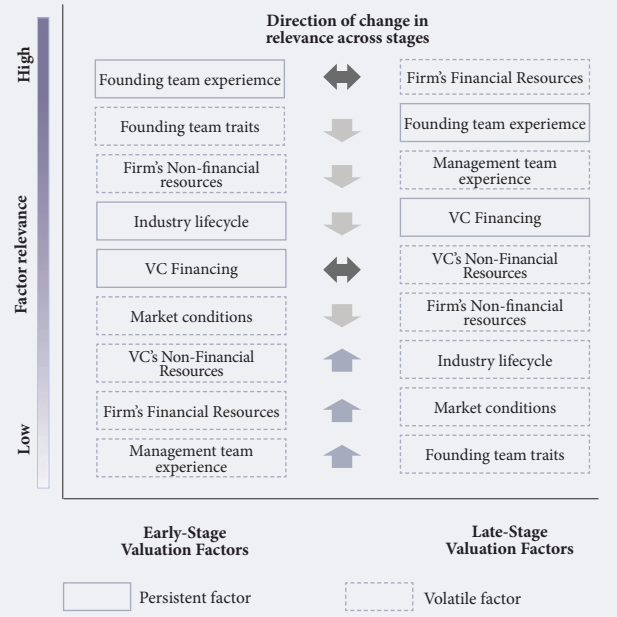
Relevance hierarchy of valuation factors

Relevance hierarchy offers an interesting dimension of relevance of valuation factors across lifecycle stage. Figure 4 shows the relevance hierarchy in early-stages followed by relevance hierarchy in late-stages to its right. The arrows in the middle against each box indicate the direction of change in relevance of that factor across lifecycle stages. An up/down arrow indicates that the factor has risen/dropped in relevance hierarchy by +2/-2 or more levels. A status-quo arrow indicates that the factor has retained its relevance within +1/-1 levels.

It should be emphasized that startups are highly dynamic entities with outliers observed frequently. Hence it would be impossible to attribute an absolute relevance value. Rather, the relevance hierarchy is an attempt to visualize the relative relevance of valuation factors that can inform empirical studies in this domain.

The key highlights of this literature review from a theoretical standpoint are summarized below –

Figure 4. **Relevance Hierarchy across Lifecycle Stages**



Source: authors.

- A critical determinant of firm valuation in its early-stage is its human capital, i.e.; Founding team experience and Founding team traits. Founding team experience continues to be a high determinant of firm valuation in its late-stages with its scope expanding beyond founders to its top management team.
- A significant jump in value relevance is seen in favor of the Firm's financial resources. This is consistent with prior studies that show that value moves from non-financial resources to financial resources across lifecycle stages.
- The quantum of VC financing received retains its relevance across stages, while the relevance of non-financial resources accrued from VC association increases substantially in the late-stages.
- External factors such as Industry lifecycle and Market conditions have a relatively higher value relevance in early-stages of a startup.

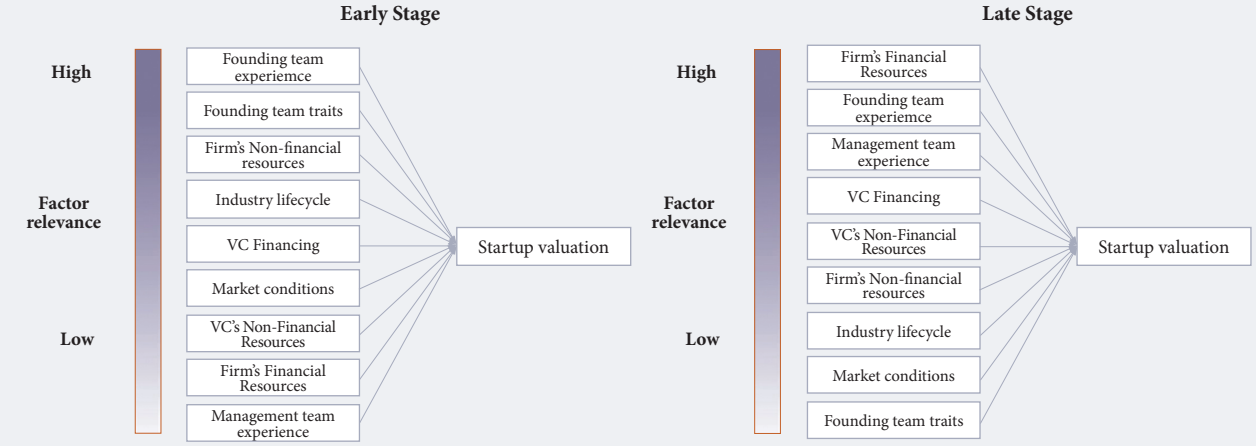
Persistent and volatile factors

The relevance hierarchy offers a sharper focus on variations in factor influences. This allows us to further uncover '*persistent*' and '*volatile*' factors.

The key highlights of this literature review from a theoretical standpoint are summarized below –

- Persistent factors retain their relevance levels across a startup's lifecycle stages. Hence such factors should be strongly considered in empirical studies.

Figure 5. **Meta-model of Early-stage and Late-stage Valuation**



Source: authors.

- Volatile factors vary in relevance levels across a startup's lifecycle stages. Inclusion and exclusion of these factors should be carefully considered based on lifecycle stage of the study.
- Founding team experience and VC financing were found to be persistent factors across lifecycle stages. This implies that its influence on startup valuation remains relevant throughout. Founding team experience also demonstrates the strongest influence on valuation.
- Volatile factors include Firm's non-financial resources, Firm's financial resources, VC's non-financial resources, Industry lifecycle, Market conditions, Management team experience and Founding team traits. This implies that its influence changes across lifecycle stages. Volatile factors can move up or down in relevance across lifecycle stages.

A meta-model of startup valuation based on relevance

We now present a meta-model model of startup valuation that is unique to each lifecycle stage in Figure 5. It includes the diversity of explanatory constructs we found in prior entrepreneurial studies assessing startup valuation and overlays it with the *relevance hierarchy*. In simple terms, the conceptual model is essentially a superset of all determinants of startup valuation. However, by overlaying the *relevance hierarchy* into the conceptual model, the revised model provides valuable guidance on the significance of each factor in that lifecycle stage.

While some of these determinants remain constant, some others wane and grow in importance across lifecycle stages. As more empirical studies are being taken up in emerging startup ecosystems such as India, South East Asia, and Latin America, such an understanding can help improve quality of data collected for these studies. It also reduces model complexity by dropping variables of lower relevance and thus improves quality of data analysis conducted.

To summarize, in stage-specific studies, the relevance hierarchy informs contraction of control variable set. Whereas in the case of mixed-stage studies, it informs expansion of control variable set.

Conclusion

Despite large pools of private money chasing startups, the successful evolution of a startup from its early-stages to late-stages is a slow process, often involving transformative changes, which motivated the title of this study – *Spawning Butterflies*. The process, while painful to entrepreneurs, has also been baffling to researchers due to dynamic capabilities and confounding effects. This study contributes to disentangling confounding effects in valuation factors by applying the '*looking glass*' of lifecycle stage. Closely following prior empirical studies in entrepreneurship domain, this study identifies valuation drivers and catalogues them based on their relevance to startup valuation into a '*relevance hierarchy*'. This presents a novel view to future researchers that can inform selection of independent and control variables in their study of startup valuation. The relevance hierarchy also allowed the study to uncover *persistent and volatile* valuation factors. The study finally distills overall findings into a refined meta-model for startup valuation unique to each lifecycle stage.

Venture capital industry has realized the need for stage-wise specialization, resulting in the rise of early-stage VCs, growth-stage VCs and late-stage VCs. Startup incubators too further sub-segment early-stage startups into idea-stage, pre-idea stage, etc. These developments signify the need to micro-

target startup academic studies specific to the firm stage. The evolution of an egg into a butterfly is one of nature's most delightful mysteries. The intermediate transformations though almost unrecognizable, demystify our understanding of it.

Our study addresses the following existing gaps in literature. Firstly, by seeking stage-wise interpretations, we compare the role and relevance of valuation factors across stages. Such differences across stages have been acknowledged by prior literature surveys (Köhn, 2018; Berre, Le Pendeven, 2023; Colombo et al., 2023). Secondly, it expands our understanding of each of these valuation factors by *relevance*. Third, the *relevance hierarchy* allows us to introduce *persistent and volatile factors* in startup valuation. The ebb and flow of these factors directly addresses and informs existing gaps in selection of explanatory variables in multi-stage studies. Finally, the study distills overall findings and provides a meta-model for startup valuation. This view opens up future avenues of study into factors driving these movements.

Looking ahead, we see multiple avenues of future research. Volatile factors identified in this study warrant further contextualization studies. Understanding the 'why' and 'how' of volatility of factors via empirical studies is required. For example, exploring the volatility in VCs non-financial resources can help delve deeper into the capabilities of VC's involved in early-stage, growth-stage or late-stage investments. What are the evolving characteristics of micro-VCs (early-stage VCs) and how do they influence startup performance? Other volatile factors such as firm's non-financial resources, or market conditions also warrant deeper studies.

Another area that has remained under researched is the study into boundary conditions driving the ebb and flow of volatile factors. It is opportune to explore what drives the increase or decrease of relevance of volatile factors via interaction effects. There has been sustained interest in the exploration of interaction effects of valuation factors (Vincent, Zakkariya, 2021; Coad et al., 2016; Sethuram et al., 2021). For example, it would be interesting to investigate the interaction effects of founder risk propensity and firm stage or founder quality and VC financing. Such interaction studies can help explore boundary conditions of valuation factors or path dependencies that cause one effect to prevail over another.

Lastly, and this is the most unambiguous research direction from this study, we recommend entrepreneurial studies to have a narrow timeline of analysis – go "inch wide, mile deep". This points to the need to expand beyond cross-sectional factors-based analysis but rather delve deeper into iterative events that occur within a developmental stage of the firm.

The author(s) declare this paper is the result of original research. We have NO financial and/or business interests in any company that may be affected by the research reported in the enclosed paper. We have disclosed all interests fully.

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