



# Financing paths, firms' governance and corporate entrepreneurship: Accessing and applying operant and operand resources in biotechnology firms

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## ABSTRACT

This study investigates the systemic relationship between financing paths used by early-stage biotechnology firms, the accessed resources, the subsequent reconfiguration of management and governance structures, and their effect on the level of corporate entrepreneurship. Adopting a qualitative methodology based on an inductive approach, in 2018 and 2019 we observed 12 UK biotechnology ventures that accessed private, corporate or crowdfunding equity investments. We collected primary data through open-ended and semi-structured interviews with CEOs and board members of these firms. Findings were interpreted applying a resource-based perspective, which unveiled the role and importance of operant and operand resources for organizational coordination and functioning. The way in which the controlled operant resources are used to improve the management and governance structures, and their functional interdependence, ultimately determines an optimal level of corporate entrepreneurship for effectively exploiting the accessed operand resources. The results provide useful insights regarding the systemic interdependence between financing paths, organizational resources, management team, governance bodies, and corporate entrepreneurship, that can enhance the understanding and performance of managers, shareholders and policy-makers involved in biotechnology business.

## 1. Introduction

Entrepreneurship literature indicates that innovative start-ups can use various financing paths (Ahmed and Cozzarin, 2009; Block et al., 2017; Fraser et al., 2015; Wallmeroth et al., 2018). Among these paths, external equity investments introduce new players in organizational governance structures, creating potential tensions between management team and shareholders (or their representatives), but also providing needed resources for firm survival and development, which include: funds; expertise; access to markets, networks and organizations; entrepreneurial drive; and ideas (Drover et al., 2017; Klein et al., 2013; Li et al., 2018). The level of these resources will affect the post-investment management and strategy of the firm (Collin and Smith, 2003a, 2003b; Dalton et al., 2003; Drover et al., 2017; Kumar and Zattoni, 2017), especially in terms of corporate entrepreneurship vision and actions (Collin and Smith, 2003a, 2003b; Klein et al., 2013; Rigolini, 2013).

Studies have shown specific changes in the post-investment evolution of firms financed by venture capital (Manigart et al., 2002; Puri and Zarutskie, 2012), business angels (Collewaert et al., 2010),

crowdfunding (Walthoff-Borm et al., 2018) or corporate venture capital (Chemmanur et al., 2014; Maula et al., 2005). However, despite the importance of properly understanding the relationship between equity-based entrepreneurial financing, corporate governance evolution, and the corporate entrepreneurship mechanisms that determine post-investment firm evolution (Cumming et al., 2019; Fraser et al., 2015; Hisrich and Ramadani, 2017), no extant research has comparatively studied the differences between start-up ventures using various equity financing paths. This gap is particularly evident in the case of the new forms of entrepreneurial finance, such as crowdfunding (Ahlstrom et al., 2018; Block et al., 2018; Cavallo et al., 2019). While many studies analyze the controlled resources, corporate governance, and management structure of firms accessing private or corporate equity capital (Lerner et al., 2012; Weisbach, 1988; Zu Knyphausen-Aufseß, 2005), research on the post-investment period of equity crowdfunding-backed firms is mainly investigating their financial performance (Hornuf et al., 2018; Signori and Vismara, 2018; Walthoff-Borm et al., 2018), treating the evolution of the board of directors and of the management team as a “black box” phenomenon.

We address this knowledge gap answering the following research

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question: *What is the impact of different equity financing paths on the post-investment corporate governance, management, and entrepreneurship of high-technology startups?* Although this impact can be studied using various time horizons, we are deliberately focusing on the immediate effects of equity financing, and, for this reason, we restrict the interval under investigation to 12–18 months after the financing event.

In comparison with other entrepreneurial ventures, biotechnology startups have specific characteristics that exacerbate the need for external funding (Ahmed and Cozzarin, 2009), but also the importance of effective corporate governance (Veilleux and Roy, 2015) and corporate entrepreneurship (Rigolini, 2013). In this study, we focus exclusively on the UK biotechnology sector – considered the most mature life sciences sector in Europe, with a large number of high-potential startups (Conley, 2018) that are confronted with a challenging financing environment (De Concini and Brzezicka, 2018; Fraser et al., 2018; Signori and Vismara, 2018). We comparatively analyze a matched sample (Neergaard, 2007) that includes three groups of four UK biotechnology ventures, the firms from each group accessing equity capital either through private, corporate, or crowdfunding investments (Block et al., 2017). This qualitative approach is justified by the complex and systemic nature of our research topic, which requires a holistic analysis of the evolving relationship between corporate resources, financing paths, corporate governance structures, management team and entrepreneurial actions.

This study provides an original contribution to several streams of literature, connecting financial management, corporate governance, and corporate entrepreneurship models with the resource-based theory, and proposing a novel interpretation of these relationships from a systemic perspective. Using a resource-based theoretical lens (Kellermanns et al., 2016), our analysis outlines the importance of operand and operant resources (Madhavaram and Hunt, 2008) in the investigated biotechnology firms, and explains the subtle interdependence between controlled resources, corporate governance and organizational management (Li et al., 2018). Our findings provide useful insights for biotech managers and directors, helping them to: (i) select the equity financing path with the right combination of operand and operant resources for their organization; and (ii) successfully exploit these resources through a balanced interaction between management and governance structures.

The paper is structured as follows. After presenting the financing paths available to biotechnology startups, we discuss the complex interdependence between management and governance structures in high-technology ventures, outlining the importance of corporate entrepreneurship for their survival and development. We explain the methodology applied to collect, code and analyze primary data, followed by the main findings of the study. The discussion explains the interdependence between controlled resources, management team, governance structures and corporate entrepreneurship, in relation to a specific equity-financing path, using an original interpretative framework. After presenting the theoretical and practical implications of our findings, the paper concludes with an overview of its main limitations, and with propositions for future research.

## 2. Context

Biotechnology represents the industrial use of biological organisms and processes to manufacture medical, agricultural and consumer products (Oakey et al., 1990). Biotechnology applications include, among others, bulk and specialty chemicals, healthcare, food and drink products, waste or pollution treatment, and agriculture (Sager, 2001). The global biotechnology market is projected to reach \$727.1 billion by 2025 (Grand View Research, 2017 cited in Pereira et al., 2019).

Discovering and developing a new drug is an extremely long, expensive and risky process (Herper, 2013): R&D projects (across all therapeutic areas) take 14 years on average (Paul et al., 2010), with median costs estimated at \$350 million, and with 95% of the

experimental medicines failing to demonstrate effectiveness and safety. For this reason, most health biotechnology ventures attempt to identify and focus on their main area of expertise, collaborating with other organizations to successfully complete their R&D processes (Kind and Zu Knyphausen-Aufseß, 2007).

## 3. Equity financing for healthcare biotechnology firms

To fund their R&D projects, biotechnology startups can use several alternative financing sources (Ahmed and Cozzarin, 2009; Schiff and Murray, 2004): founders' capital, research grants, bank loans, private equity, corporate equity, initial public offering (IPO) or crowdfunding. However, each of these financing paths provide different opportunities and liabilities: founders' capital usually covers only the costs to incorporate the firm and, eventually, secure some intellectual property; state and regional grants are limited in scope and amount, carrying high bureaucratic burdens; banks are often reluctant to finance high-risk early-stage R&D projects; an IPO requires a well-developed R&D pipeline to attract stock market investors. These specifications significantly narrow the options of early-stage biotechnology ventures, leaving three privileged financing paths: (i) private equity – funds provided by Business Angels (BA) (Ramadani, 2012) or Venture Capitalists (VC) (Klein et al., 2013); (ii) corporate equity (CE) – the financial participation of other organizations, in exchange of shares and future profits (Allen and Phillips, 2000); and (iii) crowdfunding (CF) – private and corporate equity accessed through online platforms that act as financial brokers between firms and investors (Ahlers et al., 2015).

There are both time and regional variations in biotechnology investments. Investment in the biotech sector was abundant in 2015 and in 2016 – but 2017 registered weaker results (Ernst and Young, 2016) – and 2018 was again characterized by high investment levels (Cassidy, 2018). From a regional perspective, the US and Europe represent the most important biotechnology markets, “the average US company receiving around five times more financing than its European counterpart” (De Concini and Brzezicka, 2018, p. 5). UK firms may experience a drastic financing shortage after Brexit, losing access to the European Investment Fund (Cambridge Network, 2017). In these conditions, crowdfunding is welcomed by many experts, consultants and managers (Hornuf and Schwiendbacher, 2018; Kaminski et al., 2019). The democratization of online investment markets can eventually provide funding for grassroots, healthcare and sustainability innovations located in less developed or transition economies, or in high-risk market sectors (Dana et al., 2019; Hisrich et al., 2016; Ramadani et al., 2019; Vismara, 2019).

In recent years, the popularity of crowdfunding has grown in Europe, expected to overtake venture capital funding by 2020 (Taylor Vinters, 2018). The UK has the most developed equity crowdfunding market in Europe, both in terms of number and size of offerings (Signori and Vismara, 2018). Capital Cell, the first crowdfunding European platform dedicated to life sciences, started its activity in September 2017: “Capital Cell works with companies whose technology is based on biology or healthcare to secure the investment they need to progress their innovative, potentially life-changing ideas. Capital Cell's model is to support early stage companies, with seed stage investment up to £1 million” (Cambridge Network, 2017). In exchange for their services, crowdfunding platforms charge project management fees to firms and investors alike. They are often managed by experienced venture capitalists, investing themselves in some equity projects, either to boost the confidence of individual investors, or to take advantage of promising business opportunities (Bessière and Stéphany, 2015).

The use of crowdfunding platforms provides both opportunities and challenges (Vulkan et al., 2018). Firms can obtain the necessary investments much quicker than in traditional venture capital markets; however, the success of crowdfunding projects depends on the expert evaluation realized by the platform and on clear communication regarding the future business prospects (Ahlers et al., 2015). On the other

hand, as many crowdfunding investors have limited expertise in the biotechnology sector, the funded firms cannot take advantage of their market and business knowledge, as it is often the case with professional venture capitalists (Girard and Deffains-Crapsky, 2016). For investors, equity crowdfunding projects are extremely risky; in 2016, the UK Financial Conduct Authority issued a statement warning that equity crowdfunding is “a high-risk activity” and “it is very likely that you will lose all your money” (Terry, 2018). In the best-case scenario, it may take years until the investment brings some returns, and the number of successful exits is extremely low (Taylor Vinters, 2018).

With equity financing, investors provide funding and become involved in firm governance (Drover et al., 2017). As these investors own a part of the company, they become directly interested in its functioning and performance, to protect and valorize their investment. Individual or corporate investors are represented in the board of directors, participating in strategic decision-making and providing professional expertise to enhance organizational performance (Cumming et al., 2019). Sometimes, corporate equity investment is complemented by joint venture agreements or strategic alliances between the investing and the financed organizations (Allen and Phillips, 2000). Although these participatory mechanisms are extensively studied in the corporate governance literature (Li et al., 2018), they still represent a knowledge gap in relation to equity crowdfunding (Cumming et al., 2019; Girard and Deffains-Crapsky, 2016).

#### 4. Corporate governance and entrepreneurship

According to Daily et al. (2003) corporate governance structures and mechanisms determine the use of organizational resources and the resolution of conflicts among those involved in the organization. Although shareholders, directors, and executives are the “three major forces responsible for determining corporate direction and action” (Monks and Minow, 2012, p. 18), extant governance research has primarily focused on the roles and impact of the board of directors (Li et al., 2018). Boards play a central role in corporate governance, but their activities interact with, or are contingent on, other actors or institutions: Chief Executive Officers (CEOs), owners, top management teams, capital markets (Brunnering et al., 2007).

Traditionally, the board of directors has a twofold function (Hillman and Dalziel, 2003): (i) control – monitoring the behavior of the management team on behalf of firm's shareholders; and (ii) provision of resources, such as internal advice, corporate legitimacy, external communication, and access to resources critical for organizational success. Investigating the importance of corporate entrepreneurship in modern organizations, Rigolini (2013) posits that the board of directors “has an entrepreneurial function in guiding managers to increase shareholder wealth [...] by ensuring that managers develop and pursue viable strategies [and] working with them to identify suitable opportunities for growth” (p. VIII).

In enacting its functions, the board of directors has to strike a fine balance between disciplining and enabling actions (Collin and Smith, 2003a). The role of governance structures in the design and implementation of corporate strategies allow board members to open or close specific “windows of entrepreneurship” for the management team (Collin and Smith, 2003b). These entrepreneurial initiatives are particularly expected in the case of high-technology firms that have sufficient resources to initiate proactive actions (Collin and Smith, 2003a, 2003b). Normally, in the organizations that just secured equity financing, the post-investment level of corporate entrepreneurship should be similar or higher than the pre-investment level, any exception indicating a defective interaction between management and governance structures (Nakara and Mezzourh, 2011). However, by accessing equity finance, the corporate governance structure of these firms will also be modified, which indicates the existence of systemic interdependencies between controlled resources, corporate governance and

entrepreneurial management.

Extant studies suggest that a board with the correct mix of skills and connections can improve corporate entrepreneurship activity (Rigolini, 2013; Tuggle et al., 2010; Zahra et al., 2009) to achieve organizational development and success (Audretsch et al., 2009). However, the composition and characteristics of the board of directors will be determined by the financing path selected by the firm (Bessière et al., 2018). This evidence resonates with the idea that the choice of a specific financing path – and consequently, of a specific post-financing governance structure, is required to properly develop, manage and exploit the strategic resources owned by a firm (Kochhar, 1997). Private or corporate equity shareholders are few in number, highly knowledgeable regarding the firm and its market, and invest large sums of money, their involvement in firm's strategy and management being significant (Klein et al., 2013). In the case of financing methods – IPO or crowdfunding – that attract many shareholders with low individual investments (Bessière and Stéphany, 2015), major shareholders will still be present as, or represented by, board members to protect their interests; however, the involvement of minor shareholders depends on their level of interest and collective organization. Potential corporate governance mechanisms available to low investment shareholders are: (i) individual votes during the general assembly meeting; (ii) syndication and selection of leaders to represent them in the board of directors; or (iii) delegation of crowdfunding platform representatives or major shareholders to represent and defend their interest in the corporate board (Girard and Deffains-Crapsky, 2016). According to Klein et al. (2013), in comparison with publicly traded companies, the firms financed through private equity (PE) present a more entrepreneurial governance structure, as the “general partners of PE firms are among the economy's most important entrepreneurs, and [the] executives of their portfolio companies are more like entrepreneurs than managers” (p. 41). The centrality of high-risk and innovation, for the survival and development of biotechnology startups, requires strong corporate entrepreneurship action to exploit technological and/or market opportunities (Patzelt et al., 2012).

Although these systemic interdependencies between controlled resources, governance structure and corporate entrepreneurship are shaped by the selected financing paths (Bessière et al., 2018), there are yet no comparative studies that clearly identify and present the differences induced by private, corporate and crowdfunding equity investments. We address this knowledge gap using a qualitative approach to investigate a sample of early-stage UK biotechnology ventures.

#### 5. Methodology and sampling

Most papers investigating corporate governance in entrepreneurial firms published in top journals adopt a quantitative approach (Li et al., 2018), using on hypothetico-deductive methodology (Dana and Dana, 2005). However, quantitative research does not represent the best choice to explore complex phenomena that require answers not only to ‘what’, but also to ‘how’ questions. Given the complex systemic interdependence between controlled resources/assets, financing paths, corporate governance and management actions, we adopt a qualitative approach based on the comparative analysis of a matched sample of biotechnology firms (Neergaard, 2007). Our inductive method is centered on open-ended and semi-structured interviews using in-depth oral testimonies, thick description, and direct quotations from people about their attitudes, intentions, actions and experiences (Dana and Dana, 2005).

To obtain a representative and purposeful sample (Lincoln and Guba, 1985), we identified the main characteristics of our population of study and then we used them as selection criteria: (i) startup biotechnology ventures; (ii) involved in early-stage health-related R&D; and (iii) that secured their first equity financing – private, corporate or crowdfunding – in the past 12 months (i.e., between April 2017 and March 2018). To single out these ventures, we explored the online UK

biotechnology databases and news (e.g., BioPharmGuy: <https://biopharmguy.com/links/country-united-kingdom-all-location.php>; UK Bioindustry Association: <https://www.bioindustry.org/>; UK Biotech: <https://www.ukbiotech.com/uk/portal/index.php>). Thirty-one companies matched the selection criteria: 14 accessed private equity; eleven, corporate equity; and six, equity crowdfunding. Using the available secondary data, we sent email messages to the CEO and three board members of each identified firm, presenting our research project and inviting them to participate as key informants (Gioia et al., 2013), under the promise of strict confidentiality. In addition, we asked them to send us the name and contact details of any other member of the management team or board of directors, who was directly involved in the financing project, and who was willing to provide information. Representatives of 16 biotechnology ventures answered positively, but only 12 of these firms (four financed through private equity, four through corporate equity, and four through crowdfunding equity) have been retained because both the CEO and at least two board members accepted our invitation. The final selection was also determined by our comparative approach that required a matched sample of biotechnology ventures (Neergaard, 2007). For the final sample of selected firms, the funding event investigated in this paper took place between June 2017 and February 2018.

## 6. Data collection and coding

Primary data was collected through three rounds of Skype and/or phone interviews (see Appendix A). The first round, realized during April–June 2018, consisted in 34 open-ended interviews, each lasting between 30 and 45 min, in which we asked the respondents to “present in detail the financing equity project and its impact on corporate governance, management and entrepreneurship”. The interviews were recorded with the interviewees’ permission, and then transcribed and edited to remove any information permitting the identification of firms or respondents. In addition to the provided answers, 14 respondents (at least one in each investigated firm) also gave us access to internal documents regarding this project, such as transcripts of board of directors’ or management team’s meetings regarding the planning, discussion, negotiation and implementation of equity financing, as well as internal reports detailing the financial and strategic situation of the company before, during and after the financing event. These documents provided relevant information regarding the strategic projects planned or launched by the firm before or after the financing event, significantly facilitating the evaluation of pre- and post-financing level of corporate entrepreneurship (measured by taking into account the strategic projects planned, launched, maintained, stopped or postponed before and after the completion of the equity financing event).

Using the contacts provided by respondents, we also interviewed by Skype or phone three financial advisers specialized in the biotechnology sector, two crowdfunding platforms managers, and an experienced venture capitalist. These semi-structured interviews lasted around 30 min, focusing on the general context of UK financial markets and platforms, to better understand the interaction between fund seekers and finance providers. During the initial coding procedure, these alternative perspectives were corroborated with the data provided by corporate respondents to reduce research and interpretation bias.

We initially applied a parallel coding procedure, in which each co-author read and interpreted the collected data, to identify the main themes and produce a list of open codes. At the end of this process, the two co-authors compared their lists, identifying and discussing differences in data interpretation and coding. This process led to a common list of open codes that was subsequently enriched, modified and refined by confronting the identified themes with the extant literature on equity financing and corporate governance in entrepreneurial firms. The final list of open codes included 22 items, that were classified under five overarching categorical concepts (Cohen and Munshi, 2017). Connected during axial coding, these categories were neatly assembled

into an input-process-output model (see Appendix B).

In a back-and-forth interplay between primary data and the literature review, we repeatedly checked and identified any correspondence between open codes/overarching categories and the theoretical themes/concepts presented in academic studies. This analysis was based on an inductive approach oriented towards identifying patterns and discovering theoretical properties in the data (Bowen, 2008). This recurrent process allowed us to identify specific gaps in the collected data, which were addressed during the second round of primary data collection, realized during September–October 2018, which consisted into semi-structured interviews with 19 respondents. These interviews lasted between 15 and 20 min, covering identified information gaps. The collected data was interpreted and classified using the common coding frame, the result being again critically compared with theoretical/conceptual categories developed in the extant literature, until achieving data saturation (Bowen, 2008).

To avoid potential data collection biases introduced by respondents’ perceptions regarding the evolution of corporate entrepreneurship, we decided to initiate a third round of primary data collection, six months after the end of the first wave of interviews (i.e., January–February 2019). Our decision was justified by the idea that changes in corporate entrepreneurship require more time to get fully-manifested after the completion of the equity investment project. We contacted the CEO of every investigated firm, as, in our opinion, they were the best-informed respondents regarding the evolution of corporate entrepreneurship – defined as the strategic initiatives taken within an existing organization to develop products, services or processes, in order to create value and generate revenue growth (Foley, 2019). In our study we evaluated the changes in the corporate entrepreneurship level of the investigated firms, considering the strategic projects directed towards value creation and revenue growth that were planned, launched, maintained, stopped or postponed before and after the completion of the equity financing event. When the CEO was replaced after equity financing, we contacted both the pre-investment and the post-investment CEO. These semi-structured interviews lasted approximately 15 min, being specifically focused on three issues related to corporate entrepreneurship: determining factors, organizational evolution, and organizational consequences. The market consequences of corporate entrepreneurship were not investigated as this would address the issue of firm performance, which, in our opinion, could not be properly investigated using a qualitative approach and a short-time research orientation. On the other hand, as our research covered a period of 12 to 18 months (calculated as the interval between the financing event of various investigated firms and the last data collection point of our study), we consider that our data is sufficient to provide relevant information regarding the short-term impact of different equity financing paths on the corporate governance, management and entrepreneurship of high-technology startups, as formulated in our research objective.

## 7. Data analysis

In conducting our data analysis, we applied the principles of reflexive pragmatism (Alvesson, 2011), often used in industrial contexts to critically assess interview responses. This method helps the researcher to grasp the contextual meanings of answers, to assess the trustworthiness of respondents and identify transferable insights. The interdependence between various coding categories was analyzed and interpreted considering the history, profile, activity and context of the investigated firms, to unveil stable patterns of relationships expressed at structural and functional levels. Finally, the firms using different equity financing paths were compared to evidence the differences between the level and specificity of controlled resources, governance mechanisms, management action and corporate entrepreneurship. Using constructive (during the process) and evaluative (post hoc) procedures – triangulation and negative case analysis – we enhanced the trustworthiness and quality of data analysis and results (Bowen, 2008).



The next section presents the main findings, using direct quotations from the collected answers. To preserve the level of confidentiality required by our respondents, we refer to the investigated companies with letters from A to L.

## 8. Findings

The organizational profiles of the investigated biotechnology firms were very similar: all were younger than five years old and could be defined as small organizations, with fewer than 50 employees. The investigated firms were engaged – before the equity-financing event – in one or two early-stage R&D projects with a high market potential, based on their intellectual property and scientific expertise. Ten of these firms were founded by scientists, while two represented spin-offs of larger organizations and had experienced businesspeople in their founding team: “The business development director, and one of the founders of the firm, has ample experience in biotechnology business and financing. This helped us significantly to attract the right people in our board, and to identify a good venture capital firm for our financing project” (CEO, firm B).

The capital of these startups was mainly based on the financial contribution of their founders – some of which was converted into untradeable shares; five of the investigated firm succeeded to secure national R&D grants, and four obtained bank loans to acquire real estate or laboratory equipment. No other private, corporate or crowdfunding equity was part of these firms’ capital before the investigated financing projects, which is not unusual for biotech firms in their early startup phases.

The complexity of governance and management structures varied from one firm to another, but generally included the elements presented in Fig. 1. The Chairman is appointed by firm founders (often being him/herself among the founders) because of his positive widespread reputation as a top scientist and/or business expert. He/she has an important participation in the firm, often owning intellectual property, but did not want to be directly involved in daily management activities.

The board of non-executive directors represents the central governance structure, including people with important capital or asset participations, but also honorific members nominated for their business experience, extensive personal network, or position in other companies: “It is strange, but our board of non-executive directors is as large as the number of employees of our firm. Basically, the founders have included any person they know, and who could significantly contribute to the development of the firm. They are the main stakeholders” (CEO, firm J).

Another collective structure is the scientific advisory board, comprising researchers and academics who provide scientific counsel to advance the R&D pipeline and enhance the scientific reputation of the organization; however, six of the investigated biotechnology ventures did not have a separate scientific advisory structure, integrating this

group into the non-executive directors’ board. Usually, the chairman is a permanent member of the two boards and presides their regular meetings. Both these boards have a strong signaling function (Ahlers et al., 2015), which facilitates fund raising and partnership development: “The board acts as an advertising billboard for our organization. Investors, potential partners, banks, governmental agencies, they see these people and they think that we must be good if they accepted to be associated with us. And, of course we are, but, in our job, results often come after a very long time; until then, we have to demonstrate our potential.” (CEO, firm G).

The CEO is the main person in charge with firm’s management, being selected and nominated by the board of directors. In addition to salary, she/he often receives a minority ownership participation in the firm, to better align her/his interests with those of other shareholders (Audretsch et al., 2009). The top management team is complemented by several executive directors: Financial, Research, and Business Development Managers. After completing their equity financing project, nine of the investigated firms also added a Manager for Investors and Media Relations, who coordinates external communication.

By initiating an equity investment call, the main objective of all investigated firms was to finance their ongoing R&D projects (Kochhar, 1997). Nine of these companies had secondary objectives: six attempted to access additional business expertise; two were interested in additional business contacts; two, in additional management skills; three startups wanted to develop a long-term partnership with a specific life science company. It is interesting that these secondary objectives were strongly aligned with their initial internal business/management expertise – the firms lacking these competencies attempted to access them through equity financing; for example, all startups interested in inter-organization partnerships called for corporate equity investments (See Table 1).

According to our respondents, the financing objective has been achieved by all organizations, but some firms were less successful regarding their secondary objectives: “We got the money we were looking for, but because of the chosen financing path [i.e., crowdfunding], we were not able to access good business expertise or information, as our investors’ population is highly fragmented, heterogeneous, and overall, with little professional knowledge about biotechnology” (Board member, Firm K).

As a result of successful access to equity investments, the corporate governance structure has changed in eight of the 12 investigated firms, the main investors becoming part of, or being represented in, the board of non-executive directors. In four of these firms, the top management structure also changed, as the new shareholders imposed a new Finance Manager (firm A), a new CEO (firm F), or a new Business Development Manager (firms D and G). In addition, nine of these firms created the new executive position of Investor and Media Relations Manager. In the firms receiving corporate equity investments, the scientific board was enlarged with new members representing the investing company.

In terms of corporate entrepreneurship, six of the investigated firms increased their entrepreneurial drive after accessing equity investments (i.e., they launched new strategic projects aiming to value creation and new revenue generation), while four remained at the same level (i.e., they maintained the previously planned/launched strategic projects), and two have reduced it (i.e., they stopped or postponed one or more of the previously planned/launched strategic projects). Once again, it is interesting to see the connection between these changes, the financing path used by the firm, and the subsequent modifications in corporate governance structures (see Table 1). For example, firms K and L, which reported a lower level of post-investment corporate entrepreneurship, initially had only scientific expertise, used a crowdfunding platform, and were unsuccessful to reach their non-financial objectives; as a consequence, the reconfiguration of management and governance structures was minimal, as only an Investor and Media Relations Manager was added to the extant management team.

The originality of our research approach makes difficult the

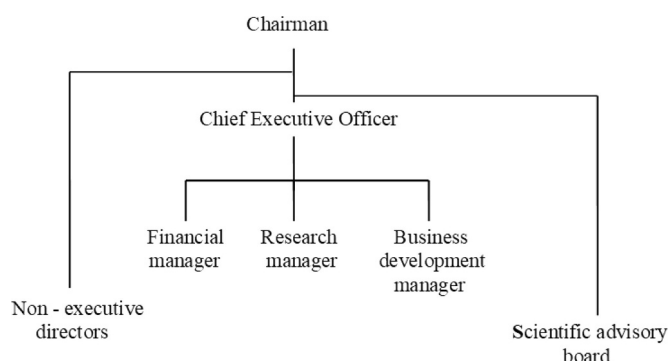


Fig. 1. Governance and management structures of early-stage biotechnology ventures.

**Table 1**  
Synthesis of the main findings.

Firm	Initial expertise	Objective(s) of the financing project	Type of financing path	Fulfillment of objectives	Changes in the board	Changes in the management team	Corporate entrepreneurship
A	Scientific	(1) funding; (2) business skills	private equity	(1) yes (2) yes	new shareholders represented in the board of directors	New Financial Manager	higher than pre-investment level
B	Scientific, business, management	(1) funding	private equity	(1) yes	none	Investor and Media Relations Manager	similar with pre-investment level
C	Scientific, business	(1) funding; (2) management skills	private equity	(1) yes (2) no	new shareholders represented in the board of directors	Investor and Media Relations Manager	similar with pre-investment level
D	Scientific	(1) funding; (2) business skills; (3) management skills	private equity	(1) yes (2) yes (3) yes	new shareholders represented in the board of directors	New Business Development Manager	higher than pre-investment level
E	Scientific, management	(1) funding; (2) business skills; (3) partnership	corporate equity	(1) yes (2) yes (3) yes	new members in the board of directors and in the scientific board	Investor and Media Relations Manager	higher than pre-investment level
F	Scientific, business	(1) funding	corporate equity	(1) yes	new members in the board of directors and in the scientific board	New CEO; Investor and Media Relations Manager	higher than pre-investment level
G	Scientific	(1) funding; (2) business skills; (3) partnership	corporate equity	(1) yes (2) yes (3) yes	new members in the board of directors and in the scientific board	New Business Development Manager	higher than pre-investment level
H	Scientific, management	(1) funding; (2) partnership	corporate equity	(1) yes (2) yes (3) yes	new members in the board of directors and in the scientific board	Investor and Media Relations Manager	similar with pre-investment level
I	Scientific, management	(1) funding; (2) business contacts	crowdfunding	(1) yes (2) no	shareholders' holding represented by the platform in the board	Investor and Media Relations Manager	higher than pre-investment level
J	Scientific, business, management	(1) funding	crowdfunding	(1) yes (2) no (3) no	none	Investor and Media Relations Manager	lower than pre-investment level
K	Scientific	(1) funding; (2) business skills; (3) business contacts	crowdfunding	(1) yes (2) no (3) no	none	Investor and Media Relations Manager	lower than pre-investment level
L	scientific	(1) funding; (2) business skills	crowdfunding	(1) yes (2) no	none	Investor and Media Relations Manager	lower than pre-investment level

comparison of our findings with previous studies, because, to the best of our knowledge, there is no extant paper investigating the interdependence between the choice of a specific financing path, corporate governance, management action and corporate entrepreneurship in startup firms. Previous studies approach this complex topic from two separate angles: (i) some papers explore the changes induced in the governance and management structure of firms that access various types of investment (Bessière and Stéphanie, 2015; Bessière et al., 2018; Klein et al., 2013; Rigolini, 2013); while (ii) others compare the growth of firms backed by different types of capital (Ahmed and Cozzarin, 2009; Fraser et al., 2015; Gilligan and Wright, 2012; Manigart and Wright, 2013).

The studies from the first category outline the level of non-financial strategic resources (e.g., management skills, business capability and entrepreneurial experience) provided by private equity investors to the funded organizations in comparison with other types of investors, as well as the differences in investors' representation and involvement in the governance structure of the funded firm. Our study confirms these results, interpreting the choice of the financing path as a strategic decision, that should be taken in relation to the level/the lack of specific strategic resources in the pre-investment period, knowing that various types of equity investors (i.e., private, corporate, or crowdfunding investors) provide different non-financial contributions to the post-investment governance/management of the funded firms.

The studies included in the second research stream attempt to connect the type of investment received by a firm with its subsequent medium and long-term market performance; various papers using different performance indicators (Fraser et al., 2015), such as survival, growth, labor productivity, volume of sales, employment or internationalization. The overall findings posit that organizations funded by private equity have a better market performance than those funded by other types of capital (Gilligan and Wright, 2012), such as, for example, business angels (Parhankangas, 2012). Using another analytical framework, a study of Canadian biotechnology firms (Ahmed and Cozzarin, 2009) indicates that venture capital, business angels and bank financing contribute significantly to sales growth while funding from government, alliance partners and IPOs has no clear impact on this performance dimension. Unfortunately, it is extremely difficult to compare these results with the findings of our study, as no extant research considered corporate entrepreneurship based on managerial action as a variable indicating the short-term impact of an equity financing event, with the exception of the theoretical papers of Collin and Smith (2003a and 2003b) that guided the development and application of our interpretative framework.

## 9. Discussion

Our findings provide interesting evidence that the equity financing paths used by early-stage UK biotechnology firms are related with their level of pre-investment resources and objectives, and have a specific impact on the evolution of their governance, management structures, and corporate entrepreneurship. Initiating an equity investment call represents a complex project that allows the firm not only to obtain the necessary funds to fuel its R&D activities, but also to access business or management skills, or to conclude inter-organizational strategic partnerships (Kochhar, 1997). We attempt to interpret this phenomenon by mobilizing a resource-based perspective, and particularly the concepts of operand and operant resources.

The resource-advantage theory defines resources as: "tangible and intangible entities available to the firm that enable it to produce efficiently and/or effectively a market offering that has value for some market segment(s)" (Hunt, 2000, p.138). These resources can be classified as operand (those on which an act or operation is performed) and operant (those that act on other resources) resources (Madhavaram and Hunt, 2007). Operand resources mainly consist of physical and financial assets – such as money or raw materials, while operant

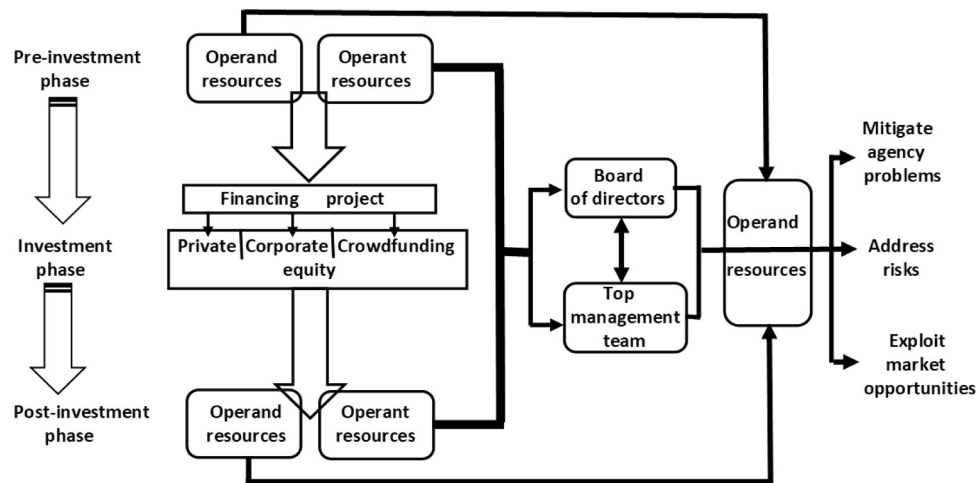
resources are typically human (e.g., skills and knowledge), organizational (e.g., controls, routines, competences), informational (e.g., knowledge about markets, customers, competitors, or technology), and relational (e.g., relationships with competitors, suppliers, and customers) (Hunt, 2004).

The distinction between operand and operant resources is particularly important if we consider that an organization with sufficient operand resources may still fail if it does not control and exploit the necessary operant resources that permit the effective valorization of its financial and physical assets. The extant literature (Bessière et al., 2018; Drover et al., 2017; Klein et al., 2013) regarding equity financing paths outlines that, besides funding – an operand resource, organizations often have access to a series of operant resources provided by investors: control, advice, entrepreneurial skills, business information and contacts, or inter-organizational partnerships. In the biotechnology sector, these operant resources are provided freely or cheaply by major investors to protect the value of their shares and obtain a good return on investment (Klein et al., 2013; Schweinitz, 2014). Considering the high risks and long development times associated with biotechnology R&D projects (Herper, 2013), the involvement of major investors represents a valuable source of operant resources that can significantly enhance the governance and management of these organizations.

This approach opens a new, strategic perspective regarding the financing path selected by early-stage biotechnology firms. The private equity provided by Business Angels or Venture Capitalists can also bring business knowledge and experience, management capabilities or entrepreneurial skills (Klein et al., 2013), while the corporate equity invested by pharmaceutical or biotechnology organizations may provide the basis for inter-organizational partnerships that facilitate further access to operand or operant resources (Allen and Phillips, 2000). In contrast, equity crowdfunding seems less capable to contribute with additional operant resources, because the population of investors is often heterogeneous and fragmented into small participations. Crowdfunding investors offer what they are explicitly asked for: money, but often they do not have the necessary expertise and motivation to help the organization in its market activities (Terry, 2018). In addition, their involvement in corporate governance structures is difficult to organize and manage (Girard and Deffains-Crapsky, 2016).

The model presented in Fig. 2 includes three phases: (i) pre-investment; (ii) investment; and (iii) and post-investment. The result of a successful equity financing project is access not only to funds – i.e., an operand resource, but also to various types of operant resources that are offered/manifested by investors to protect and valorize their investment. Collin and Smith (2003a, 2003b) discuss the interaction between two types of operant resources: corporate governance skills, which implement disciplining action to control management's decisions and actions, and management capabilities, that enable entrepreneurial initiative and action. The organizational performance of high-technology firms embedded into hyper-competitive environments largely depends on striking the right balance between these two categories of operant resources, as the vision and action of managers and non-executive directors have to complement each other (Schweinitz, 2014) to: (i) reduce entrepreneurial and agency risk; and (ii) take bold decisions and actions to preserve and develop the firm's competitive advantage(s) (see Fig. 2). However, this balancing act depends directly on accessing and using the appropriate operand and operant resources, which brings into focus the importance of strategically selecting and managing the best equity financing path in relation to a specific organizational and market context (see Table 2).

The findings presented in Table 1 indicate that most of the investigated firms have strategically approached the available financing options. The objectives associated with the chosen financing project include access not only to operand resources – i.e., money, but also to essential operant resources that these organizations do not have in the pre-investment stage. It is also rather obvious that in some cases the firms did not choose the right financing path, as for example, the firms



**Fig. 2.** The systemic interaction between resources, equity financing projects, management and governance structures, and the entrepreneurial orientation of the firm.

C, I and K do not succeed to access operant resources and, therefore, to fulfill their secondary objectives.

Once engaged on a specific financing path, the received investment impacts not only the financial balance of the firm, but also, in most cases, the composition of their board(s) and management team. To protect their investment and increase the chances of a quick return, major investors become members of, or are represented in, the board of directors, having the possibility to nominate and control executive managers, but also to get directly involved into strategic decision making and implementation. From a practical perspective, we note that the biotechnology firms that obtained corporate equity investment added new members both in the board of directors and in the scientific board. On the other hand, all firms obtaining equity financing through crowdfunding platforms have included in their management team an Investor and Media Relations Manager, which emphasizes the importance (and probably the difficulty) of corporate communication, as this financing path involves a large number of heterogeneous investors.

Due to time and resource limitations, this study could not adopt a long-term perspective to properly investigate the way in which the use of various financing paths, as well as the subsequent changes in corporate governance, management and entrepreneurship, influence the medium and long-term market performance of the analyzed firms. However, considering the importance of corporate entrepreneurship for the survival and development of early-stage biotechnology firms, we asked our respondents to evaluate the evolution of this strategic capability, as a result of the equity-financing event. Once again, it is interesting to note that the firms K and L that had a lower level of corporate entrepreneurship than in the pre-investment stage, used a crowdfunding platform to attract equity investment, but their secondary objectives were not properly aligned with the characteristics of the selected financing path, as these firms were not capable to access the necessary operant resources. Thus, although the organization

obtained the targeted operand resources (i.e., money), they did not have, and could not obtain from the attracted investors, the operant resources required to make good use of these financial assets. As a consequence, the management team became cautious, and, being afraid to commit the newly attracted operand resources, it reduced the level of corporate entrepreneurship in comparison with the pre-investment period.

## 10. Theoretical implications

By combining the theory of resource-based competitive advantage (Hunt, 2000) with the specific consequences of various equity financing paths on early-stage UK biotechnology firms (Bessière et al., 2018), we contend that equity investment projects have a strategic dimension that overpasses the immediate firm's need to finance its ongoing R&D projects. This strategic approach includes also the need to properly exploit the operand, and particularly, the operant resources attracted through equity investment, by modifying and preserving a proper balance between the board of directors' disciplining and enabling actions, in relation to the management structure and activity (Collin and Smith, 2003a and 2003b).

Our resource-based interpretative framework opens the way for investigating the role and effect of operant and operand resources in firm governance, management, strategic-decision making, and corporate entrepreneurship – outlining the importance of properly identifying, accessing, controlling and exploiting both type of resources, as well as the manifestation of operant resources in the governing and management structures of the firm. In this respect, we confirm Kochhar's (1997) conclusions that the selection and management of financing paths depends on the specificity of the strategic assets and capabilities controlled by the firm. To properly develop and exploit these strategic resources, the firm requires both financial capital – as

**Table 2**

A comparison of various equity financing paths in terms of accessed resources, advantages and challenges.

Types of equity financing	Accessed resources	Advantages	Challenges
Private Equity	• Operand: Money	• Direct involvement of shareholders in corporate governance and management	• Finding and negotiating with the right investors
Corporate Equity	• Operand: Business knowledge, Management skills	• Access to complementary resources through inter-organizational alliance	• Finding and negotiating with the right investors
	• Operand: Money		• Potential loss of independence and control
Crowdfunding Equity	• Operand: Business knowledge, Management skills, Inter-organizational partnership	• Quick access to money	• Access to operand resources
	• Operand: Money	• Low involvement of shareholders	• Interacting with the crowdfunding platform and with shareholders
	• Operand: Experience for IPO		



the development and exploitation of these assets implies – often important – costs, and the management/business expertise needed to extract rents from these assets.

## 11. Managerial implications

Our findings unveil an important strategic perspective regarding the choice of a specific equity financing path by UK biotechnology startups. Future organizational success depends on carefully planning and acting to achieve a strategic alignment between the specific profile and circumstances of the organization – in terms of ownership of, access to, and control of, operand and operant resources; the selected financing path; and the post-investment implementation and management of the acquired operand and operant resources, by achieving a proper balance between corporate governance, managerial vision and entrepreneurial action.

On this basis, we propose a simple model of strategic action to achieve this alignment, which includes seven sequential steps:

- (1) evaluate the extant level of operand and operant resources owned and controlled by the firm, and measure the gap between this level and the necessary resources for long-term organizational development and success;
- (2) acknowledging these gaps, establish clear objectives regarding the required type and amount of operand and operant resources that need to be accessed through equity financing;
- (3) considering the specificity of various equity financing paths, select the one that has the best potential to provide the required operand and operant resources;
- (4) make the best possible use of the attracted operand, and, especially, operant resources, by modifying the extant corporate governance and management structures, and facilitating the involvement of new shareholders in strategic decision-making and implementation;
- (5) create governance and management structures and procedures that maintain a dynamic alignment between the operand and operant resources controlled by the firm, its strategic objectives, the interest of shareholders and managers, and the specific evolution of the competitive environment;
- (6) build and maintain the proper balance and interaction between controlling and disciplining action, to reduce business risks, optimize the level of corporate entrepreneurship, and maximize the long-term organizational performance;
- (7) consider each new financing project as a strategic opportunity to access a specific combination of operand/operand resources and liabilities, and select the one that provides the highest level of resource-based competitive advantage to the firm, on a long-term basis, trying to avoid selective bias and resource myopia.

## 12. Conclusion

This paper addresses an important question for both academic researchers and practitioners: *What is the influence of various equity financing paths on the corporate governance, management and entrepreneurship of high-technology startups, considering a short-term perspective?* In the present economic context in which, on the one hand, high-technology startups encounter significant challenges to attract, secure and manage equity financing, while, on the other hand, the modalities of equity financing become more diversified, e.g., through the rapid development of various forms of crowdfunding, this question is extremely actual for managers, directors, consultants, investors and policy-makers (Block et al., 2018). To answer this question, we explore the complex interdependence between the resource needs of early-stage biotechnology ventures, the financing paths they use to access operand and operant resources, the subsequent reconfiguration of governance and management structures, and finally, the impact of these structures' on the level of corporate entrepreneurship, which, in the presence of

the much needed financial resources for organizational development, should normally reach higher levels in the post-investment period.

Our findings highlight the dependence of a positive organizational evolution on the access of the right combination of operand and operant resources, and consequently, on the proper use of attracted operand resources (i.e., management capabilities, business expertise, or market contacts) to improve corporate governance, management structures and entrepreneurial capabilities. Using the resource-based perspective to analyze and explain the relationships between various financing paths, governance and management structures, we provide an original framework that outlines the systemic interdependence between resource, financial, and organizational management (Kochhar, 1997). To clearly evidence the effect of various equity financing paths, we employ an inductive methodology based on the comparative analysis of a matched sample of 12 UK biotechnology startups. Our results advance the knowledge regarding the short-term impact of equity financing paths on the corporate governance, management and entrepreneurial action of high-technology startups, a research area which is still underdeveloped, specifically lacking comparative research projects based on qualitative approaches.

This study has several limitations determined by the selected population of study, limited sample size, and applied research methodology. However, considering the particular context of this research project – the equity financing paths of UK biotechnology startups, these limitations are negligible: the population of study is representative for the segment of high-potential, high-technology startups; the sample size is naturally limited by the small number of UK biotech startups that realized successful equity financing projects during the investigated period; while the use of a qualitative and comparative research method is justified by the necessity to analyze and evaluate the impact of three different equity financing paths on intrinsically complex phenomena determined by the interdependence of corporate governance and management structures.

The generalizability of our findings is naturally limited to the UK biotechnology sector. Although the results and implications of this study may be applicable in other national contexts or high-tech sectors, it is necessary to explore the startups' situation in different countries and/or industries, in order to validate, expand and refine our findings. Our qualitative approach provides a holistic perspective of the systemic interdependencies that connect heterogeneous organizational elements, representing an interesting methodological and interpretative framework for future research projects. Unfortunately, because of time and resource constraints, our study lacks a long-term longitudinal perspective that could have investigated and evidenced in more detail the subsequent evolution of firms' competitiveness and market performance.

The findings and implications of this study represent an original contribution to the extant literature regarding the financing, governance and management of high-technology ventures, providing useful insights to firm managers, shareholders, potential investors, but also to academics and policymakers. From a theoretical perspective, our study unveils and explains the complex interdependence between various equity financing paths, and the subsequent organizational transformation in terms of corporate governance and management, which impacts the level of controlled resources and corporate entrepreneurship. On the other hand, professionals – such as corporate managers, directors or consultants, can pragmatically use our findings to select the most adapted equity financing path for the structure and needs of their organization. Future studies should further investigate these complex systemic relationships, either using in-depth case studies or applying quantitative methods based on clearly defined/measured variables and statistical analysis. Promising research topics include the specific relations developed between management and governance structures in various firms, the effect of various types of resources on corporate entrepreneurship, and the long-term effects of management and governance structures on organizational functioning and performance.

**CRedit authorship contribution statement**

**Călin Gurău:** Conceptualization, Methodology, Data curation, Visualization, Investigation. **Leo-Paul Dana:** Data curation, Validation, Writing - review & editing.

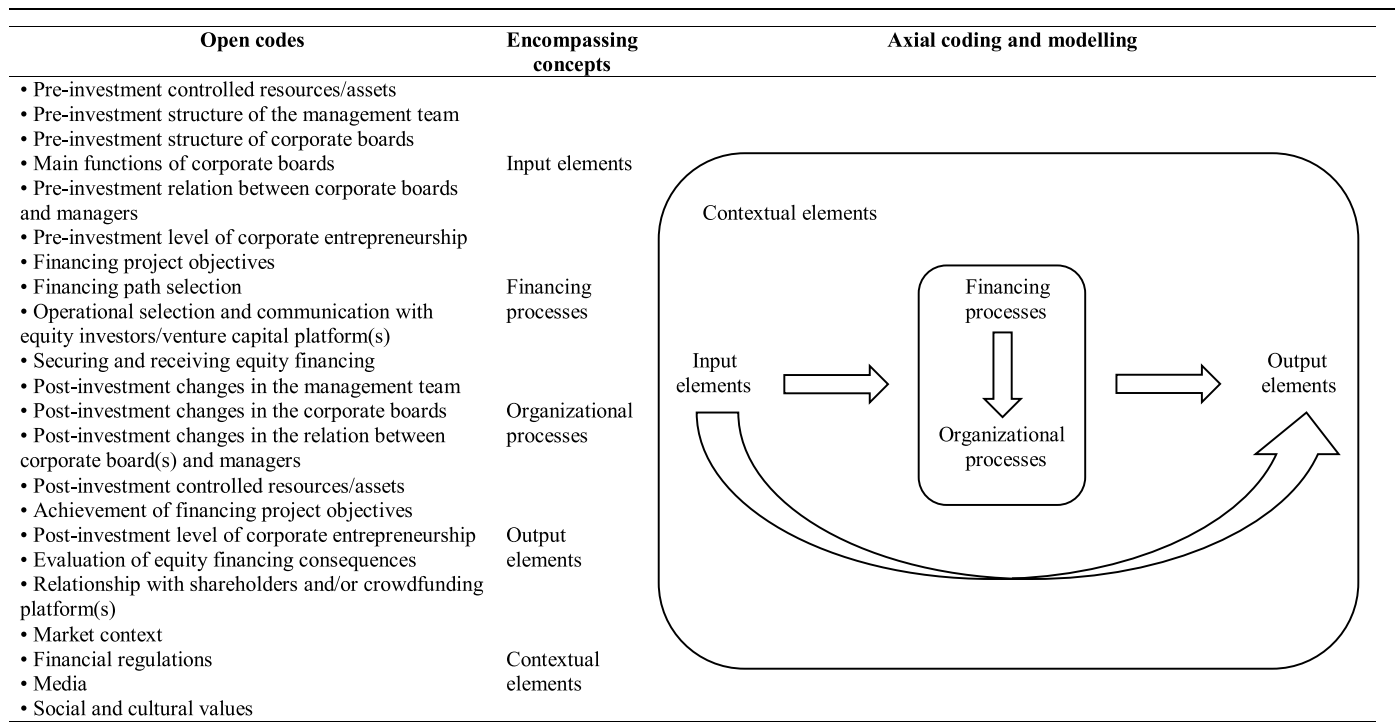
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**Appendix A. The general objectives, themes and questions addressed in the applied open and semi-structured interviews**

Stage and type of interview	Number of respondents	Main objectives	Examples of themes/questions
i. open inter-views	34 members of the board of directors and management team of investigated startups	Explore in detail the financing equity project and its immediate impact on corporate governance, management and entrepreneurship.	Why did you choose this particular type of equity financing? How did you communicate with potential investors? Please describe the process of internal discussion/debate that led to the selection and implementation of this project. Which were the planned/predicted immediate changes in the corporate governance, management and strategy of the firm as a result of this financing project? Have these immediate changes happened, and if yes, in what proportion in comparison with the predictions?
i'. semi-structured inter-views	Three financial advisers specialized in the biotechnology sector, two crowdfunding platforms managers, and an experienced venture capitalist	Explore the general context of UK financial markets and platforms, focusing on the interaction between fund seekers and finance providers for different types of equity financing projects.	What are the specific advantages/disadvantages of various forms of equity financing, in the present UK context? What are the main types of equity financing used by UK biotech startups and why? What is the influence of various type of equity financing on the composition of the board of directors, management team and strategy of the financed firms?
ii. semi-structured inter-views	19 members of the board of directors and management team of investigated startups	Investigate the situation of the firm before the financing event and collect detailed information regarding the immediate post-financing changes in the corporate governance, management and strategy of the firm.	Please provide information regarding the financial situation of the firm before the financing event? Which were the main sources of finance used by the firm before the financing event? Can you please indicate the unplanned/unexpected changes in the corporate governance, management and strategy of the firm, as a result of equity financing? Please discuss the internal tensions and consequences determined by these unplanned/unexpected changes.
iii. semi-structured inter-views	Twelve actual CEOs and one ex-CEO of investigated startups	Investigate the short-term horizon changes determined by the equity financing event in the corporate entrepreneurship level of the firm (evaluated in relation to the number of pre- and post-financing strategic projects and of their implementation)	Please indicate the number and the specificity of the strategic projects launched before the financing event. Please indicate the number and the specificity of the strategic projects launched after the financing event. How many of the projects launched in the pre-financing period have been stopped, suspended or postponed and why?

## Appendix B. Stages of the coding procedure: open and axial coding



## References

- Ahlers, G.K.C., Cumming, D.J., Guenther, C., Schweizer, D., 2015. Signaling in equity crowdfunding. *Entrepreneurship Theory and Practice* 39 (4), 955–980.
- Ahlstrom, D., Cumming, D., Vismara, S., 2018. New methods of entrepreneurial firm financing: fintech, crowdfunding and corporate governance implications. *Corporate Governance: An International Review* 26, 310–313.
- Ahmed, S., Cozzarin, B.P., 2009. Start-up funding sources and biotechnology firm growth. *Appl Econ Lett* 16 (13), 1341–1345.
- Allen, J.W., Phillips, G.M., 2000. Corporate equity ownership, strategic alliances, and product market relationships. *J Finance* 55 (6), 2791–2815.
- Alvesson, M., 2011. *Interpreting Interviews*. Sage Publications, London, UK.
- Audretsch, D.B., Lehmann, E.E., Plummer, L.A., 2009. Agency and governance in strategic entrepreneurship. *Entrepreneurship Theory and Planning* 33 (1), 149–166.
- Bessière, V., Stéphanie, E., 2015. Financement et gouvernance des start-ups en equity crowdfunding. *Finance Contrôle Stratégie* 18 (4). <https://journals.openedition.org/fcs/1684>.
- Bessière, V., Stéphanie, E., Wirtz, P., 2018. Crowdfunding, business angels, and venture capital: new funding trajectories for start-ups? <https://ssrn.com/abstract=3137095>.
- Block, J.H., Colombo, M., Cumming, D., Vismara, S., 2018. New players in entrepreneurial finance and why they are there. *Small Business Economics* 50 (2), 239–250.
- Block, J.H., Fisch, C., van Praag, M., 2017. The schumpeterian entrepreneur: a review of the empirical evidence on the antecedents, behavior, and consequences on innovative entrepreneurship. *Industry and Innovation* 31 (8), 793–801.
- Bowen, G.A., 2008. Naturalistic inquiry and the saturation concept: a research note. *Qualitative Research* 8 (1), 137–152.
- Brunninge, O., Nordqvist, M., Wiklund, J., 2007. Corporate governance and strategic change in SMEs: the effects of ownership, board composition and top management teams. *Small Business Economics* 29 (3), 295–308.
- Cambridge Network, 2017. Europe's first dedicated life sciences crowdfunding platform opens to UK investors. Cambridge Network, September 20. <https://www.cambridgenetwork.co.uk/news/europes-1st-life-sciences-crowdfunding-opens-uk/>.
- Cassidy, J., 2018. A record-breaking year for biotech funding. *Pharma Times Magazine*, December. [http://www.pharmatimes.com/magazine/2018/december\\_2018/a\\_record-breaking\\_year\\_for\\_biotech\\_funding](http://www.pharmatimes.com/magazine/2018/december_2018/a_record-breaking_year_for_biotech_funding).
- Cavallo, A., Ghezzi, A., Dell'Era, C., Pellizzon, E., 2019. Fostering digital entrepreneurship from startup to scaleup: the role of venture capital funds and angel groups. *Technological Forecasting & Social Change* 145, 24–35.
- Chemmanur, T.J., Loutskina, E., Tian, X., 2014. Corporate venture capital, value creation, and innovation. *Rev Financ Stud* 27 (8), 2434–2473.
- Cohen, S.K., Munshi, N.V., 2017. Innovation search dynamics in new domains: an exploratory study of academic founders' search for funding in the biotechnology industry. *Technological Forecasting & Social Change* 120, 130–143.
- Collewaert, V., Manigart, S., Aernoudt, R., 2010. Assessment of government funding of business angel networks in Flanders. *Reg Stud* 44 (1), 119–130.
- Collin, S.-O., Smith, E., 2003a. Disciplining and enabling action: corporate governance influencing corporate entrepreneurship. Working Paper Series 2003, 6. Kristianstad University College, Sweden. [https://www.researchgate.net/publication/265010345\\_Disciplining\\_and\\_enabling\\_action\\_Corporate\\_governance\\_influencing\\_corporate\\_entrepreneurship](https://www.researchgate.net/publication/265010345_Disciplining_and_enabling_action_Corporate_governance_influencing_corporate_entrepreneurship).
- Collin, S.-O., Smith, E., 2003b. Window of entrepreneurship: explaining the influence of corporate governance mechanisms on corporate entrepreneurship in two riding schools. Working Paper Series 2003, 9. Kristianstad University College, Sweden. [https://www.researchgate.net/publication/265010345\\_Disciplining\\_and\\_enabling\\_action\\_Corporate\\_governance\\_influencing\\_corporate\\_entrepreneurship](https://www.researchgate.net/publication/265010345_Disciplining_and_enabling_action_Corporate_governance_influencing_corporate_entrepreneurship).
- Conley, T., 2018. Report: UK biotech strongest in Europe. FDI Intelligence, January 25. <https://www.fdiintelligence.com/News/Report-UK-biotech-strongest-in-Europe>.
- Cumming, D.J., Vanacker, T.R., Zahra, S.A., 2019. Equity crowdfunding and governance: toward an integrative model and research agenda. *Academy of Management Perspectives* Published online 20 January 2019. DOI: 10.5465/amp.2017.0208. Available at SSRN. <https://ssrn.com/abstract=3317678>.
- Daily, C.M., Dalton, D.R., Cannella Jr, A.A., 2003. Corporate governance: decades of dialogue and data. *Academy of Management Review* 28 (3), 371–382.
- Dalton, D., Daily, C., Certo, S., Roengpitya, R., 2003. Meta-analyses of financial performance and equity: fusion or confusion? *Academy of Management Journal* 46 (1), 13–26.
- Dana, L.P., Dana, T.E., 2005. Expanding the scope of methodologies used in entrepreneurship research. *International Journal of Entrepreneurship and Small Business* 2 (1), 79–88.
- Dana, L.P., Gurau, C., Hoy, F., Ramadani, V., Alexander, T., 2019. Success factors and challenges of grassroots innovations: learning from failure. *Technological Forecasting & Social Change* Published online 27 March 2019. <https://doi.org/10.1016/j.techfore.2019.03.009>.
- de Concini, A., Brzezicka, P., 2018. Financing the next wave of medical breakthroughs. In: What works and what needs fixing? European Investment Bank. [https://www.eib.org/attachments/pj/access\\_to\\_finance\\_conditions\\_for\\_life\\_sciences\\_r\\_d\\_en.pdf](https://www.eib.org/attachments/pj/access_to_finance_conditions_for_life_sciences_r_d_en.pdf).
- Drover, W., Busenitz, L., Matusik, S., Townsend, D., Anglin, A., Dushnitsky, G., 2017. A review and road map of entrepreneurial equity financing research: venture capital, corporate venture capital, angel investment, crowdfunding, and accelerators. *J Manage* 43 (6), 1820–1853.
- Ernst and Young, 2016. Biotech financing. bountiful harvest leaves biotech well prepared for financial winter. [https://www.ey.com/Publication/vwLUAssets/ey-beyond-borders-2016-biotech-financing/\\$FILE/ey-beyond-borders-2016-biotech-financing.pdf](https://www.ey.com/Publication/vwLUAssets/ey-beyond-borders-2016-biotech-financing/$FILE/ey-beyond-borders-2016-biotech-financing.pdf).
- Foley, S. 2019. Corporate entrepreneurship definition. <https://corporate-entrepreneurs.com>.
- Fraser, S., Bhaumik, S.K., Wright, M., 2015. What do we know about entrepreneurial finance and its relationship with growth? *International Small Business Journal* 33 (1), 70–88.
- Gilligan, J., Wright, M., 2012. *Private Equity Demystified*. ICAEW, London, UK.

- Gioia, A.D., Corley, K., Hamilton, A., 2013. Seeking qualitative rigor in inductive research. *Organ Res Methods* 16 (1), 15–31.
- Girard, C., Deffains-Crapsky, C., 2016. Les mécanismes de gouvernance disciplinaires et cognitifs en equity crowdfunding: le cas de la France. *Finance Contrôle Stratégie* 19 (3). <https://journals.openedition.org/fcs/1829>.
- Herper, M., 2013. The cost of creating a new drug now \$5 billion, pushing big pharma to change. *Forbes*, August 11. <https://www.forbes.com/sites/matthewherper/2013/08/11/how-the-staggering-cost-of-inventing-new-drugs-is-shaping-the-future-of-medicine>.
- Hillman, A.J., Dalziel, T., 2003. Boards of directors and firm performance: integrating agency and resource dependence perspectives. *Academy of Management Review* 28 (3), 383–396.
- Hisrich, D.R., Petkovic, S., Ramadani, V., Dana, L.P., 2016. Venture capital funds in transition countries: insights from Bosnia and Herzegovina and Macedonia. *Journal of Small Business and Enterprise Development* 23 (2), 296–315.
- Hisrich, R.D., Ramadani, V., 2017. *Effective Entrepreneurial Management*. Springer, Cham, Switzerland.
- Hornuf, L., Schmitt, M., Stenzhorn, E., 2018. Equity crowdfunding in Germany and the UK: follow-up funding and firm failure. *Corporate Governance: An International Review* 26, 331–354.
- Hornuf, L., Schwienbacher, A., 2018. Market mechanisms and funding dynamics in equity crowdfunding. *Journal of Corporate Finance* 50, 556–574.
- Hunt, S.D., 2000. A General Theory of Competition: Resources, Competences, Productivity, Economic Growth. Sage Publications, Thousand Oaks, CA.
- Hunt, S.D., 2004. On the service-centered dominant logic of marketing. *J Mark* 68 (1), 21–22.
- Kaminski, J., Hopp, C., Tykvová, T., 2019. New technology assessment in entrepreneurial financing – does crowdfunding predict venture capital investments? *Technological Forecasting & Social Change* 139, 287–302.
- Kellermanns, F.W., Walter, J., Crook, T.R., Kemmerer, B., Narayanan, V., 2016. The resource-based view in entrepreneurship: a content-analytical comparison of researchers' and entrepreneurs' views. *Journal of Small Business Management* 54 (1), 26–48.
- Kind, S., Zu Knyphausen-Aufseß, D., 2007. What is "business development"? the case of biotechnology. *Schmalenbach Business Review* 59 (2), 176–199.
- Klein, P.G., Chapman, J.L., Mondelli, M.P., 2013. Private equity and entrepreneurial governance: time for a balanced view. *Academy of Management Perspectives* 27 (1), 39–51.
- Kochhar, R., 1997. Strategic assets, capital structure, and firm performance. *Journal of Financial and Strategic Decisions* 10 (3), 23–36.
- Kumar, P., Zattoni, A., 2017. Advancing the literature on ownership structure and corporate governance. *Corporate Governance: An International Review* 25 (1), 2–3.
- Lerner, J., Hardyman, F., Leamon, A., 2012. *Venture Capital & Private Equity: A Casebook*, 5th Edition. John Wiley & Sons, New York, NY.
- Li, H., Terjesen, S., Umans, T., 2018. Corporate governance in entrepreneurial firms: a systematic review and research agenda. *Small Business Economics*. <https://doi.org/10.1007/s11187-018-0118-1>.
- Lincoln, Y., Guba, E., 1985. *Naturalistic Inquiry*. Sage, Beverly Hills, CA.
- Madhavaram, S., Hunt, S.D., 2008. The service-dominant logic and a hierarchy of operant resources: developing masterful operant resources and implications for marketing strategy. *Journal of The Academy of Marketing Science* 36 (1), 67–82.
- Manigart, S., Baeyens, K., Van Hylte, W., 2002. The survival of venture capital backed companies. *Venture Capital: An International Journal of Entrepreneurial Finance* 4 (2), 103–124.
- Manigart, S., Wright, M., 2013. Venture capital firm involvement in their portfolio companies. *Foundations and Trends in Entrepreneurship* 9 (4–5), 365–570.
- Maula, M., Autio, E., Murray, G., 2005. Corporate venture capitalists and independent venture capitalists: what do they know, who do they know and should entrepreneurs care? *Venture Capital: An International Journal of Entrepreneurial Finance* 7 (1), 3–21.
- Monks, R.A.G., Minow, N. (Eds.), 2012. *Corporate Governance*, 5th Edition. Wiley, Hoboken, NJ.
- Nakara, W., Mezzourh, S., 2011. *Entrepreneuriat et gouvernance des jeunes entreprises innovantes*. *Entreprendre & Innover* 1 (9–10), 59–68.
- Neergaard, H., 2007. Sampling in entrepreneurial settings. In: Neergaard, H., Ulhøi, J.P. (Eds.), *Handbook of Qualitative Research Methods in Entrepreneurship*. Edward Elgar, Cheltenham, UK, pp. 253–278.
- Oakey, R., Faulkner, W., Cooper, S., Walsh, V., 1990. *New firms in the biotechnology industry*. Pinter Publishers, London, UK.
- Parhankangas, A., 2012. The economic impact of venture capital. In: Landstrom, H., Mason, K. (Eds.), *Handbook of Venture Capital Research 2*. Edward Elgar, Cheltenham, UK, pp. 124–158.
- Patzelt, H., Schweizer, L., Behrens, J., 2012. *Biotechnology entrepreneurship. Foundations and Trends in Entrepreneurship* 8 (2), 63–140.
- Paul, S.M., Mytelka, D.S., Dunwiddie, C.T., Persinger, C.C., Munos, B.H., Lindborg, S.R., Schacht, A.L., 2010. How to improve R&D productivity: the pharmaceutical industry's grand challenge. *Nature Reviews Drug Discovery* 9 (3), 203–214.
- Pereira, C.G., Lavoie, J.R., Garces, E., Basso, F., Dabić, M., Porto, G.S., Daim, T., 2019. Forecasting of emerging therapeutic monoclonal antibodies patents based on a decision model. *Technological Forecasting & Social Change* 139, 185–199.
- Puri, M., Zarutskie, R., 2012. On the life cycle dynamics of venture-capital and non-venture-capital-financed firms. *Journal of Finance* 67 (6), 2247–2293.
- Ramadani, V., 2012. The importance of angel investors in financing the growth of small and medium sized enterprises. *International Journal of Academic Research in Business and Social Sciences* 2 (7), 306–322.
- Ramadani, V., Hisrich, R.D., Abazi-Alili, H., Dana, L.P., Panthi, L., Abazi-Bexheti, L., 2019. Product innovation and firm performance in transition economies: a multi-stage estimation approach. *Technol Forecast Soc Change* 140 (3), 271–280.
- Rigolini, A., 2013. *Corporate Entrepreneurship and Corporate Governance*. McGraw-Hill, Milan, Italy.
- Sager, B., 2001. Scenarios on the future of biotechnology. *Technological Forecasting & Social Change* 68, 109–129.
- Schiff, L., Murray, F., 2004. Biotechnology financing dilemmas and the role of special purpose entities. *Nat. Biotechnol.* 22 (3), 271–277.
- Schweinitz, H., 2014. *Corporate governance in fast-growing technology companies*. Korn Ferry Institute. <https://www.kornferry.com/institute/corporate-governance-fast-growing-technology-companies>.
- Signori, A., Vismara, S., 2018. Does success bring success? the post-offering lives of equity-crowdfunded firms. *Journal of Corporate Finance* 50, 575–591.
- Terry, M., 2018. Crowdsourcing funding to launch a biotech: is it as crazy as it sounds? *BioSpace* May 22. <https://www.biospace.com/article/crowdsourcing-funding-to-launch-a-biotech-is-it-as-crazy-as-it-sounds/>.
- Tuggle, C.S., Johnson, R.A., Hellriegel, D., Hitt, M., Mahajan, A., 2010. Attention patterns in the boardroom: how board composition and processes affect discussion of entrepreneurial issues. *Academy of Management Journal* 53 (3), 550–571.
- Veilleux, S., Roy, M.J., 2015. Strategic use of corporate and scientific boards in the internationalisation of biotech firms. *International Journal of Technoentrepreneurship* 3 (1), 67–93.
- Vismara, S., 2019. Sustainability in equity crowdfunding. *Technological Forecasting & Social Change* 141, 98–106.
- Wallmeroth, J., Wirtz, P., Groh, A.P., 2018. Venture capital, angel financing, and crowdfunding of entrepreneurial ventures: a literature review. *Foundations and Trends in Entrepreneurship* 14 (1), 1–129.
- Walthoff-Borm, X., Vanacker, T., Collewaert, V., 2018. Equity crowdfunding, shareholder structures, and firm performance. *Corporate Governance: An International Review* 26, 314–330.
- Weisbach, M., 1988. Outside directors and CEO turnover. *J financ econ* 20 (1–2), 431–460.
- Zahra, S.A., Filatotchev, I., Wright, M., 2009. How do threshold firms sustain corporate entrepreneurship? the role of boards and absorptive capacity. *Journal of Business Venturing* 24, 248–260.
- Zu Knyphausen-Aufseß, D., 2005. Corporate venture capital: who adds value? venture capital. *An International Journal of Entrepreneurial Finance* 7 (1), 23–49.

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