The goal and performance heterogeneity of academic spinoffs

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A B S T R A C T

We argue that the divergent motivations underlying their creation and goals can contribute to the varying performance of academic spinoffs. Through a quantitative study on a sample of 778 academic spinoffs established by 59 Italian state universities from 2006 to 2015, we show that academic spinoffs established (1) for extrinsic monetary motivations are more likely to generate higher profits, (2) for extrinsic reputational motivations are more likely to grow and (3) for intrinsic motivations are more likely to survive. These relationships are negatively moderated by the founding team's complexity. Based on our study, we aim to articulate new theoretical insights for understanding the goal-performance nexus in academic spinoffs, serving as a springboard for future research on academic entrepreneurship.

1. Introduction

Given the importance of research commercialization through academic entrepreneurship for improving the economic and social welfare of societies (Fini et al., 2018; Shane, 2004; Vincett, 2010), a growing body of research has sought to identify factors that contribute to explaining entrepreneurial behaviors in academia (Wright and Phan, 2018). In fact, the different motivations underlying the creation of academic spinoffs (Fini et al., 2018) lead to variances in their goals. Performance reflects the achievement of goals, and should consequently be assessed in terms of the convergence of the outcomes and goals (e.g. Hmieleski and Powell, 2018; Knockaert et al., 2011; Mathisen and Rasmussen, 2019; Shepherd et al., 2021; Wennberg et al., 2011). However, goal heterogeneity leads to difficulties in unambiguously assessing performance, which has resulted in a number of studies pointing to the underperformance of academic spin-offs vis-a-vis independent firms (Clarysse et al., 2011; Hmieleski and Ensley, 2005; Mathisen and Rasmussen, 2019).

We argue that the findings from this body of research suffer from theoretical limitations and empirical indeterminacy, as most studies measure the performance of academic spin-offs in terms of organizational efficiency, i.e. the relationship between inputs and outputs,

without specifying the goals to be achieved, the context of these goals and/or assessing performance in terms of the outcomes with respect to the goals. Current knowledge on the performance of academic spinoffs thus remains fragmented, and the importance of goals as a critical element of assessing their performance ranks high on the agenda of academic entrepreneurs and policymakers. The assessment of organizational performance depends indeed on how organizational goals and outcomes are measured (Aguilera et al., 2023).

This paper aims at advancing our knowledge of the academic spinoff phenomenon, by focusing on the translation of entrepreneurial motivations in organizational goals and consequently in performance as the missing link in extant theorizing.

How do heterogeneous goals resulting from different entrepreneurial motivations affect the performance of academic spinoffs? We address this question by trying to relate the different motivations to establish academic spin-offs to organizational goals, whereby different performance measures could reflect the pursuit and achievement of such different goals. We focus specifically on the founding teams of academic spinoffs, whose propensities and motivations are imprinted in the organization and shape the key decisions of the firm (Fauchart and Gruber, 2011).

We rely on a sample of 778 Italian spinoffs created by 59 Italian state

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universities from 2006 to 2015. To consider the 'how-driven' architecture of our enquiry (Chrisman et al., 2016), we perform a quantitative analysis aimed at connecting the three main entrepreneurial motivations from Lam (2011) – extrinsic monetary, extrinsic reputational and intrinsic – first to the organizational goals identified as propensity to pursue financial gains, size growth and staying in business, and then to performance proxied by profit, growth and survival, respectively. Further, taking into consideration the notion of entrepreneurial team complexity (Harrison and Klein, 2007), we explore the impact of the copresence of individual goals in the establishment of organizational goals, and find that the three motivation-performance relationships are negatively moderated by founding team complexity.

Our study contributes to different streams of literature. First, we contribute to the literature on academic spinoffs' performance, by explaining different performances in the light of different motivations implying differences in the desired outcomes. Second, we contribute to the literature on university entrepreneurial ecosystems, by showing the embeddedness of academic spinoffs, as entrepreneurial motivations may be strongly affected by the entrepreneur's environment, including institutional and contextual factors. Third, to the literature on organizational goals, by underlying the relevance of non-economic goals within organizations and some factors affecting firms' decisions to pursue specific goals.

Our study has also relevant practical implications. To design supportive policies, a better understanding of the heterogeneity of academic spinoff's motivation and goals is crucial. Focusing on financial rewards only may provide an incomplete set of incentives for academic entrepreneurs.

The remainder of the paper is structured as follows. Section 2 describes the theoretical background and presents the hypotheses. Section 3 describes the empirical strategy, whose results are examined in Section 4. Their implications and contributions to the academic entrepreneurship and management literature are then discussed in Section 5, which concludes the paper.

2. Theoretical background and hypotheses development

2.1. University entrepreneurial ecosystems

Academic entrepreneurship does not occur in a vacuum (O'Shea et al., 2008). Both the establishment and the evolution of academic spinoffs are influenced by the context where they operate - the reference context for academic entrepreneurship is the university entrepreneurial ecosystem (Hayter et al., 2018; Prokop, 2021b).

University entrepreneurial ecosystems stimulate academic entrepreneurial activity, by (i) carving their entrepreneurial motivation (Fini et al., 2009; Hayter, 2016); (ii) enabling the achievement of specific organizational goals (Abootorabi et al., 2023; Hayter, 2015); (iii) shaping firm performance.

Academics may be driven by commercialization motivation (Lam, 2011; Prokop et al., 2019), with the expectation of financial gains from either selling (Jelfs, 2016) or listing the company on the stock market through IPOs (Bonardo et al., 2011). In university entrepreneurial ecosystems, academic entrepreneurs may acquire the management and business skills they normally lack through collaboration with the industry (D'Este et al., 2013) and through the involvement of professional managers within the founding team, who provide leadership, experience and connections to investors (Hayter et al., 2018; Vohora et al., 2004). Along with business-related human capital thus, academic entrepreneurs need financial resources and within the university entrepreneurial ecosystems have access to private investors like business angels and venture capitalists (Hayter, 2016; Hayter et al., 2018; Prokop, 2021b). This is more likely to be found in a regional context characterized by regional prosperity (Bergmann et al., 2016) and low unemployment (Horta et al., 2016).

Academic rationales may be strong motivations as scientists aim at obtaining financial resources to support their research, to advance their careers, and to gain personal fulfillment and recognition by peers (Fini et al., 2009; Hayter, 2015; Lam, 2011). Here the actors in the university entrepreneurial ecosystem mostly involved are for sure at the university level (Fini et al., 2009; Hayter et al., 2018). Academic entrepreneurship is concentrated in research-oriented more than teaching-oriented institutions (Lockett et al., 2003), where research prestige of the academic peers, the department and the entire university (Civera and Meoli, 2018; Perkmann et al., 2011; Sine et al., 2003; Zucker et al., 1998) play a key role. Both inside and outside the university, entrepreneurial culture stimulates academics and offers role models to imitate (Bercovitz and Feldman, 2008; Clarysse et al., 2014; Davey et al., 2016; Fini et al., 2017).

Academics' intrinsic values such as science advancement and social orientations are a great deal of motivation for academic entrepreneurs, and here financial gain and urge for commercialization play a smaller part (Hayter, 2011; Lam, 2011). In this case, academic founders tend to maintain their academic identity without individuals with different experiences and expertise (Ferretti et al., 2020; Fiorentino et al., 2022). Similarly, they may privilege public funds, very often research-related (Clarysse et al., 2014; Prokop, 2021b). The homophily in human financial capital is reflected also into the university entrepreneurial ecosystem culture, as they tend to look for stakeholders and communities with the same values (Abootorabi et al., 2023).

For academic entrepreneurs, to engage with a given actor, according to the type of resources they control (like funding, expertise, reputation) allows academic spinoffs to reach specific goals (Abootorabi et al., 2023; Hayter, 2015). According to Hayter (2015) and Quélin et al. (2017), academic spinoffs primarily obtain the resources they need from two broad kinds of stakeholders: commercial stakeholders (with economically oriented investment goals) and public stakeholders (with socially oriented investment goals).

Venture capitalists, angel investors, investment banks and other parties who primarily pursue financial investment objectives are examples of private stakeholders. In contrast, universities, technology transfer offices (henceforth TTOs), business incubators, municipalities and other types of public agencies and political entities prioritize social investment goals (Abootorabi et al., 2023).

For academic entrepreneurs deciding which actors to interact with is therefore strategic to secure the amount and type of resources they require (Abootorabi et al., 2023) and it entails evolving configurations of the ecosystems (Hayter, 2016; Prokop, 2021b; Prokop et al., 2019; Prokop and Kitagawa, 2022). Thus, at the beginning academic spinoffs tend to rely on academic-oriented networks, where TTOs and universities are the main interlocutors, because they exploit founders' social capital to solve resource-starvation and legitimacy problems, typical of the initial stages (Prokop, 2021b; Prokop et al., 2019). In later stages, conversely, such companies switch towards more instrumental and calculative networks that provide specific and unique resources for growth (Prokop et al., 2019).

Finally, university entrepreneurial ecosystems have been proven to influence performance. The involvement of industry-experienced individuals enhances their propensity to spin-out companies and the success chances of their ventures (Criaco et al., 2014; Ferretti et al., 2020; Fiorentino et al., 2022). External partners may facilitate access to funding providers, which in turn increases spinoffs' survival chances (Prokop et al., 2019), growth (Gubitta et al., 2016) and financial performance (Jelfs, 2016). The identification of these external key actors is one of the main tasks of the universities, through the TTOs (Lockett et al., 2003). Their role is found to be marginal for spinoff formation (Clarysse et al., 2011; Fini et al., 2011, 2017), but influential for investment generation (Fini et al., 2017; Gubitta et al., 2016), growth (Gubitta et al., 2016) and survival (Prokop et al., 2019).

2.2. Academic spinoffs' motivations

Due to the multiplicity of motivations driving academic spinoff establishment, a classification is necessary (Hayter, 2011). We adopt the one suggested by Lam (2011), who identifies three main motivations: 'gold' (financial rewards), 'ribbon' (reputational/career rewards), or 'puzzle' (intrinsic satisfaction). The recent rise of entrepreneurial science has allowed academics to seek financial rewards from commercial activities (Balven et al., 2018), making 'gold' an important component of the scientific reward system. Second, academics value the recognition and prestige bestowed by peers (Aschhoff and Grimpe, 2014; Stuart and Ding, 2006), and establishing a spinoff might be perceived as enhancing their profile, especially as public policies often use public engagement and societal impact as measures of institutional or individual performance (Fini et al., 2019). Third, beyond the extrinsic ribbon and gold rewards, academic scientists are intrinsically motivated to advance knowledge, and they derive satisfaction when their intuitions reach the market (Fini et al., 2009; Perkmann et al., 2013; Huyghe et al., 2016).

2.3. Academic spinoffs' organizational goals

Organizations have been increasingly characterized by goal heterogeneity and specifically for entrepreneurial ventures organization scientists have identified goal heterogeneity in terms of social and economic orientations among firms (Battilana et al., 2022). Rent and profit are part of economic goals whereas societal impact is part of social goals (Battilana and Dorado, 2010).

Pursuing both commercial and social purposes is frequently inherent to the nature of academic spinoffs (Fini et al., 2019). Academic spinoffs' organizational goals are linked to founders' motivations, which are not always linked to the economic sphere (Hayter, 2011; Lam, 2011). Academic spinoffs are companies founded by professors who typically retain their jobs and thus enjoy financial independence from their company and do not necessarily seek extensive growth for their companies.

Economic goals drive academic spinoffs towards economic performance in terms of revenues and profits, whereas social goals make companies vigilant about benefits they can provide like social economy, environmental, health and safety (Aboutorabi et al., 2023). There have been few attempts to conceptualize how academic spinoffs' non-economic goals affect their performance, despite a growing number of studies recognizing the non-economic motivations of founders to engage in entrepreneurship (Hayter, 2011; Lam, 2011).

2.4. Academic spinoffs' performance

Research has resorted to different performance measures, which can be classified according to their nature into market-oriented, financial and survival indicators (Jelfs, 2016).

Since the ultimate goal of academic spinoffs is generating value for their shareholders (founders, universities and investors), market-based measures have been assessed as the most suitable to indicate the financial value of the company. Share price, firm market and book values are the preferred measures. Nonetheless, they are available only in the case of IPOs and listing on the public markets. Unfortunately, empirical evidence testifies that these are isolated cases (Bonardo et al., 2011; Jelfs, 2016). An interesting variation on this theme has been suggested by Zhang (2009) who considered the investments raised by venture capitalists. Nonetheless, as academic spinoffs are commonly accepted as risky businesses and venture capitalists are by nature risk-averse subjects, these firms struggle to receive external funds, especially in the first stages (Prokop, 2021b). For this reason, the most appropriate performance measures for academic spinoffs turned out to be growth, which can be expressed in terms of turnover (Clarysse et al., 2011; Wennberg et al., 2011; Zahra et al., 2007), employees (Clarysse et al., 2007; Wennberg et al., 2011) and sales (Clarysse et al., 2011). Growth measures, although providing dynamic information about the

companies, may be distorting as academic spinoffs typically start from nil or a very low-base value on the growth measure (Jelfs, 2016).

An increasing number of studies have adopted survival rate to assess performance (Civera et al., 2020; Criaco et al., 2014; Prokop et al., 2019; Wennberg et al., 2011; Zhang, 2009), as firm persistence over time may be a more comprehensive indicator of success (Criaco et al., 2014; Prokop et al., 2019). While academic spinoffs exhibit disappointing performance when other performance measures are employed, they are characterized by higher survival rates (Wennberg et al., 2011). A potential explanation may be that academics often create academic spinoffs to continue a line of research or as a life-style company, not to maximize returns for its shareholders but to keep their lead researcher status at the parent university (Criaco et al., 2014). The kaleidoscope of academic spinoffs' performance in the literature is due to their goal heterogeneity (Aboutorabi et al., 2023), which is the result of the multiplicity of entrepreneurial motivations.

2.5. Linking motivations, goals and performance

Academic entrepreneurs can be motivated by more than just one motivation. They may be interested at the same time, but to a different extent, in achieving initial public offering, attracting early-stage finance, financial return, survival and growth (Hayter, 2011). The underlying idea is therefore that according to the motivations driving them, academic spinoffs are created to pursue diverse goals. In turn, since founders have a significant effect on firm performance (Bolzani et al., 2021; Vanacker et al., 2014) we expect that according to the different specific organizational goals, the academic spinoffs perform differently.

The integrative framework developed by Aguilera et al. (2023) offers a view of how organizational goals originate and affect outcomes and performance. Building on this framework, we derive the most likely organizational goals pursued and the most likely performance entailed according to a given entrepreneurial motivation.

The first entrepreneurial motivation we focus on is extrinsic monetary motivation. Neoclassical economic theory assumes that the economic agent displays profit-maximizing behavior (Cassar, 2007). Numerous studies see financial (or economic) motivations as fundamental to modeling entrepreneurial entry and self-employment (Cassar, 2007; Gimeno et al., 1997). Such motivations have two components related to an academic individual's intention: to create value through the company (Jelfs, 2016; Shane, 2004) or to obtain financial security (Cassar, 2007; Hayter, 2011). This distinction, involving the concepts of opportunity and necessity entrepreneurship, has been recently extended to academic entrepreneurship (Civera et al., 2020).

Hence, those spinoffs that ultimately produce value for their shareholders are characterized by good financial performance (Gubitta et al., 2016). First, when investors invest in a given company, they ensure to process university knowledge into technologies and finally develop revenue-generating products or services (Clarysse et al., 2011). Second, receiving investments signals firm credibility (Vohora et al., 2004) and quality (Fini et al., 2017), which is often used as a prerequisite for other investors engaging with the venture, especially as spinoff companies require multiple rounds of funding (Wright et al., 2006) to fuel their financial performance (Bigdeli et al., 2016). On the other hand, financial motivation may reflect the desire or need to achieve financial security and independence. The rate of establishing academic spinoffs appears higher where and when there is a shortage of high-skilled career opportunities (Horta et al., 2016), or the lack of academic job positions (Roach and Sauermann, 2010). Under these conditions, pursuing an entrepreneurial career through establishing an academic spinoff allows academics and PhD holders to exploit the advanced knowledge in their field of expertise (Mangematin, 2000).

For these reasons, the goal of academic spinoffs created for extrinsic monetary motivations would be financial gain in terms of either generating value or gaining financial independence. Thus, spinoffs should be profitable. We therefore propose.

Hypothesis 1. Academic spinoffs established for extrinsic monetary motivations are more likely to achieve higher profits.

We now focus on extrinsic reputational motivation. According to Cassar (2007), entrepreneurs who place importance on recognition, such as gaining a higher position for themselves, undertake venturing activities of a larger scale because society values high-growth venturing more than low-growth venturing. With specific reference to the academic entrepreneurship context, a number of studies have recognized the relevance of status enhancement for academic entrepreneurs as a driver for entrepreneurial activities (Cassar, 2007; Hayter, 2011; Lam, 2011). In academia, business engagement can in fact be used as currency to build scientific credit and enhance careers (Meoli and Vismara, 2016) and the professional standing of scholars benefits from their spinoffs' growth (Pitsakis et al., 2015).

We may assume that entrepreneurs seeking recognition, including academic entrepreneurs, found companies aimed to grow. In this regard, Bower (2003) made a step forward by arguing that in the case of the biotech firm Genentech, outstanding human capital has been attracted in virtue of the high status of the senior scientists involved in the company. The fact that Genentech's scientists continued to collaborate with famous academic laboratories, to publish and to attend conferences turned out to be extremely seductive to potential employees. We therefore may conceive company expansion and growth, respectively, as the natural organizational goal and performance measure for extrinsic reputationally motivated scholars. Accordingly, we propose.

Hypothesis 2. Academic spinoffs established for extrinsic reputational motivations are more likely to achieve higher growth.

Finally, we consider intrinsic motivations. It is frequently argued that well-performing organizations survive while poorly performing ones disappear (Alchian, 1950; Williamson, 1991). Firms are naturally selected according to the profit they generate; those making a profit are 'adopted' by the environment, and the others are rejected and disappear (Penrose, 1952). This view implies a unidimensional relationship between economic performance (defined as economic returns to entrepreneurs) and survival, since the most likely to discontinue are the firms that perform the worst (Gimeno et al., 1997). It follows that economic performance and survival should have the same determinants or predictors. Interestingly, however, the empirical evidence shows that the determinants of economic profit and survival often diverge (Kalleberg and Leicht, 1991; Levinthal, 1991).

According to Gimeno et al. (1997), an organization's survival is determined by its performance threshold, below which the dominant organizational constituents will act to dissolve the organization. This implies that survival is not strictly a function of economic performance but is relative to a firm-specific threshold influenced by the fact that entrepreneurs have objectives other than (or in addition to) maximizing economic returns to their equity (Gimeno et al., 1997).

Through academic spinoffs established for intrinsic motivations, academics seek to 'do good' socially and derive satisfaction from engaging in challenging and creative activities. Intrinsic motivation arises independently of the presence of material rewards, since it derives from engagement and "entrepreneurial passion" (Hayter, 2011; Lam, 2011). However, high intrinsic motivation might not benefit performance, since having a social vision creates a sense of purpose that transcends profit-maximizing. Shin and Grant (2019) find evidence of a 'dark side of intrinsic motivation', whereby individuals who are highly intrinsically motivated in an initial task perform worse in subsequent tasks. Hence, the intrinsic motivation to establish an academic spinoff could not necessarily drive toward profit and growth but requires staying in business. We therefore argue that the organizational goal of this type of spinoff may be achieved through survival, fostering social and affective outcomes. Formally stated.

Hypothesis 3. Academic spinoffs established for intrinsic motivations are more likely to achieve higher survival rates.

2.6. Team complexity

Academic spinoffs are companies established by university faculties and in the vast majority of cases are owned by the very same academics who founded them (Ferretti et al., 2020; Fiorentino et al., 2022). Yet, academic founders' decisions and activities may be contingently affected by the actors in the surrounding university entrepreneurial ecosystems (Prokop, 2021; Prokop and Kitagawa, 2022).

Other shareholders, when involved in the establishment of academic spinoffs can affect its strategy, potentially leading to diversified – and competing – organizational goals (Ferretti et al., 2020) and firm performance (Prokop, 2021). So far, the participation of non-academics has been found to be a determinant of academic spinoffs' performance. More specifically, while university support is acknowledged to speed up the product/service commercialization and revenue generation, private companies like venture capitalists and non-academics in general provide both resources and skills necessary for the commercialization that academics owners do not have (Criaco et al., 2014; Ferretti et al., 2020; Fiorentino et al., 2022).

Several studies have investigated the optimal level of academic and non-academic co-presence in managing academic spinoffs (Criaco et al., 2014; Ferretti et al., 2020; Fiorentino et al., 2022). Criaco et al. (2014) focus on founders' specific human capital, and disentangle the entrepreneurship, industry and university components. Entrepreneurship human capital is related to the knowledge gained via formal education and personal experience in entrepreneurship, for example through previous spinoff activities. Industry human capital instead refers to the knowledge gained through prior experience in a particular industry. Finally, the knowledge gained by prior experience in research and teaching in higher education institutions is referred to as university human capital. The authors found that, contrary to industry human capital, the university and entrepreneurship human capital enhance the survival rate of academic spinoffs. Fiorentino et al. (2022) made a step forward by considering the evolution of the entrepreneurial team composition over time. While at the foundation stage the entrepreneurial team consists mainly of academics, in the following stages it becomes mixed as companies require the continuous development of competencies, especially business-related ones. The presence of non-academic members providing a complementary set of skills and knowledge is considered therefore to be positively associated with company performance. Similar findings are reported by Ferretti et al. (2020), who distinguished between ownership and board structures. They specifically showed a non-linear pattern, according to which the fraction of board seats held by academics positively influence sales growth, though only up to a certain threshold above which the effect becomes negative.

The studies mentioned above recognized however that large and diversified entrepreneurial teams introduce complexity. Balancing a research and an entrepreneurial mindset, although beneficial, can create tensions in the team, as well as communication and collaboration problems (Nikiforou et al., 2018), due to potential disputes between academic and non-academic members, who are characterized by different cultures. Moreover, academics and non-academics might be motivated by different goals, which, in the worst case, can conflict (Craig Boardman and Ponomariov, 2009) and damage the performance of academic spinoffs (Ferretti et al., 2020; Fiorentino et al., 2022; Visintin and Pittino, 2014).

In our framework, the complexity of founding teams can thus lead to the coexistence of competing motivations (Aguilera et al., 2023), which may lead to divergent organizational goals and may hinder the academic spinoff's capacity to achieve its goals (Klotz et al., 2014). Accordingly, we propose.

Hypothesis 4. The relationship between extrinsic monetary motivations for establishing academic spinoffs and the likelihood of achieving higher profit is negatively moderated by founding team complexity.

Hypothesis 5. The relationship between extrinsic reputational motivations for establishing academic spinoffs and the likelihood of achieving higher growth is negatively moderated by founding team complexity.

Hypothesis 6. The relationship between intrinsic motivations for establishing academic spinoffs and the likelihood of survival is negatively moderated by founding team complexity.

3. Empirical strategy

3.1. Data and sources

Our sample comprises 778 academic spinoffs created between 2006 and 2015 by 59 state universities in Italy. In Italy academic spinoffs in line with the definition from Shane (2004), are companies established by university faculties only based on technologies licensed from their respective university. University faculties include contractually bounded tenured and non-tenured such as professors and research fellows. The intellectual property generated by academics is owned by the university. By contrast, the university does not systematically own an equity stake and when it is the case university participation does not exceed 10%.

Data were collected from the Italian Ministry of Universities and Research (MUR) Spinoff Italia database,[1] which provides the name, year of establishment, sector, geographic location and parent university of each spinoff (Civera et al., 2020). We merged these data with those of Bureau van Dijk's *Analisi Informatizzata delle Aziende* (AIDA), which provides accounting data for the last 10 years of firm activity.

3.2. Models and dependent variables

To test our three hypotheses, we identify three different performance measures adopted as our dependent variables. First, we measure profit as the ratio of the firm's operating profits and total assets, denoted in the accounting literature as 'return on assets' (ROA). Operating profits are measured as earnings before interest, taxes, depreciation and amortizations. We ran an ordinary least square (OLS) regression where the firm-level dependent variable is the average ROA over three years after the establishment of the spinoff.

Second, we run an OLS regression where the dependent variable is the compound annual growth rate in total assets over three years from incorporation.

Third, we run a log-log regression where the dependent variable is survival, measured as the likelihood of an academic spinoff ceasing in a certain year.[2] We rely on a proportional hazards model extended to discrete-time because our measure for survival time is in years.

Finally, we use founding team complexity as a moderator to test Hypotheses 4, 5 and 6. Team complexity is measured in terms of team size and team diversity. Size is measured as the number of members in the founding team. Large teams might experience coordination and monitoring problems (Clarysse and Moray, 2004). These problems can intensify when teams are diversified as they include members with different academic statuses and profiles (Visintin and Pittino, 2014), due to dysfunctional conflict and decision-making difficulties (Knockaert et al., 2015). Diversity[3] is defined as a dummy variable equal to 1 if the team consists of at least one academic and one non-academic member.

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[1] http://www.spinoffricerca.it/.

[2] All failures in our sample refer to companies going bankrupt or terminating their activity and liquidating their assets.

[3] We are aware that the proportion of academic and non-academic members may also lead to complexity in goal setting, though this would overlap with our definition of goal orientation. This is why our analysis of complexity in goal setting is limited to team size and team diversity.

3.3. Measuring the motivations to establish academic spinoffs

According to the university entrepreneurial ecosystem theory, motivations depend on the configuration of entrepreneurial ecosystems where academic entrepreneurs are embedded.

Based on the university entrepreneurial ecosystem literature, for intrinsically motivated academics, the founding team is homogeneous (Ferretti et al., 2020; Fiorentino et al., 2022) and we measure it though the presence of an academic CEO (dummy variable) and through the percentage of academics in the founding team. Intrinsically motivated academics look for stakeholders with similar values, therefore they mainly rely on public resources at the university level, intended as the ratio of public resources to total university budget because universities are stakeholders more oriented to societal goals (Abootorabi et al., 2023). At the context level, social goals are more likely to be found in communities where non-profit sector is highly developed (percentage of non-profit companies over the total number of companies in a region) and there is a high electoral turnout (percentage of citizens who vote for elections in a region), following studies that have identified social capital using the indicators of civicness, participation in groups and associations and charitable level (e.g., Guiso et al., 2004).

For extrinsic monetary motivated academics, we use almost the same variables but we expect an opposite relationship. In this case, the founding team should include more business-experienced individuals and be driven by an external entrepreneur (Hayter et al., 2018; Vohora et al., 2004). They should rely on private stakeholders more oriented to economic goals (Abootorabi et al., 2023) and be concentrated in the prosperous contexts, proxied by the regional unemployment rate (Horta et al., 2016).

For extrinsic reputational motivated entrepreneurs, founding teams should be composed mainly of tenure professors, who establish academic spinoffs to provide job opportunities for their PhDs (Lam, 2011). This could enhance their reputation, resulting in a 'virtuous circle' whereby they attract promising young researchers to their laboratories. We measure it through the ratio of tenure staff over the number of team members. Extrinsic reputational motivated entrepreneurs are positively influenced by their university culture, especially when it is marked by scientific prestige – proxied by university presence in the international Academic Ranking of World Universities (ARWU) (Civera and Meoli, 2018) – and previous entrepreneurial experience to imitate, accounted for the number of companies already spun-out by the same university to which the entrepreneur is affiliated (Bercovitz and Feldman, 2008; Fini et al., 2017). Similarly, the entrepreneurial culture developed in the regional context matters (Clarysse et al., 2014; Davey et al., 2016), and is proxied by both the ratio of self-employed workers over the total working population in a given region and the presence of innovative start-ups over the total number of start-ups listed in the Italian Register of the Innovative companies, retrieved by the Chamber of Commerce.

The relationship existing between the university entrepreneurial ecosystem characteristics and the entrepreneurial motivations is shown

Table 1
Relation between the university entrepreneurial ecosystem antecedents and entrepreneurial motivations.

	Extrinsic monetary	Extrinsic reputation	Intrinsic
Human capital	Academic CEO (−) Academic ratio (−)	Tenure ratio (+)	Academic CEO (+) Academic ratio (+)
Financial capital & university support	Public resource dependence (−)	ARWU (+) Spinoff experience (+)	Public resource dependence (+)
Context level	Regional unemployment (−)	Self-employment (+) Innovative start-up activity (+)	Electoral turnout (+) Non-profit sector (+)

in the results of the factor analysis in Table 1.

We employ a factor analysis to reduce the number of university entrepreneurial ecosystem variables in a number of factors (motivations) consistent with our theoretical structure (i.e. 3 factors). Specifically, our exploratory factor analysis accommodates the use of binary dummies by computing the polychoric correlations. Three factors are selected based on high eigenvalues (greater than 1) in the explanatory factor analysis. The factor analysis does not aim to split the sample of academic spinoffs into three distinct groups but rather identify for each the extent to which an academic spinoff is likely to be established by each of the three factors. Therefore, each of our spinoffs may score high in more than one motivation factor.

Tables 2 and 3 present the results of the factor analysis. Most methods that drive decisions on how many factors to retain are determined by the eigenvalues of each factor. Table 4 indicates that out of our 11 antecedents, the first three factors have eigenvalues above 1 with 96% of total variance explained by the explanatory factor analysis. We use a 'component after rotation' matrix to interpret the final results of the explanatory factor analysis. The VARIMAX procedure redistributes the variance between the factors and facilitates their interpretation. Table 5 shows a strong correlation between the three factors and the antecedents, hence the expected signs in Table 3 are confirmed.

3.4. Control variables

Following the recent literature on university entrepreneurial ecosystem, we identify three sets of control variables as predictors of spinoff performance (Civera et al., 2020; Fini et al., 2011; Hayter et al., 2018). The first category involves firm-level characteristics with firm size measured as the natural logarithm of the firm's total assets, leverage measured as debt-to-equity ratio, and founding year dummies indicating the year of establishment of each spinoff. The second category comprises university-level control variables. University size is measured as the natural logarithm of the university's total faculty (tenured and non-tenured), university age is calculated as the natural logarithm of the number of years since its foundation, teaching orientation is proxied by the student to staff (tenured and non-tenured) ratio, research orientation is measured as the ratio of publications per academic staff, spinoff experience is measured as the cumulative number of spinoffs since 1999, university total budget as the total amount of resources available in a given year for the university, and TTO size represents the number of staff in the university's TTO. The third category of contextual factors comprises measures identifying the features of the entrepreneurial ecosystem, such as regional R&D expenditure (as a percentage of regional GDP), regional VC investments (number of investments per region in a given year), the value added in manufacturing (as a percentage of regional GDP) in order to account for sectoral composition of the region, regional population measured as the natural logarithm of the regional population, and regional patents calculated as the natural logarithm of the number of patents in the region.

Table 2
Eigenvalues and percentage of variance explained by each component after rotation.

Component	Eigenvalue	Proportion	Cumulative
Comp1	1.60698	0.4319	0.4319
Comp2	1.1936	0.3208	0.7527
Comp3	1.08422	0.2108	0.9634
Comp4	0.52965	0.1223	1.1058
Comp5	0.38073	0.0954	1.1812
Comp6	0.25779	0.0693	1.2505
Comp7	−0.01231	−0.0033	1.2472
Comp8	−0.06369	−0.0171	1.2301
Comp9	−0.26915	−0.0723	1.1577
Comp10	−0.27904	−0.075	1.0827
Comp11	−0.30787	−0.0827	1

Table 3
Component matrix after rotation.

	Component 1	Component 2	Component 3
	Extrinsic monetary	Extrinsic reputational	Intrinsic
Academic CEO	−0.093	0.128	0.395
Academic ratio	−0.063	0.065	0.729
Tenure ratio	−0.044	0.668	0.183
Public-resource dependence	0.052	−0.027	−0.161
ARWU	−0.055	0.233	0.092
Spinoff experience	−0.124	0.652	−0.143
Regional unemployment	−0.307	−0.249	0.056
Self-employment	0.142	0.778	−0.059
Innovative activity	−0.043	0.469	0.165
Electoral turnout	−0.063	0.041	0.545
Non-profit sector	0.014	−0.0084	0.531

We drew information on academic staff from the website of the Ministry of University and Research ,[4] university publication data from the SCOPUS database, TTO size data from the website of the Italian Rectors' Conference [5] and ARWU[6] variable data from the Shanghai Ranking website (http://www.shanghairanking.com/). Data on the regional context derived from the Italian National Institute of Statistics (ISTAT), regional venture capital (VC) investments from the yearly reports of AIFI (Italian Association of Venture Capital, Private Equity and Private Debt) and accounting information from the Aida database.

Details on the variable definitions and their sources are reported in Table 4.

3.5. Descriptive statistics

Table 5 reports the descriptive statistics. Italian academic spinoffs are characterized by modest performance in terms of both ROA (three-year average 3.37%) and growth in total assets (compound annual growth rate over three years 1.16%), but show extremely high survival rates (only 11% fail), in line with other studies in the Italian context (Civera et al., 2020; Muscio et al., 2016), and lower performances than in other countries (see, for example, Wennberg et al., 2011). Founding teams, on average, consist of four members (more than the 2.3 members according to Visintin and Pittino, 2014). Teams are homogeneous (see, for example, Nikiforou et al., 2018), as around three out of four members are academics, around 30% of team members have university tenure, and around 30% have an academic CEO. However, half of the teams include at least one academic and one non-academic. Regarding institutional characteristics, universities strongly depend on public resources, as on average 40% of their budget derives from public funding. More than half of the universities (54.5%) appear in the ARWU ranking, suggesting that academic entrepreneurship is enhanced by academic prestige (Stuart and Ding, 2006). Moreover, the sample universities have consolidated experience in spinning out companies to a degree higher than found in Italy (see, for example, Muscio et al., 2016, where the cumulated spinoff experience is below two). Finally, focusing on contextual factors, the unemployment rate is 9.58%, in line with Horta

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[4] The Ministry of University and research provides the USTAT MIUR database: http://ustat.miur.it/opendata/where it collects information related to students, staff and income of Italian higher education system.

[5] It is an association of the rectors of public universities and recognized private universities. By October 2001 the rectors of 77 university institutions belonged to CRUI.

[6] Known also as Shanghai ranking, it is one of the yearly publications of global university rankings. The league table was the first global university ranking containing a variety of metrics, and it was created and published by the Shanghai Jiao Tong University in 2003.

Table 4
Variable descriptions.

Variable	Definition	Source
Panel A: Dependent variables		
Profit	Average Return on Asset (EBITDA/total assets) over three years after establishment of the spinoff	Aida
Growth	Compound annual growth rate of total assets over three years after establishment of the spinoff	Aida
Failure	Dummy variable equal to 1 if academic spinoff has failed.	Spinoff Italia
Panel B: Factor variables		
Academic CEO	Dummy variable equal to 1 if the CEO of the spinoff is academic	Spinoff's website
Academic ratio	Ratio of academics on number of team members of the academic spinoffs	Spinoff's website
Tenure ratio	Ratio of tenured members on number of team members of the academic spinoffs	Spinoff's website
Public dependence	Ratio of public resources to total budget of the university where the spinoff was established	MUR
ARWU	Dummy variable equal to 1 if university where the spinoff was established is included in ARWU (Academic Ranking of World Universities).	Shanghai ranking website
Spinoff experience	Cumulative number of spinoffs since 1999 until the observation year in the university where the spinoff was established	Spinoff Italia
Unemployment rate	Unemployment rate in the region where the spinoff was established	ISTAT
Self-employment	Number of self-employed over 15 years of age in the region over the population	ISTAT
Innovative activity	Number of innovative start-ups in the region over total number of active companies	Ministry of Economic Development
Non-profit sector	Number of non-profit organizations per thousand people	ISTAT
Electoral turnout	Number of citizens voting in the region for political elections over total voting population	ISTAT
Panel C: Moderators		
Team size	Number of team members	CVs
Team diversity	Dummy variable equal to 1 if the academic spinoff has at least one academic and a non-academic in the team	CVs
Panel D: Firm-level control variables		
Firm Size	Firm's total assets. Natural logarithm used in the regressions.	Aida
Leverage	Firm's debt-to-equity ratio.	Aida
Founding Year	Dummy foundation year.	Spinoff Italia
Panel E: University-level control variables		
University size	Total number of faculty members (tenured and non-tenured) of the university where the spinoff was established	MUR
University age	Number of years since the foundation of the university where the spinoff was established; natural logarithm used in the regressions	MUR
Teaching orientation	Ratio of the number of students and academic staff in the university where the spinoff was established	MUR
Research orientation	Ratio of the total number of papers published by the faculty of a university in a certain year and academic staff of the university where the spinoff was established	Scopus
University total budget	Total amount of resources available in a given year for the university	MUR

Table 4 (*continued*)

Variable	Definition	Source
TTO size	Number of employees in TTOs where the spinoff was established	CRUI
Panel F: Context-level control variables		
Regional R&D expenditure	Percentage of the regional GDP comprised of R&D expenditures for public administrations, universities, and private and public enterprises	ISTAT
Regional VC investments	Number of VC investment per region per year	AIFI reports
Value added in manufacturing	Regional value added in manufacturing as a % of regional GDP	ISTAT
Regional population	Population in the region where the spinoff was established	ISTAT
Regional patents	Number of patents in the region where the spinoff was established	ISTAT

Notes: All the variables are calculated at the year of the spinoff's foundation.

Table 5
Descriptive statistics.

	Obs.	Mean	Std. Dev.	Min	Max
Panel A: Dependent variables					
Profit (average three-years ROA, %)	778	3.37	27.88	−42.46	73.34
Growth (CAGR of total assets, %)	778	1.16	10.36	−1.00	230.08
Failure (%)	778	11.05	31.38	0.00	100.00
Panel B: Factor variables					
Academic CEO (%)	778	30.99	46.41	0.00	100.00
Academic ratio (%)	778	73.34	29.59	0.00	100.00
Public resource dependence (%)	778	39.14	16.18	0.00	97.05
Tenure ratio (%)	778	29.28	28.93	0.00	100.00
ARWU (%)	778	54.50	49.83	0.00	100.00
Spinoff Experience	778	4.13	6.30	2.00	12.00
Unemployment (%)	778	9.58	4.16	3.19	23.42
Self-employment (*1000 workers)	778	19.62	4.66	11.96	32.52
Innovative start-up activity (*mln firms)	778	21.81	48.14	1.30	179.07
Non-profit sector (*1000 people)	778	2.16	3.89	0.49	13.72
Electoral turnout (%)	778	78.30	10.95	89.56	7.80
Panel C: Moderators					
Team size	778	3.81	1.56	1.00	10.00
Team diversity (%)	778	53.51	50.05	0.00	100.00
Panel D: Firm-level control variables					
Firm Size	778	338.44	4559.97	0.00	126,489.00
Leverage	778	0.32	1.99	−22.01	29.23
Founding year	778	3.81	2.43	0.00	12.00
Panel E: University level control variables					
University size	778	1144.13	786.26	23.00	4697.00
University age	778	322.23	312.87	6.00	925.00
Teaching orientation	778	27.67	6.93	0.00	78.25
Research orientation	778	1.56	2.23	0.00	43.48
University total budget (mln euro)	778	141,82	99.23	0.80	582.84
TTO Size	778	4.03	3.04	0.00	13.00
Panel F: Context-level control variables					
Regional R&D expenditure (%)	778	1.10	0.39	1.21	0.75
Regional VC investments (No.)	778	17.81	45.16	0.00	114.00
Value added in manufacturing (%)	778	14.42	2.14	17.25	12.84
Regional population (*1000 people)	778	4210.64	2682.89	11.43	10,000.00
Regional patents	778	63.64	50.06	0.00	166.88

et al. (2016). Around 20 per thousand workers are self-employed, and only 22 out of 1 million companies are innovative start-ups. The results for social capital are in line with Guiso et al. (2004), as the electoral

turnout is almost 80%, with on average two non-profit organizations for every 1000 people.

Finally, in line with previous studies in the Italian context (see, for example, Civera et al., 2020a,b; Fini et al., 2011), academic spinoffs have, on average, total assets of 338.44 €, a debt-to-equity ratio of 0.32 and an average age of less than four years. Moreover, academic spinoffs are established in institutions enrolling on average 32,000 students and are 322 years old. These universities have 27 students per academic staff, their academic staff produces on average 1.5 publications per year and their TTO office hires on average four people. Regarding regional controls, spinoffs are located in regions with 64 patents on average and four million inhabitants.

Table 6 presents the correlation matrix of the antecedents of organizational goals. We checked for potential multicollinearity issues using variance inflation factor (VIF) tests. The individual VIF scores were well below the usual warning level of 10, and the average below the critical level of 2.5 (Gujarati, 2003).

4. Results

Tables 7–9 exhibit the main results concerning the first three hypotheses. All models in Tables 7 and 8 are second-stage regressions, where the first stage is a probit model on the spinoffs having survived three years. The instrumental variable in the first stage is the number of spinoffs in Italy over the year of foundation, significant in the first stage at less than 1% (t-statistic equal to 3.32).

Our general model is described by the following set of regressions, following the general switching model in Heckman (1990) and Vella (1998):

$$y_i^* = Extrinsic\_Monetary_i\,\beta_1 + Extrinsic\_Reputation_i\,\beta_2 + Intrinsic_i\,\beta_3 + X_i^{'}\zeta + \varepsilon_i \qquad [1]$$

$$d_i^* = Italian\_Spinoff_i\,\gamma + X_i^{'}\zeta + \omega_i \qquad [2]$$

$$d_i = 1 \; if \; d_i^* > 0; \; d_i = 0 \; otherwise \qquad [3]$$

$$y_i = y_i^* * d_i \qquad [4]$$

In this model, y_i^* is the latent variable, with an observed counterpart y_i, namely the outcome variable (ROA in Table 7, Growth in Table 8); d_i is the dummy variable describing the observability of the outcome, and is estimated through the latent variable d_i^*; *Extrinsic Monetary$_i$*, *Extrinsic Reputation$_i$* and *Intrinsic$_i$* are the three variables measuring the motivations; *Italian spinoff$_i$* is the exogenous variable in the observability regression; $X_i^{'}$ contains all control variables.

Each table shows Model 1 presenting the effect of extrinsic monetary motivation (when β_2 and β_3 are set to zero), Model 2 presenting the effect of extrinsic reputational motivation (when β_1 and β_3 are set to

Table 7
Performance - profit.

	(1)	(2)	(3)	(4)
	Profit	Profit	Profit	Profit
Extrinsic monetary	0.022**	–	–	0.037**
	(0.009)	–	–	(0.014)
Extrinsic reputational	–	−0.012	–	−0.014
	–	(0.024)	–	(0.096)
Intrinsic	–	–	−0.036	−0.092**
	–	–	(0.052)	(0.044)
Firm size	0.018*	0.018*	0.018*	0.017
	(0.010)	(0.010)	(0.010)	(0.011)
Leverage	0.001	0.001	0.001	0.002
	(0.006)	(0.006)	(0.006)	(0.007)
University size	0.030**	0.030**	0.030**	0.032***
	(0.012)	(0.012)	(0.012)	(0.014)
University age	−0.022	−0.026	−0.026	−0.005
	(0.048)	(0.048)	(0.048)	(0.049)
Teaching orientation	−0.001	−0.001	−0.001	−0.002
	(0.002)	(0.002)	(0.002)	(0.003)
Research orientation	−0.013	−0.016	−0.016	−0.007
	(0.025)	(0.025)	(0.025)	(0.026)
University total budget	0.022	0.034	0.033	0.012
	(0.028)	(0.042)	(0.038)	(0.017)
TTO Size	0.001	0.001	0.001	0.001
	(0.005)	(0.005)	(0.005)	(0.005)
Regional R&D exp.	−0.021	−0.016	−0.017	−0.011
	(0.032)	(0.018)	(0.020)	(0.023)
Regional VC investments	0.007*	0.007*	0.007*	0.005*
	(0.004)	(0.004)	(0.004)	(0.002)
Value added in manufact.	0.016	0.024	0.022	0.009
	(0.014)	(0.036)	(0.035)	(0.012)
Regional population	0.036*	0.034*	0.034*	0.032*
	(0.019)	(0.018)	(0.018)	(0.017)
Regional patents	0.001**	0.001**	0.001**	0.001**
	(0.000)	(0.000)	(0.000)	(0.000)
Year dummies	YES	YES	YES	YES
Constant	0.527	0.551	0.559	0.558
	(0.498)	(0.505)	(0.505)	(0.504)
Observations	750	750	750	750
R-squared	0.152	0.142	0.144	0.158

Notes: This table presents the results of the ordinary least square regression with respect to 3-year performance in terms of average ROA. All models are second-stage regression where the first stage is a probit model on the spinoff having survived the first and second year. The instrumental variable in the first stage is the number of spinoffs in Italy over that year, significant in the first stage at less than 1% level (t-statistic equal to 3.32). Model 1 presents the effect of extrinsic monetary motivation. Model 2 presents the effect of extrinsic reputational motivation. Model 3 presents the effect of intrinsic motivation. Model 4 presents the effect of all three motivations together. Year dummies are included in all models. Standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

zero), Model 3 presenting the effect of intrinsic motivation (when β_1 and β_2 are set to zero) and Model 4 presenting the effect of all three motivations.

Table 7 reports the results of the OLS regression for three-year

Table 6
Correlation matrix of the antecedents of organizational goals.

	1	2	3	4	5	6	7	8	9	10	11
1. Academic ratio	1.000										
2. Academic CEO	0.329*	1.000									
3. Tenure ratio	0.393*	−0.071	1.000								
4. Public resources	0.083	−0.130	−0.024	1.000							
5. ARWU	−0.120	−0.054	0.086	0.015	1.000						
6. Spinoff experience	−0.143	−0.041	0.185*	−0.056	−0.050	1.000					
7. Regional unemployment	0.014	0.021	−0.063	0.131*	−0.227*	0.201*	1.000				
8. Self-employment	0.021	−0.020	0.091	−0.063	0.312*	0.010	−0.213*	1.000			
9. Innovative activity	0.030	−0.067	0.249*	−0.002	−0.003	0.395*	0.061	0.134*	1.000		
10. Non-profit sector	0.064	−0.053	0.172*	0.002	0.046	0.279*	0.002	0.136*	0.472*	1.000	
11. Electoral turnout	−0.155	0.148	0.003	−0.203*	0.139*	−0.161*	−0.071*	0.378*	−0.093*	−0.175*	1.000

Notes: Asterisks indicate significance at the 5% level.

Table 8
Performance - growth.

	(1)	(2)	(3)	(4)
	Growth	Growth	Growth	Growth
Extrinsic monetary	0.137	–	–	0.099*
	(0.259)	–	–	(0.056)
Extrinsic reputational	–	0.144**	–	0.195***
	–	(0.061)	–	(0.064)
Intrinsic	–	–	−0.072	−0.083
	–	–	(0.116)	(0.147)
Firm size	−2.139***	−2.151***	−2.149***	−2.188***
	(0.363)	(0.364)	(0.364)	(0.366)
Leverage	0.095	0.097	0.097	0.102
	(0.210)	(0.210)	(0.210)	(0.212)
University size	−0.421	−0.327	−0.326	−0.540
	(1.577)	(1.566)	(1.566)	(1.609)
University age	−0.239	−0.234	−0.234	−0.202
	(0.398)	(0.399)	(0.399)	(0.401)
Teaching orientation	−0.088	−0.092	−0.092	−0.089
	(0.193)	(0.194)	(0.194)	(0.196)
Research orientation	0.223	0.274	0.274	0.180
	(0.775)	(0.770)	(0.769)	(0.782)
University total budget	0.108	0.108	0.105	0.098
	(0.254)	(0.214)	(0.202)	(0.117)
TTO Size	0.162	0.165	0.165	0.171
	(0.154)	(0.154)	(0.154)	(0.155)
Regional R&D exp.	−0.098	−0.096	−0.098	−0.077
	(0.224)	(0.207)	(0.195)	(0.103)
Regional VC investments	0.017	0.018	0.015	0.018
	(0.024)	(0.024)	(0.022)	(0.027)
Value added in manufact.	0.088	0.083	0.078	0.066
	(0.124)	(0.135)	(0.141)	(0.124)
Regional population	0.702	0.656	0.656	1.006*
	(0.481)	(0.473)	(0.473)	(0.559)
Regional patents	0.014	0.014*	0.014*	0.014
	(0.009)	(0.009)	(0.009)	(0.009)
Year dummies	YES	YES	YES	YES
Constant	6.393	6.617	6.616	16.672
	(4.114)	(4.123)	(4.131)	(4.142)
Observations	750	750	750	750
R-squared	0.184	0.206	0.182	0.208

Notes: This table presents the results of the ordinary least square regression with respect to 3-year performance in terms of growth in total assets. All models are second-stage regression where the first stage is a probit model on the spinoff having survived the first and second year. The instrumental variable in the first stage is the number of spinoffs in Italy over that year, significant in the first stage at the 1% level significant in the first stage at less than 1% level (t-statistic equal to 3.32). Model 1 presents the effect of extrinsic monetary motivation. Model 2 presents the effect of extrinsic reputational motivation. Model 3 presents the effect of intrinsic motivation. Model 4 presents the effect of all three motivations together. Year dummies are included in all models. Standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

average ROA performance. The extrinsic monetary factor is statistically significant whereby an increase in 1 standard deviation leads to a 2% increase in expected ROA performance over the first three years (Model 1) when considered alone and 7% when combined with the other factors (Model 4). These results confirm Hypothesis 1.

Table 8 reports the results of the OLS regression for three-year growth in total assets. The extrinsic reputational factor is statistically significant whereby an increase of 1 standard deviation increases the compound annual growth rate in total assets by around 10% when considered alone (Model 1) and by 13% when combined with the other factors (Model 4). The extrinsic motivation factor is weakly significant ($p < 0.1$). These results confirm Hypothesis 2.

Table 9 reports the results of the complementary log-log regression with the probability of spinoff failure used as the dependent variable. Our general model is described here by equation [5], as in Kalbfleisch and Prentice (2002):

Table 9
Performance - survival.

	(1)	(2)	(3)	(4)
	Survival	Survival	Survival	Survival
Extrinsic monetary	0.051	–	–	0.176
	(0.078)	–	–	(0.294)
Extrinsic reputational	–	0.015	–	0.114
	–	(0.018)	–	(0.109)
Intrinsic	–	–	−0.122*	−0.520**
	–	–	(0.067)	(0.236)
Firm size	−0.230**	−0.228**	−0.228**	−0.217**
	(0.108)	(0.108)	(0.108)	(0.109)
Leverage	−0.013	−0.014	−0.014	−0.018
	(0.067)	(0.067)	(0.067)	(0.066)
University size	−0.572**	−0.473*	−0.475*	−0.466*
	(0.247)	(0.245)	(0.245)	(0.263)
University age	−0.069	−0.071	−0.071	−0.094
	(0.125)	(0.127)	(0.127)	(0.127)
Teaching orientation	0.002	0.001	0.001	0.008
	(0.023)	(0.023)	(0.023)	(0.025)
Research orientation	0.198	0.202	0.204	0.208
	(0.245)	(0.244)	(0.244)	(0.251)
University total budget	−0.040	−0.052	−0.052	−0.076
	(0.089)	(0.091)	(0.093)	(0.080)
TTO Size	0.045	0.045	0.045	0.044
	(0.047)	(0.047)	(0.047)	(0.045)
Regional R&D exp.	0.038	0.048	0.045	0.037
	(0.067)	(0.061)	(0.059)	(0.052)
Regional VC investments	−0.012	−0.012	−0.014	−0.008
	(0.023)	(0.025)	(0.027)	(0.019)
Value added in manufact.	−0.030	−0.032	−0.031	−0.024
	(0.069)	(0.071)	(0.073)	(0.047)
Regional population	−0.058	−0.074	−0.075	−0.142
	(0.124)	(0.126)	(0.128)	(0.161)
Regional patents	−0.000	−0.000	−0.000	−0.000
	(0.003)	(0.003)	(0.003)	(0.003)
Year dummies	YES	YS	YES	YES
Observations	778	778	778	778
Log-likelihood	−496.123	−496.115	−495.928	−495.335

Notes: This table reports the results of the Cox proportional hazard regression. Model 1 presents the effect of extrinsic monetary motivation. Model 2 presents the effect of extrinsic reputational motivation. Model 3 presents the effect of intrinsic motivation. Model 4 presents the effect of all three motivations together. Year dummies are included. Standard errors in parentheses. ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

$$\log\left(-\log\left(1 - \lambda_{ij}\right)\right) = Extrinsic\_Monetary_i\,\beta_1 + Extrinsic\_Reputation_i\,\beta_2 + Intrinsic_i\,\beta_3 + X_i'\zeta + \varepsilon_i \tag{5}$$

In equation (5), λ_{ij} is the discrete-time hazard rate, regressed against the three variables measuring the motivations, namely *Extrinsic Monetary$_i$*, *Extrinsic Reputation$_i$* and *Intrinsic$_i$; and X_i'* comprising all control variables. The table reports Model 1 presenting the effect of extrinsic monetary motivation (when β_2 and β_3 are set to zero), Model 2 presenting the effect of extrinsic reputational motivation (when β_1 and β_3 are set to zero), Model 3 presenting the effect of intrinsic motivation (when β_1 and β_2 are set to zero) and Model 4 presenting the effect of all three motivations. The results show that the intrinsic factor positively affects firm survival, confirming Hypothesis 3.

Regarding the controls, small firms are more likely to grow in size than larger ones. By contrast, small firms are less likely to make a profit and survive, as they may lack the essential resources. Spinoffs from bigger universities are more likely to survive and make a profit given their greater amount of available resources. At the context level, regional patents and population are positively associated with spinoff profit, as they proxy for regional commitment to research and development and local wellbeing, respectively.

Table 10 estimates the moderating effect of multiple organizational

goals on performance. Both team size and diversity are interacted with the extrinsic monetary, extrinsic reputational and intrinsic factors. The moderating effect of team size is negative and statistically significant for profit and growth performance. The potential conflicts arising from large team sizes may hinder academic spinoff performance. By contrast, we find no statistical evidence for team diversity based on member identity (the compresence of academics and non-academics). Hypotheses 4 and 5 are thus partially confirmed, while no statistical evidence is found for Hypothesis 6.

4.1. Robustness checks

Table 11 reports the results of our robustness analyses. Models (1) to (3) test for the robustness of our results in terms of the choice of the dependent variable. In Model (1), we replicate Model (4) in Table 7, replacing average ROA with average ROE. In Model (2), we replicate

Model (4) in Table 8, replacing growth in total assets with reputation, measured by counting the number of national and international press clippings relating to a university and its spinoffs in a single article in the LexisNexis database. In Model (3), we replace our survival analysis provided in Model (4) in Table 9 with a logit model on the likelihood of a spinoff going bankrupt in Model (3).

Models (4) to (6) test the robustness of our factor identification. Through a cluster analysis, we divide our sample into three groups, identifying three clusters based on the same variables used for factor identification, identifying spinoffs with predominant extrinsic monetary, extrinsic reputational, or intrinsic motivations. The results are consistent with our earlier findings.

5. Discussion and conclusions

In this section, we summarize our study's theoretical contributions,

Table 10
Goal diversity.

	(1)	(2)	(3)	(4)	(5)	(6)
	Profit	Profit	Growth	Growth	Survival	Survival
Extrinsic monetary	0.024**	0.026**	–	–	–	–
	(0.011)	(0.012)	–	–	–	–
Extrinsic reputational	–	–	0.181**	0.198**	–	–
	–	–	(0.061)	(0.086)	–	–
Intrinsic	–	–	–	–	−0.141*	−0.179*
	–	–	–	–	(0.064)	(0.090)
Team size	0.010	–	0.020	–	−0.691	–
	(0.074)	–	(0.111)	–	(0.781)	–
Team size × Factor	−0.014**	–	−0.039*	–	0.059	–
	(0.006)	–	(0.022)	–	(0.040)	–
Team diversity	–	0.038	–	0.069	–	0.092
	–	(0.041)	–	(0.044)	–	(0.090)
Team diversity × Factor	–	−0.016	–	−0.032	–	−0.174
	–	(0.016)	–	(0.031)	–	(0.170)
Firm size	0.019*	0.019*	−2.144***	−2.139***	−0.232**	−0.216**
	(0.010)	(0.010)	(0.365)	(0.364)	(0.109)	(0.106)
Leverage	0.001	0.001	0.095	0.089	−0.009	−0.015
	(0.006)	(0.006)	(0.210)	(0.211)	(0.067)	(0.064)
University size	0.022*	0.026*	−0.341	−0.444	−0.485*	−0.460*
	(0.012)	(0.014)	(1.570)	(1.572)	(0.252)	(0.263)
University age	−0.025	−0.029	−0.275	−0.158	−0.056	−0.035
	(0.049)	(0.048)	(0.429)	(0.410)	(0.137)	(0.128)
Teaching orientation	−0.001	−0.001	−0.093	−0.087	−0.002	−0.001
	(0.002)	(0.002)	(0.194)	(0.194)	(0.024)	(0.025)
Research orientation	−0.013	−0.016	0.282	0.249	0.209	0.196
	(0.025)	(0.025)	(0.841)	(0.821)	(0.242)	(0.251)
University total budget	0.032	0.030	0.099	0.095	−0.050	−0.048
	(0.040)	(0.033)	(0.173)	(0.114)	(0.085)	(0.073)
TTO Size	0.001	0.001	0.165	0.149	0.043	0.035
	(0.005)	(0.005)	(0.155)	(0.155)	(0.047)	(0.048)
Regional R&D exp.	−0.016	−0.017	−0.096	−0.098	0.048	0.045
	(0.018)	(0.020)	(0.207)	(0.195)	(0.061)	(0.059)
Regional VC investments	0.007*	0.007*	0.018	0.015	−0.012	−0.014
	(0.004)	(0.004)	(0.024)	(0.022)	(0.025)	(0.027)
Value added in manufact.	0.024	0.022	0.083	0.078	−0.032	−0.031
	(0.036)	(0.035)	(0.135)	(0.141)	(0.071)	(0.073)
Regional population	0.030**	0.030**	0.606	0.637	−0.076	−0.056
	(0.012)	(0.012)	(0.434)	(0.437)	(0.120)	(0.124)
Regional patents	0.001**	0.001**	0.014	0.015*	−0.000	−0.000
	0.030**	0.030**	0.606	0.637	−0.076	−0.056
Year dummies	YES	YES	YES	YES	YES	YES
Constant	0.494	0.650	−5.413	−5.013	–	–
	(0.476)	(0.424)	(4.439)	(4.585)	–	–
Observations	750	750	750	750	778	778
R-squared/(log-likelihood)	0.154	0.153	0.186	0.184	−494.923	−494.612

Notes: This table reports our analysis of the moderating effect of goal diversity proxied by team size and team diversity. Models (1–2) replicate Model (1) in Table 6 where team size and team diversity are respectively interacted with the extrinsic monetary factor. Models (3–4) replicate Model (2) in Table 7 where team size and team diversity are respectively interacted with the extrinsic reputational factor. Models (5–6) replicate Model (3) in Table 8 where team size and team diversity are respectively interacted with the intrinsic factor. Models (1–4) are second-stage regressions where the first stage is a probit model on the spinoff having survived the first and second year. The instrumental variable in the first stage is the number of spinoffs in Italy over that year, significant in the first stage at less than 1% level (t-statistic equal to 3.32). Year dummies are included in all models. Standard errors in parentheses. ***$p < 0.01$, **, $p < 0.05$, *$p < 0.1$.

Table 11
Robustness analysis.

	(1)	(2)	(3)	(4)	(5)	(6)
Extrinsic monetary	0.097**	0.090*	0.199	–	–	–
	(0.046)	(0.048)	(0.316)	–	–	–
Extrinsic reputational	−1.268	0.149***	1.404	–	–	–
	(1.476)	(0.056)	(1.180)	–	–	–
Intrinsic	−0.928	−0.628	−0.638**	–	–	–
	(1.712)	(1.729)	(0.274)	–	–	–
Extrinsic monetary dummy	–	–	–	0.143**	0.154	1.993*
	–	–	–	(0.049)	(0.273)	(1.182)
Extrinsic reputational dummy	–	–	–	−0.164	0.130*	1.081*
	–	–	–	(0.163)	(0.056)	(0.583)
Firm size	6.415***	2.839***	−0.258**	0.020*	−2.177***	−0.228**
	(1.284)	(0.431)	(0.125)	(0.011)	(0.362)	(0.108)
Leverage	−1.169	−0.211	−0.022	0.001	0.100	−0.013
	(0.740)	(0.249)	(0.072)	(0.006)	(0.210)	(0.066)
University size	0.090	2.934	−0.132	0.054*	−0.198	−0.181
	(0.060)	(1.892)	(0.521)	(0.024)	(1.573)	(0.475)
University age	0.041	0.691	−0.098	0.017	−0.216	−0.087
	(0.036)	(0.472)	(0.136)	(0.024)	(0.400)	(0.127)
Teaching orientation	−0.004	0.202	0.014	−0.001	−0.095	0.003
	(0.018)	(0.102)	(0.028)	(0.002)	(0.193)	(0.024)
Research orientation	−0.054	−0.993	0.161	−0.018	0.385	0.171
	(0.121)	(1.003)	(0.266)	(0.025)	(0.839)	(0.244)
University total budget	0.032	0.099	−0.050	0.030	0.095	−0.048
	(0.040)	(0.173)	(0.085)	(0.033)	(0.114)	(0.073)
TTO Size	0.095	0.048	0.053	0.000	0.162	0.051
	(0.182)	(0.152)	(0.051)	(0.005)	(0.155)	(0.047)
Regional R&D exp.	−0.019	−0.105	0.055	−0.020	−0.107	−0.016
	(0.018)	(0.207)	(0.061)	(0.020)	(0.195)	(0.027)
Regional VC investments	0.007*	0.018	−0.012	0.007	0.015	−0.031
	(0.004)	(0.024)	(0.025)	(0.005)	(0.022)	(0.073)
Value added in manufact.	0.024	0.083	−0.032	0.022	0.078	−0.056
	(0.036)	(0.135)	(0.071)	(0.035)	(0.141)	(0.124)
Regional population	2.214	2.296***	−0.179	0.032**	0.658	−0.083
	(1.962)	(0.657)	(0.186)	(0.014)	(0.473)	(0.137)
Regional patents	0.056*	0.025**	−0.000	0.001**	0.016*	−0.000
	(0.032)	(0.011)	(0.003)	(0.000)	(0.009)	(0.003)
Year dummies	YES	YES	YES	YES	YES	YES
Constant	2.074	−9.892	–	0.730	−3.172	–
	(2.096)	(7.987)	–	(0.474)	(3.595)	–
Observations	750	750	778	750	750	778
R-squared/(log-likelihood)	0.155	0.135	−229.638	0.156	0.186	−495.012

Notes: This table reports the results of our robustness analyses. In Models (1) to (3), we test for the robustness of our results with respect to the choice of the dependent variable. In Model (1) we replicate Model (4) in Table 6 replacing average ROA with average ROE. In Model (2) we replicate Model (4) in Table 7 replacing growth in total assets with reputation. In Model (3) we replace our survival analysis as provided in Model (4) in Table 8 with a logit model on the likelihood of a spinoff going bankrupt. In Model (4–6) we test for the robustness of our factor identification. Through a cluster analysis, we divide our sample into three groups, identifying three clusters based on the same variables chosen for factor identification and identifying spinoffs with a dominant extrinsic monetary, extrinsic reputational, or intrinsic motivation. Then, we replicate Models (4) in Tables 6–8 replacing the three factors with two dummy variables for spinoffs characterized by extrinsic monetary and extrinsic reputational motivation, with intrinsic motivation spinoffs as the referent case. Models (1–2) and (4–5) are second-stage regression where the first stage is a probit model on the spinoff having survived the first and second year. The instrumental variable in the first stage is the number of spinoffs in Italy over that year, significant in the first stage at the 1% level of significance (t-statistic equal to 3.32). Year dummies are included in all models. Standard errors in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.

present a framework for future research in academic entrepreneurship, suggest how our findings provide policy implications and, finally, point out limitations and directions for future research.

5.1. Theoretical contributions

This study offers insights into the genesis of academic spinoffs within the university entrepreneurial ecosystem framework. The understanding of the process leading to their creation must consider a broad set of motivations that lead in turn to different organizational goals. Since goals represent the desired outcomes, the evidence that the motivations for creating academic spinoffs diverge may imply differences in the desired outcomes. In turn, this concurs to explain the variance observed in the performance of academic spinoffs (Clarysse et al., 2011; Hmieleski and Ensley, 2005; Mathisen and Rasmussen, 2019). Following this line of thought, our study contributes to the literature on academic entrepreneurship, puzzled by the performance of these companies (Jelfs,

2016; Mathisen and Rasmussen, 2019; Wennberg et al., 2011). The emphasis on a specific outcome, such as creating economic profits, is not necessarily aligned with every firm's goals. The lack of consideration of the specific goals behind the establishment of academic spinoffs has limited the understanding of their functioning and biased the appraisal of their performances. Our study moreover shows how much the process of academic spinoff establishment is embedded in the configuration of the ecosystem in which the entrepreneur is embedded, in terms of human capital, source of funding and contextual characteristics. Motivations, goals and performance are interconnected with industrial partners, public and private sources of funding, entrepreneurial culture and dynamism of the context, at both university and regional levels (Hayter et al., 2018).

In all organizations, goal setting has the vital function of transforming the desired outcomes into organizational policies and actions (Cyert & March 1963). Therefore, goal setting is crucial for predicting organizational outcomes and assessing performance related to goal

achievement (Chua et al., 2018). The literature has emphasized the broad and heterogeneous array of organizational goals (Battilana et al., 2022; Battilana and Dorado, 2010). Non-economic goals have also been discussed in various literature streams, including management (Abootorabi et al., 2023; Kotlar et al., 2018). This study contributes to the literature on organizational goals by developing a more detailed understanding of the factors affecting firms' decisions to pursue specific goals (Abootorabi et al., 2023; Kotlar et al., 2018). Our focus on the different motivations for becoming an entrepreneur, as well as its link with variable performance indicators, addresses an important gap in entrepreneurship research, which often assumes monetary incentives as prime motivators and success indicators. We reveal that motivations are strongly affected by the entrepreneur's environment, including institutional and contextual factors.

5.2. A framework to understand the goal-performance nexus in academic spinoffs

In this paper, we build a framework that adds to the theorization of the academic spinoff company, aiming at understanding academic spinoffs as a special case of firms. We therefore contribute to the "academic spinoff theory of the firm" (Prokop, 2021a). This is an important contribution, as the field starts to finally develop a better understanding of what the academic spinoff is. Hence, we now present the integrated framework for goal-performance nexus in academic spinoffs based on the theoretical implications in the preceding section and illustrated in Fig. 1. Theoretical abstraction from the findings of our study forms the basis of our framework. In Fig. 1, we marked in bold the variables measured in our study. Then, by abstracting from our findings, we identified additional variables that represent promising research directions.

We begin by distinguishing the *motivations to establish academic spinoffs*, between extrinsic and intrinsic. Then, we focus on the conditions that concur to generate such motivations – the *antecedents of*

motivation – and on the other hand, on the translation of such motivations into different *performance* through the achievement of *organizational goals*. Our analysis has shed light on the multi-faceted conceptualization of performance, which is receiving increasing attention in the management debate (Barney, 2020)and proves to be central to the understanding of the specificities of academic entrepreneurship. By underscoring the chain of causality that leads to heterogeneous performance as a function of the achievement of different organizational goals, our findings challenge the existing body of knowledge that attempted to assess firm performance without specifying the goals to be achieved, the contexts within which the goals were to be achieved, and/or did not assess performance in terms of the extent to which the outcomes have achieved the goals.

Still, while our research focused on academic spinoffs as "stand-alone" organizations, a fuller theoretical framework in line with university entrepreneurial ecosystems should factor in the specificity of this type of firm, that challenges the individuals involved (i.e., the academic entrepreneurs) to manage the balance between their academic and commercial *persona* (Hayter et al., 2018; Prokop, 2021b). Their need to ambidextrously respond to both commercial and academic demands might be stronger, for instance, when the parent university has an equity position in the academic spinoff (Bolzani et al., 2021; Feldman et al., 2002). The presence and the level of university *ownership* (shareholding) might indeed complicate the goal-setting of an academic spinoff. Similarly, we should consider that academic entrepreneurs act as entrepreneurs in the spinoff but remain affiliated with their university, whose leaders may be concerned that the involvement of academics in the spinoff might distract them from their scientific endeavors and ultimately undermine the quality of their teaching and research (Czarnitzki et al., 2009). The resources of academic entrepreneurs are indeed limited, and spending energies in commercialization activities might harm their academic productivity (Czarnitzki and Toole, 2010).

On the other hand, there might well be positive spillovers to the university in which the academic spinoff originated (Breschi et al.,
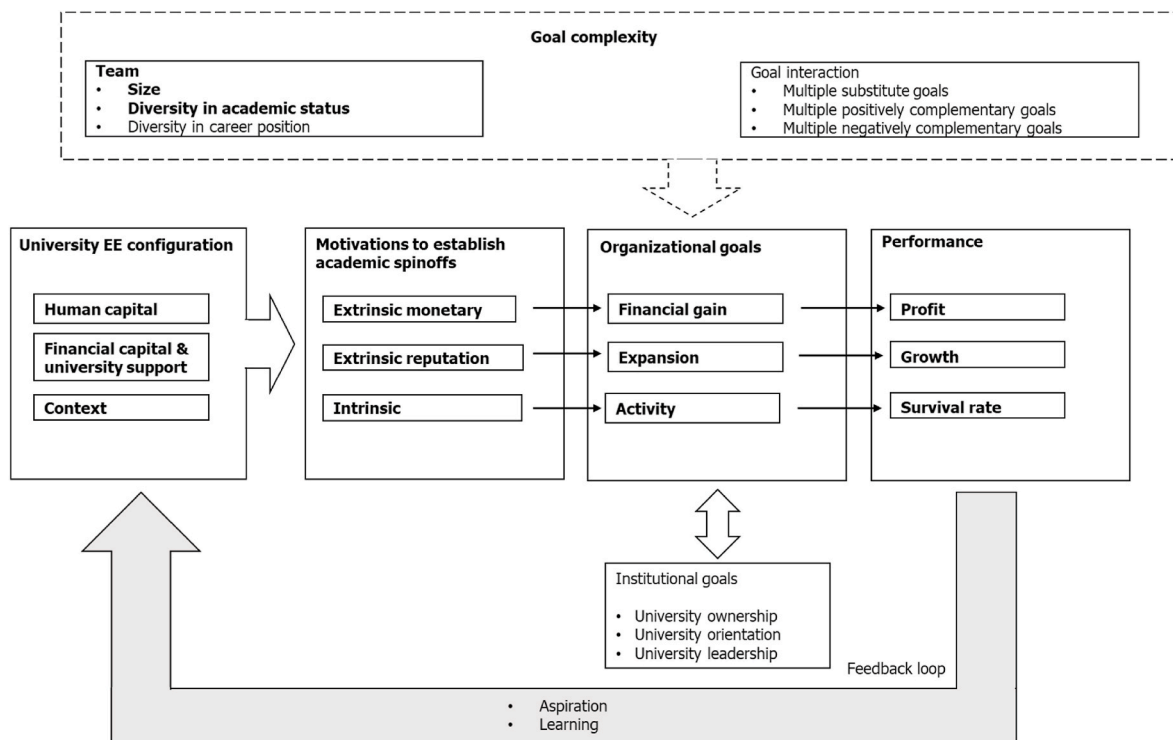

Fig. 1. A framework to understand the heterogeneity of academic spinoffs' performance.
Notes: Non-bold items are outside of the present study's scope and indicate promising aspects for future studies drawing on our framework. The dotted part represents the moderation effect of the goal complexity dimension.

2007). Engagement in entrepreneurial activity can indeed be a means to increase the reputation of the individual scientist but also of their parent university (Pitsakis et al., 2015). Second, the alignment between the organizational goals of the academic spinoff and the institutional goals of the parent university is likely to be affected by the *orientation* of the university (Etzkowitz et al., 2000), intended as the configuration of universities in terms of their resource endowments and scientific base (Mustar et al., 2006). For instance, pursuing forms of academic entrepreneurship aimed at creating high-growth spin-offs based on a faculty's research may be a more appropriate strategy for more research-intensive universities (Siegel and Wright, 2015). Third, the *leadership* and management of a university influence the attitudes of academics toward their work environment (Blackmore and Blackwell, 2006), including their entrepreneurial orientation. Leaders at both the university and the departmental level can define an institutional goal-setting more or less favorable to the involvement in academic entrepreneurship (Civera et al., 2020; Leih and Teece, 2016). University ownership in the spinoff, as well as the characteristics of parent universities in terms of leadership and orientation are three aspects that might influence the configuration of institutional (university) and organizational (spinoff) goals. A fuller theoretical framework should therefore incorporate a micro foundational perspective (Linder and Foss, 2018) and consider how the setting of organizational goals of academic spinoffs relates to the *institutional goals* of the parent university, in that the pursue of the formers might be detrimental due to goal incongruence as well as sustain those of the parent institution. Thus, in our proposed framework we have reported a double arrow between the organizational goals and the institutional goals boxes.

Relevant to the proposed framework is the *goal complexity* in the academic entrepreneurship context (Balven et al., 2018). In our analysis, we focused on team complexity (in terms of team size and team diversity in academic status), which is one aspect of the complexity in goal setting related to the heterogeneity within the team members (Kotlar et al., 2018). Our emerging framework suggests that researchers consider team complexity more broadly than in the current study, encouraging scholars to take into account further elements that characterize team complexity, such as the diversity in career positions between for example tenure and untenured staff (Jain et al., 2009). Young and untenured researchers may be more sensitive to social and contextual dimensions compared to their senior counterparts (Rizzo, 2015), which inevitably affects their individual motivations and goals. Moreover, our framework suggests expanding the goal complexity dimension by considering how different goals interact. Multiple organizational goals may have additive effects, jointly influencing a single outcome (Abootorabi et al., 2023), as well as interactive effects, such that the accomplishment of one goal may lower or increase the saliency of another goal, following hierarchical rules (Shepherd et al., 2021). Accordingly, goals can be distinguished into (i) multiple substitutive goals to which the founding team attaches varying importance; (ii) multiple positive complementary goals which, if achieved, yield a higher utility than the sum of the utilities from achieving the two goals if the goals were merely substitutable; (iii) multiple negative complementary goals or conflicting goals that lead to diminishing the utility gained from achieving a goal when another goal is achieved (Abootorabi et al., 2023; Chua et al., 2018). These aspects concur to explain potential trade-offs emerging in organizational goal setting, as heterogeneous teams have different motivations, and according to the emerging dominant coalition, their dominant motivations and consequent goals vary. Understanding the coalitions within the founding team is beneficial not only for the academic entrepreneurship literature, but also for other research areas such as stakeholder theory, social entrepreneurship and any other area where one or more dominant stakeholders, with different motivations and goals, are encountered.

Finally, the proposed framework suggests including a *feedback loop* that originates from the outcomes of organizational goals (i.e., performance) and dynamically influences their antecedents. The dynamism

intrinsic to organizational goal setting can be explained with behavioral theory, suggesting that organizational goals can change following an adaptive *learning* process. Organizations learn from their experience by collecting performance measures, creating *aspiration* levels based on their own performance or the performance of other organizations, and changing organizational activities if the performance is lower than the aspiration level (Iyer and Miller, 2008). Organizational learning along with the mismatch between actual performance and the founding team's aspiration are two key aspects to understanding the goal-performance nexus both in academic spinoffs and in other firm types.

5.3. Policy implications

Public and governmental interest is granted to academic spinoffs because of their potential for job creation, regional development and more broadly societal development (Shane, 2004). However, their puzzling performance raises criticism (Clarysse et al., 2011; Knockaert et al., 2011; Wennberg et al., 2011). Through the lenses of the goal-performance nexus, our theoretical framework and empirical findings have implications for university managers and policymakers. Policies and institutional mechanisms designed to promote research commercialization often assume that academics respond to financial incentives tied to the successful exploitation of their ideas. However, if academics are motivated by a complex mix of extrinsic and intrinsic rewards, then policy initiatives focusing narrowly on financial rewards might be inadequate or even misleading. Since goals drive behavior and performance, a clearer identification of goal formation will deepen our understanding of the heterogeneity among academic spinoffs. Considering the diverse motivations for establishing academic spinoffs, public policies broadly favoring the establishment of this type of firm are unlikely to foster high-growth venturing. Public interventions to stimulate job creation by engaging academics in entrepreneurship might be ineffective (Meoli et al., 2018), and thus a better understanding of academic spinoff goals should lead to more targeted and supportive policies. Our research cautions against policy makers' widespread simplistic attitude to assessing academic spinoffs' performance based on key performance indicators without considering their heterogeneity. Our emerging theory reveals that academic spinoffs vary in their genesis, organizational goals, institutional goals and goal complexity, and assessing their performance can only be done when considering their heterogeneity and how such aspects concur in shaping heterogeneity of performance.

5.4. Limitations and future research directions

This study is subject to limitations that open further avenues for future research beyond those mentioned in the examination of our integrated framework.

First, our unit of analysis is the firm. This makes the dimension we analyze, namely performance, observable at the firm level. However, organizational goals are derived via individual motivations that translate into individual goals. Different motivational drivers can coexist within a founding team. The number of people involved in the creation of academic spinoffs is typically low (Bjørnåli and Aspelund, 2012), so the room for conflicting goals and dominant coalitions is smaller than in other contexts such as family firms (Chrisman et al., 2016). Nevertheless, how different individual goals merge into an organizational goal system should be investigated beyond the use of two simple measures of team complexity. This would advance our understanding of the extent to which goals are mutually exclusive, multiple substitutive, multiple positive, or negative complementary. Moreover, different motivations can coexist not only within founding teams but also in individuals. As Ryan and Deci (2000) suggest, motivation is hardly a unitary phenomenon, as people do not only have different kinds and amounts of motivation. Individual-level studies might explore how individual goals emerge from the spectrum of individual motivations.

Second, the functioning of the founding team should be the focus of

investigation so that the black box connecting team attributes with organizational outcomes can be opened. While we did not consider the dynamics of founding teams, team functioning can be critical in academic spinoffs, as these ventures face several context-specific challenges that affect how their members interact to commercialize innovations. For instance, the compresence of the scientific and business worlds (Gruber et al., 2013) might create disagreements on the team's vision, strategy and daily operations. Balancing these two opposites can hinder cohesion and create tensions in the team (Nikiforou et al., 2018). Scholars could examine when and how conflict arises from the interaction of academics with different goals. This could be linked to differences in academic status or the interaction between academic and non-academic team members.

Third, we examine goal setting as a static process occurring when academic spinoffs are founded yet the reality is more complex and dynamic. Founding teams should not be viewed as immutable entities (Clarysse and Moray, 2004; Rasmussen et al., 2011; Vanaelst et al., 2006). Spinning out an academic company is a dynamic process that requires time and continuous reconfiguration as the venture moves through different phases of development (Vanaelst et al., 2006; Vohora et al., 2004), where the teams evolve and change (Vanaelst et al., 2006). Consequently, motivations and goals may not remain unaltered over time. For instance, research still needs to determine the best time to acquire non-academic members and examine how new member acquisition affects goal setting. More broadly, research could produce richer insights if explicitly accounting for the temporal dimension (Wright, 2014), clarifying how different levels of analysis (e.g. academic spinoff and the context, or spinoff and parent institution) jointly explain the emergence of specific goals.

Fourth, we measure complex and multi-faceted concepts like entrepreneurial motivations, organizational goals and team complexity by relying on quantitative methods. This introduces a certain level of inaccuracy due to the data available and our choice of measures. Of course, the theorization of such variables introduces levels of complexity which are difficult to tackle with numerical proxies. We acknowledge it as a limitation.

Finally, since our study is focused on Italy, our results may depend on the specificities of the context and hence have limited generalizability. In this respect, the choice of Italy as a reference context is supported by the literature selecting this country as a testbed for academic entrepreneurship research (e.g., Fini et al., 2009, 2011). This is particularly important for our study, since the introduction of a dedicated regulatory framework in the 1990s (Law 297/1999 and Ministerial Decree 593/2000) generated a mechanism that has made the valorization of research performance in terms of spinoffs and other technology transfer activities a criterion for the assessment of Italian academics (Meoli et al., 2018). However, the paucity of academic entrepreneurship research that compares countries (Fini et al., 2017) calls for the exploitation of diversities among regulatory and institutional settings.

CRediT authorship contribution statement

Alice Civera: Conceptualization, Data curation, Writing – original draft, Writing – review & editing, Formal analysis. **Alfredo De Massis:** Conceptualization, Supervision, Writing – review & editing. **Michele Meoli:** Conceptualization, Data curation, Formal analysis, Methodology, Writing – review & editing, Writing – original draft. **Silvio Vismara:** Conceptualization, Data curation, Methodology, Supervision, Writing – review & editing, Writing – original draft.

Data availability

Data will be made available on request.

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