



Early-stage start-up hiring: the interplay between start-ups' initial resources and innovation orientation

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Abstract Start-up firms often operate under high levels of uncertainty and resource constraints, which makes hiring a particularly challenging process. Integrating perspectives from the resource- and competence-based views of the firm and signaling theory, we posit that founders' start-up experience and the initial presence of corporate or university shareholders can mitigate challenges associated with hiring and facilitate the recruitment of employees in the nascent stages of a firm. Moreover, we propose that early-stage hiring will be more likely in start-ups that combine such a strong set of initial competences and resources with a strategic orientation towards innovation. We find support for our hypotheses with a rich dataset of Italian innovative start-ups.

Plain English Summary Hiring is challenging for start-ups and not all manage to hire personnel beyond the founders in nascent stages. We show that the odds of early-stage hiring are higher when innovation-driven start-ups secure certain competences and resources at entry. We build on the resource- and competence-based views of the firm and on signaling theory to explain how certain competences assembled at entry can explain differences in start-ups' early hiring rates. We show that founders with previous entrepreneurial experience and backed by particular shareholders (incumbent firms or universities) are more likely to hire employees in early stages, especially when running innovation-driven startups. These competences and resources, when coupled with an innovation orientation, can make a difference by either expanding the firm's resources to hire or encouraging prospective employees to join in the early stages of the firm. These findings have important implications for research and practice. They uncover the important role of initial resources in increasing a start-up's hiring propensity, unravel the contingent role of the firm innovation strategy, and shed light on a channel (i.e., early-stage hiring) through which founding conditions may affect start-up performance.

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1 Introduction

Most entrepreneurial success stories feature the need to attract the right people at the right time. No doubt Jeff Johnson was crucial for Nike's success as Shel Kaphan was for Amazon's, along with many other "early employees" who helped start-ups thrive. The importance of mobilizing employees in the early stages of a firm is not anecdotal and has been echoed by several studies (e.g., Coad et al., 2017; Honoré & Ganco, 2023; Roach & Sauer mann, 2023). Indeed, a growing research stream shows that early hires can affect the future outcomes of a start-up (e.g., Agarwal et al., 2016; Brymer & Rocha, 2023; Rocha et al., 2018; Siepel et al., 2017). Thus, even if early hiring may not guarantee long-term success, it is often a milestone towards survival and sustained growth (DeSantola & Gulati, 2017; Gjerløv-Juel & Guenther, 2019).

However, start-ups lack resources to search broadly for the best fits (Leung, 2003) and legitimacy in the eyes of many applicants (Chung & Parker, 2023; Moser et al., 2017). As a result, most start-ups face unique challenges in mobilizing their first hires (Coad et al., 2017; Fairlie & Miranda, 2017; Lancker et al., 2022). How new ventures navigate these hiring in early-stages is crucial to understand scaling-up processes and long-term entrepreneurial success. Surprisingly though, the literature has devoted far more attention to the way start-ups attract financial resources (Clough et al., 2019). Filling this void is urgent given how difficult, yet critical, early-stage hiring can be for young and small firms (Cardon & Stevens, 2004) and organizational performance more broadly (Phillips & Gully, 2015).

We address this gap by integrating perspectives from resource- and competence-based views of the firm with signaling theory to explain why some firms hire personnel within the first years of activity, while others may struggle to do so or never hire anyone beyond the founding team (Caliendo et al., 2022; Coad et al., 2017; Fairlie & Miranda, 2017; Howell et al., 2022). Heterogeneities in start-ups' initial bundle of competences may help explain the large variation in their post-entry performance (Colombo & Grilli, 2005, 2010; Colombo et al., 2004; Criaco et al., 2014, 2022; Kato et al., 2015), but the mechanisms underlying these relationships remain largely unexplored. Start-ups' propensity to hire during their

nascent stages may be a critical channel through which performance advantages unfold in the long run (Agarwal et al., 2016; Demir et al., 2017; Rocha et al., 2018). Assembling the necessary human resources is deemed vital for entrepreneurial success, but start-ups suffer from liabilities of newness and smallness (Freeman et al., 1983; Stinchcombe, 1965), limited legitimacy (Moser et al., 2017, van Werven et al., 2015) and resource disadvantages compared to large incumbent firms (Lancker et al., 2022). All these hurdles may prevent start-ups from offering competitive wages or attractive work conditions and affect prospective employees' perceptions about the quality of the jobs available in those firms (Burton et al., 2018; Ouimet & Zarutskie, 2014; Sauer mann, 2018; Sorenson et al., 2021).¹ Several demand- and supply-side constraints are, thus, at the center of start-ups' disadvantages when hiring their first employees (Brymer & Rocha, 2023; Chung & Parker, 2023; Honoré & Ganco, 2023).

We propose that start-ups will be more likely to mobilize personnel already in the early stages of their lifecycle if they combine a distinct set of founding resources. These resources can consist of unique competences that are *internally* available (within the founding team) or gathered *externally* through established organizations, namely incumbent firms or universities participating as initial shareholders. Internally, we focus on founders' entrepreneurial experience, which has been deemed a crucial competence that shapes venture outcomes partly due to experiential learning (Cope, 2011; Delmar & Shane, 2006; Parker, 2013; Toft-Kehler et al., 2014).² Entrepreneurial experience can both facilitate the steps involved in the selection process and provide valuable signals to job seekers when they assess the reliability and security of the job offer. We expect this specific dimension of entrepreneurs' human capital to have a disproportionate effect on early-stage hiring by activating both the supply of and the demand for labor,

¹ However, Roach and Sauer mann (2023) show that a key portion of the labor market, namely skilled employees, are willing to suffer a pay cut to work for high-quality startups, where they enjoy several non-pecuniary benefits.

² A stream of research questions whether entrepreneurs learn mostly from failure or success. We consider both types of experience in our theory as both are deemed important for learning to some extent (e.g., Cope, 2011; Parker, 2013).

holding other sets of founders' experience constant. Externally, we consider the role of resources assembled via corporate investors and university shareholders, which can grant access to a supportive environmental context not necessarily available through other external investments and may, hence, constitute a source of competitive advantage when hiring in the early stages of a venture lifecycle.

Furthermore, we argue that those competences and resources assembled at entry, internally and externally, will be stronger antecedents of early-stage hiring when combined with a strategic orientation towards innovation. More specifically, we contend that start-ups well-equipped with those competences and resources will send stronger quality signals and will be perceived as even more credible and attractive employers when they exhibit a commitment to innovation. This commitment can be conveyed either pre- or post-founding, i.e., through innovation-driven founding motives or significant investments in research and development (R&D) post-founding. Otherwise, in the absence of these indicators, prior start-up experiences and the presence of corporate or university shareholders will have a limited influence in early-stage human resource mobilization.

We test our hypotheses on a representative sample of 1,549 innovative start-ups surveyed in 2016 by the Italian National Institute of Statistics (ISTAT) and the Ministry for Economic Development. Our data provide a detailed snapshot of the entrepreneurial team, including a rich set of variables describing their previous experience and their motivations for starting the current business. Our dataset also comprises valuable information on the different shareholders investing in the start-up at founding, which enables us to uncover important heterogeneities in this regard.

We find broad support for our hypotheses. We show that start-ups with richer bundles of competences and resources – available internally via former entrepreneurial experiences or externally via corporate or university shareholders – are more likely to hire employees in the early years of their activity. However, those competences and resources are significant antecedents of early-stage hiring only when start-ups exhibit a commitment to innovation, reflected by innovation-driven founding motives or considerable R&D investments. Finally, conditional on overcoming early hiring hurdles, start-ups equipped with both sets of internal and external assets

recruit more educated and experienced employees on average, which reiterates the competitive advantage that those start-ups can have when hiring their first employees.

Our theory and findings offer several contributions to the literature. Firstly, we contribute to the understanding of how new-born companies can mitigate their several liabilities and mobilize human resources in nascent stages, an enquiry that remains largely unaddressed despite the relevance of early hiring for long-term start-up outcomes (Brymer & Rocha, 2023; Gjerløv-Juel & Guenther, 2019). Secondly, by adopting a resource- (and competence-) based view of human resource mobilization in entrepreneurial contexts, we identify a set of resources and competences assembled at founding that, under particular circumstances, can activate both the supply and the demand of human capital and facilitate early-stage hiring by start-ups. In doing so, we also add to the timely debate on why some start-up teams are more effective than others in launching and growing a new venture (e.g., Howell et al., 2022; Knight et al., 2020; Lazar et al., 2020; Roach & Sauermann, 2023). Besides, given our finding that different shareholders may contribute differently to attract human capital, we relate to recent discussions on the diverse value provided by external investors (e.g., Bertoni et al., 2013; Huang & Knight, 2017) and open new debates about their role in mobilizing different types of resources to start-up firms. These findings also shed new light on the mechanisms through which initial endowments and founding conditions can have an impact on future performance (Beckman & Burton, 2008; Boeker, 1988, 1989; Cooper et al., 1994; DeSantola & Gulati, 2017; Geroski et al., 2010). Finally, we identify important contingencies in the value of start-up's initial resources and competences. In line with other studies in the strategic management tradition (e.g., see Posch & Garaus, 2020), our findings point to the importance of considering leaders' (in this case founders') innovation orientation as an important boundary condition when we analyze how a firm's initial resources may impact its future outcomes. In fact, our findings show that resources and competences alone have a limited role in start-ups' propensity to hire in early stages, but they can be powerful if combined with an orientation towards innovation. In other words, we challenge the notion that start-ups with greater initial endowments of

resources and competences will always exhibit superior outcomes, by identifying boundary conditions in the context of early-stage hiring.

2 Theoretical background and hypotheses

2.1 Start-up hiring challenges

There are several possible configurations of actors involved at the outset of the entrepreneurial journey that may lead to success. Founders can embrace the unavoidable process of mobilizing resources in different ways, with the help of different actors (Howell et al., 2022). Although early-stage hiring alone might not guarantee long-term success, it provides one of the first indications that a venture is evolving well by expanding its endowments of human capital (i.e., knowledge, skills, and ability). Scholars have established the importance of human capital as a source of competitive advantage for firms (Barney, 1991; Phillips & Gully, 2015; Ployhart et al., 2014) and start-ups are no exception. In this regard, past research documents the importance of founders' human capital (Colombo & Grilli, 2005, 2010; Criaco et al., 2014; Kato et al., 2015), but founders can hardly succeed on their own. Indeed, attracting employees at an early stage shapes a start-up's long-term performance (Agarwal et al., 2016; Gjerløv-Juel & Guenther, 2019; Rocha et al., 2018) and diversity trajectories (Brymer & Rocha, 2023), and failing to recruit and retain employees with the necessary skills and fit with the firm may lead to an organization's demise, regardless of its business strategy (Phillips & Gully, 2015). Hiring can, however, be disproportionately difficult for young and small firms due to various supply and demand side constraints (Cardon & Stevens, 2004; Lancker et al., 2022).

On the supply side, prospective employees often shy away from start-up firms for many reasons. Assessing a start-up's potential is hard because they operate under considerable uncertainty and limited market distinctiveness (Chung & Parker, 2023; Moser et al., 2017; van Werven et al., 2015), and having only short track records by which outsiders can assess the firm's quality exacerbates such information asymmetries. Moreover, small start-ups fail more often than established firms (Deutsch & Ross, 2003; Rao et al., 2008), exposing their employees to

a high risk of job loss with potential damaging effects on income and career progress (Rider & Negro, 2015; Sorenson et al., 2021), often in exchange for fewer benefits than those offered by larger firms (Burton et al., 2018; Haltiwanger et al., 2013) – at least in terms of pay (Roach & Sauer mann, 2023). All these obstacles shrink the pool of applicants potentially interested in working for a start-up firm.

Additional challenges plague the demand side too. Most start-ups lack adequate human resource management (HRM) systems and policies, and therefore recruitment is often designed ad-hoc and conducted directly by the founding team (Cardon & Stevens, 2004). Moreover, especially in very early stages, founders lack experience with the hiring process and resources to conduct a broader labor market search for the ideal matches (Coad et al., 2017; Leung, 2003).

However, we argue that some start-ups will be able to mitigate these obstacles by assembling a bundle of resources and competences that, besides alleviating their disadvantages in initial endowments compared to established firms (i.e., demand-side constraints), can also provide signals of quality, commitment, and legitimacy that reduce information asymmetries among prospective employees (i.e., supply-side constraints). Start-ups that are able to effectively lessen both types of constraints will be more likely to hire personnel within their first years of activity. Thus, we integrate insights from resource- (and competence-) based views of the firm and signaling theory (Connelly et al., 2011; Spence, 1973) to formulate hypotheses on the role of internal competences and external resources in influencing start-ups' early-stage hiring. Figure 1 provides an overview of our theoretical framework and research hypotheses.

2.2 The role of internal and external resources and competences in early-stage hiring

Firms are bundles of resources and competences (Barney, 1991). Firms with distinct initial endowments of such resources and competences can, thus, sustain competitive advantages in selecting, mobilizing, and using tangible and intangible assets to perform tasks in unique ways (Fern et al., 2012; Grant, 1996; Howell et al., 2022). Differences in firms' strategic choices and ultimate performance can therefore originate in

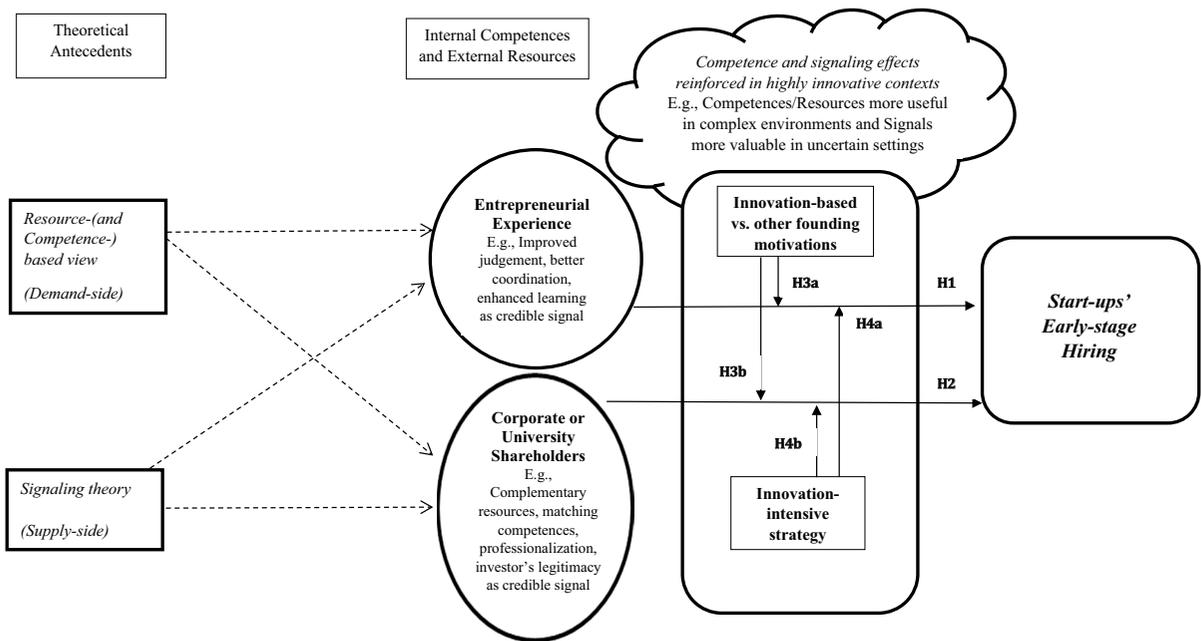


Fig. 1 Theoretical framework and hypotheses

their initial resources and competences (or lack of thereof), given the path-dependency they create in subsequent outcomes (Beckman & Burton, 2008; Boeker, 1988, 1989; DeSantola & Gulati, 2017; Fern et al., 2012; Geroski et al., 2010). We propose that internal competences and external resources assembled at founding will shape a start-up's likelihood to hire their first employees within the first years after founding.

In start-up firms, resources are often embodied in the competences possessed by founders through their distinct sets of experiences and skills (Colombo & Grilli, 2005, 2010; Criaco et al., 2014, 2022; Grilli et al., 2020; Kato et al., 2015). These "internal competences" can create differences in the number of alternatives and market opportunities identified by founders (Gruber et al., 2008, 2012), and impact several outcomes from innovation and internationalization to business survival and growth (Colombo & Grilli, 2005, 2010; Criaco et al., 2014, 2022; Dencker et al., 2009; Kato et al., 2015). Because the genesis of strategy in start-ups is largely shaped by founders' experience (Brymer & Rocha, 2023; Fern et al., 2012), we establish that founders' former entrepreneurial experience can play a major role in early-stage hiring.

Entrepreneurial experience can alleviate some of the common liabilities of new firms

by improving judgement, reducing uncertainty of particular strategies, and facilitating effective decision-making (Cassar, 2014; Colombo & Grilli, 2005; Fern et al., 2012). Mobilizing human resources is one of the decisions where such experience can be applied. Start-up experience can furthermore prepare founders to cope with coordination costs, team integration, and other transaction costs that make recruitment so challenging in new firms where formal human resource management procedures are rarely in place (Klaas et al., 2010). Experienced founders also tend to identify more opportunities and exploit those that are most innovative and have the greatest wealth-creation potential (Ucbasaran et al., 2009), which may require larger teams. In sum, entrepreneurial experience can increase the demand for human resources by boosting both the willingness and the ability to expand the team beyond their founding members. Founders' past experience in entrepreneurship can also activate labor supply. Serial entrepreneurs may have learned from past experience and outperform novice founders (Delmar & Shane, 2006; Toft-Kehler et al., 2014). If so, entrepreneurial experience can provide signals of a firm's quality, commitment, and legitimacy (Bublitz et al.,

2017; Coad et al., 2017; Deutsch & Ross, 2003; Honoré & Ganco, 2023; van Werven et al., 2015), allaying employees' reluctance to join. Thus, we hypothesize:

Hypothesis 1 (H1). Start-ups launched by entrepreneurs with prior entrepreneurial experience will be more likely to hire employees in early stages than start-ups lacking that experience.

Start-ups may also gather unique resources externally. New firms may access valuable assets, tangible and intangible, from external actors in exchange for some equity shares (Knight et al., 2020). For example, VC-backed firms seem to grow faster than other ventures (Bertoni et al., 2011; Colombo & Grilli, 2010) partly due to the financial injections and coaching received from these shareholders. Indeed, equity investors can assist start-ups with business development, strategic advice, corporate governance, and professionalization services, all of which can speed up entry and strengthen their market position (Gompers & Lerner, 2001; Hellmann & Puri, 2000; Hsu, 2004). These milestones can, in turn, provide crucial signals of quality to prospective job candidates, encourage them to join the firm, and even result in higher pay (e.g., Kim, 2018).

Start-ups may benefit an even greater deal from the support of established organizations, both corporate and academic, which sometimes invest in early-stage ventures and have a much longer time horizon for their investments than, for example, venture capitalists. We rely on the notions of “ownership competence” and “timing competence” (Foss et al., 2021) to argue that both corporate and university shareholders may be perceived by external stakeholders (including prospective employees) as having a “superior matching competence” (Foss et al., 2021, p. 315), which can increase a start-up's likelihood of early-stage hiring. The advantage of having their backing may thus stem from their (assumed) knowledge of “what to own” and “when”, given their inventory of *already-in-place* complementary resources that can be made *readily* available to the start-up.

First, both corporate and academic shareholders stand out among the pool of shareholders that start-ups may have at founding because of the rather unique context they provide to early-stage ventures (Fryges & Wright, 2014). Having incumbent firms

as initial shareholders can create multiple synergies via complementary resource bases, knowledge transfer, opportunities for collaboration in many functional areas, and access to a business network able to spur the commercialization of a start-up's products (Clarysse et al., 2014). Likewise, university-backed startups can often exploit intellectual property generated from academic research and benefit from direct access to academics' social capital and knowledge (Rasmussen, 2011; Rasmussen & Wright, 2015; Walter et al., 2016). Second, securing these types of “external resources” in early stages, when the resource base is narrower and uncertainty is higher, provides a governance structure that can boost the resource and knowledge base of a start-up firm and alleviate information asymmetries, both of which can impact the subsequent stages of a start-up's lifecycle (Uhlener et al., 2007). For these reasons, corporate and university shareholders can provide more than the financial and mentoring functions usually served by VCs and business angels (e.g., Bertoni et al., 2011; Colombo & Grilli, 2010).

Hence, start-ups that have either corporate or university among their shareholders enjoy a privileged environmental context that strengthens their resource and knowledge (both tacit and formal) bases, which are likely to increase both the need to hire in early-stages and the ability to do so. For example, start-ups having corporate or university shareholders can often tap the resources available at those affiliations (Dahl & Sorenson, 2014; Walter et al., 2016), including valuable human resources (Agarwal et al., 2016; Rocha et al., 2018), and establish new inter-organizational links that facilitate their integration in the business ecosystem surrounding them (Clarysse et al., 2011, 2014). Having those type of external shareholders can also have a particularly strong signaling value to reluctant stakeholders such as prospective employees, especially in the very early and uncertain stages of the firm. In sum, those shareholders can facilitate human resource mobilization either directly by reducing demand constraints or indirectly by providing quality signals that may alleviate supply constraints. We thus propose:

Hypothesis 2 (H2). Start-ups having corporate or university shareholders at entry will be more likely to hire employees in early stages than start-ups without them.

However, we contend that the role that both internal and external resources and competences play in early-stage hiring will be stronger in start-ups that show a commitment to innovation. In what follows, we theorize how such commitment, conveyed via either pre- or post-founding indicators, constitute important boundary conditions for the relationships postulated above.

2.3 Innovation-based founding motivations

Entrepreneurs are heterogeneous in their motivations to found (e.g., Baptista et al., 2014; Edelman et al., 2010). While some are driven by necessity and the lack of alternatives in the labor market (e.g., Buenstorf, 2009; Rocha et al., 2018), others have the ambition to alter the *status quo* and “change the world” (Dyer et al., 2008). Founding motives often signal diverse capabilities and resource endowments such as social, financial, and human capital (e.g., Block & Sandner, 2009; Buenstorf, 2009), and can therefore affect founders' growth intentions (Edelman et al., 2010), the firm strategy (Block et al., 2015), and the resources necessary to succeed (Baptista et al., 2014). We posit that in innovation-driven start-ups, the importance of internal competences and external resources for early-stage hiring will be exacerbated. “Innovativeness” is one of the many components of a firm's entrepreneurial orientation and can shape the ability to identify new opportunities that create competitive advantages over other firms (Wiklund & Shepherd, 2003, 2005) and a start-up's ultimate wealth-creation potential (Shane, 2000). Having founders driven by innovation-based motives can be an indicator of a start-up commitment to innovation.

Let us first revisit the role of founders' entrepreneurial experience. As conjectured earlier, serial entrepreneurs may be better at managing hiring processes because prior start-up experience can grant them the expertise to juggle multiple pieces of information, market opportunities, alternatives, and solutions (Gruber, 2010; Gruber et al., 2008, 2012; Ucbasaran et al., 2003, 2009). However, entrepreneurial experience *per se* may be a noisy signal as serial entrepreneurs can vary in their optimism (Ucbasaran et al., 2010) and self-evaluation (Eggers & Song, 2015; Yamakawa et al., 2015) depending on their prior performance. We thus

propose that entrepreneurial experience coupled with innovation-based founding motives can provide more credible signals of growth aspirations, persistence, commitment, and potential to learn from possible mistakes. Founders combining entrepreneurial experience with innovation-based drivers may be perceived as more legitimate employers and even attract employees who are more aligned with the innovation orientation of the firm (e.g., Moser et al., 2017). In contrast, it may be more difficult for prospective employees to gauge the risk of joining a firm established by experienced founders, in the absence of any indication of their commitment to innovation.

While intrinsic motivations are not perfectly observable nor necessarily revealed, they cannot be easily faked in the hiring process either. If innovation-based motives are a relevant driver in the establishment of a new firm, these are likely to be conveyed to some extent along the selection process (e.g., via the company website, job posts, interviews), so that job seekers have the possibility to recognize these motivational hints, assess the firm's distinctiveness and legitimacy, as well as their own alignment with the firm's goals and values (e.g., Chung & Parker, 2023; Moser et al., 2017). We thus expect innovation-based founding motivations to shape experienced entrepreneurs' tactics for labor search (e.g., narratives and communication strategies) to elicit more positive perceptions of their venture among potential candidates. More formally:

Hypothesis 3a (H3a). Start-ups launched by entrepreneurs with prior entrepreneurial experience will be more likely to hire employees in early stages than start-ups lacking that experience, especially when entrepreneurs are driven by innovation-based motivations.

Likewise, the value added by corporate and university shareholders to early-stage hiring will be amplified if these founding motivations are in place. Those external investors can endow a start-up with a rich set of resources and competences that accelerate execution, but their commitment and contribution to the venture will vary with the fit between their own and founders' goals (Huang & Knight, 2017). Not all start-ups benefit equally from external investment (Baum & Silverman, 2004; Bertoni et al., 2013, 2019;

Park et al., 2017). For example, research has found that VCs allegedly pick ventures of greater potential (Gompers & Lerner, 2001) and are willing to channel their support to the areas in which entrepreneurs are less competent (Bertoni et al., 2011). We expect the benefits of having corporate or university shareholders to depend on the same alignment between the objective functions of founders and those investors (Wasserman, 2017).

We propose that the bundle of resources and competences acquired through corporate or university shareholders will be more valuable for a start-up's early-stage hiring when entrepreneurs signal their aspiration to succeed with an innovative business. Start-up firms have all the interest in conveying the congruence of their founders' goals with those of their investors. To that end, start-ups often use framing techniques to manage legitimacy judgements (Fisher et al., 2017; Moser et al., 2017). Founding motives can be used as framing tools and, thus, shape the external perceptions of a start-up's strategic orientation. Furthermore, entrepreneurs benefit from establishing trust and cooperative ties with their stakeholders (Freeman, 1984), who will be more likely to exert greater effort when their utility functions are aligned with the firm's (Harrison et al., 2010). Established organizations investing in start-ups may thus maximize their ownership and timing competences (Foss et al., 2021) and create most value when their goals are aligned with those of the entrepreneurial team, which is most likely to be the case when founders are innovation-driven. In these conditions, both corporate and university shareholders may confer greater legitimacy in addition to valuable resources, which may expedite hiring and provide more reliable signals for prospective employees regarding the start-up's potential. On the contrary, misalignments in the objective functions of the start-up and of any of those shareholders may challenge the management and strategic positioning of the firm (Pollack & Bosse, 2014; Wasserman, 2017), preventing the firm from taking strategic decisions such as hiring. Formally:

Hypothesis 3b (H3b). Start-ups having corporate or university shareholders at entry will be more likely to hire employees in early stages than start-ups without them, especially when founded by entrepreneurs with innovation-based motivations.

2.4 Post-founding innovation strategy

Innovation-based ventures are the most likely to recombine existing knowledge into novel, unexploited opportunities, yet doing so is highly risky (Alvarez & Barney, 2002; Shane & Venkataraman, 2000). As the ability to seize first-mover advantages and reap its benefits is directly linked to the pace at which firms strategize and take action, fast decision-making is vital (Baum & Wally, 2003; Baum et al., 2000). Thus, securing the necessary resources and competences is crucial for succeeding in these uncertain contexts (Colombo & Grilli, 2005; Eesley et al., 2014; Lieberman & Montgomery, 1988; Siepel et al., 2017), and human capital is often listed as one of the priorities to build and sustain a competitive advantage (Barringer et al., 2005). Assembling the competences that help start-ups manage this time pressure and hire employees in a timely manner is therefore crucial in innovation-intensive settings.

From a labor supply perspective, we concede that the signaling value of internal competences may vary with the type of opportunities exploited. Job seekers may feel more encouraged to join experienced entrepreneurs (Honoré & Ganco, 2023), especially when these can convey other credible signals for the start-up's strategic orientation (Roach & Sauermann, 2023), such as considerable investments in innovation activities. Technology-based opportunities typically require a greater urgency for combination, integration, and orchestration of complementary knowledge (Colombo & Grilli, 2010; Dencker & Gruber, 2015). Thus, innovative start-ups displaying richer internal competences may be perceived as more serious employers, the more they invest in research and development (R&D) activities, given the importance of knowledge-based resources in those settings.

The innovation intensity of the firm is likely to shape its demand for labor too. Founders have distinct search behaviors and social networks (Dyer et al., 2008) and these differences can be amplified as they accumulate start-up experience (Ucbasaran et al., 2003). Prior start-ups can be a source of domain-specific experience that increases familiarity with the kinds of strategic choices that confront new ventures and accelerates decision-making (Forbes, 2005), including hiring in the early stages of the firm. This domain-specific experience is likely to become more relevant, the more complex and uncertain the context

in which the newly-founded firm operates; and in this respect, highly knowledge-intensive contexts are exactly those settings in which timely and fast decision making is deemed most crucial (Eisenhardt, 1989). Hence, we posit that the role of founders' entrepreneurial experience in hiring employees within the first years after founding is particularly strong in more innovation-intensive start-ups. Accordingly, we hypothesize that:

Hypothesis 4a (H4a). Start-ups launched by entrepreneurs with prior entrepreneurial experience will be more likely to hire employees in early stages than start-ups lacking that experience, especially when entrepreneurs are pursuing an innovation-intensive strategy.

Similarly, established firms and research-based organizations are among the most crucial innovation partners in the business and knowledge ecosystems supporting innovative firms (Autio et al., 2014; Clarysse et al., 2014), so the competences and resources made available by corporate and university shareholders will have a stronger value for early hiring within start-ups that are highly innovative. First, job seekers may be more attracted to a start-up backed by established organizations when the opportunity pursued requires an innovation-intensive business strategy. The involvement of those shareholders can convey a stronger signal of quality to future employees because these signals are more valuable in contexts of higher uncertainty (Connelly et al., 2011). Second, it is legitimate to assert that both corporate and university shareholders can be more complementary to innovation-based ventures, given what we know from venture capital research (Bertoni et al., 2011; Colombo & Grilli, 2010; Hellmann & Puri, 2000). Besides providing stronger signals to the labor market, the investment from either type of organization in the most innovative start-ups can indicate unique matching and timing competences (Foss et al., 2021), given the greater fit between the privileged environment those shareholders provide and the resource demands of highly innovative start-ups. In addition, corporate and university shareholders can be important levers of network capabilities, and even more so for innovative start-ups (Rasmussen, 2011; Rasmussen & Wright, 2015; Stuart & Sorenson, 2003; Walter

et al., 2016). The involvement of corporate or university shareholders in innovative start-ups can thus reduce the demand and supply constraints that would otherwise prevent those ventures from hiring in early stages. We therefore predict higher rates of early-stage hiring for those start-ups:

Hypothesis 4b (H4b). Start-ups having corporate or university shareholders at entry will be more likely to hire employees in early stages than start-ups without them, especially when pursuing an innovation-intensive strategy.

3 Data and methods

3.1 Data and sample

Testing our theory requires detailed data on start-ups' initial characteristics, including founders' human capital and motivations, shareholding structure, innovation intensity, and early hiring. This level of detail is rarely available in existing datasets, even in the richest longitudinal employer-employee databases administered by official statistical offices in several countries. Surveys offer a promising alternative by allowing to collect data from well-defined samples of comparable firms in multiple industries, while ensuring high levels of validity and specificity, even in complex and multifaceted contexts such as start-up firms (e.g., Eesley et al., 2014; Lyon et al., 2000; Roach & Sauer mann, 2023; Sauer mann, 2018).

We follow this alternative and use survey data collected in Italy to test our hypotheses. We leverage a survey conducted by ISTAT and the Ministry for Economic Development in April and May 2016. The data were collected within the project "Monitoring and Evaluation of National Policies for the Ecosystem of Italian Innovative Start-ups" with the primary goal of assessing the "Italian Start-up Act", a law introduced by the Italian government to stimulate innovative entrepreneurship (for evaluation studies of this policy see, for example, Biancalani et al., 2022; Grilli et al., 2023). The target firms were "Young Innovative Companies" (YICs), formally defined as limited companies (including cooperatives), less than five-years old, with a maximum of 5 million Euros in annual turnover and not listed in the stock market. These firms could not be the result of an M&A

or a divestiture of an existing company, nor distribute dividends. Moreover, the target start-ups have to fulfil at least one of the following three requirements to be considered innovative: (i) the start-up (or its founders) should be in possession of tangible intellectual property rights, such as a patent or a license; (ii) the total expenditure in R&D should account for at least 15% of total revenues (or operating costs if they exceed the revenues); (iii) at least one third of the total workforce (which could also include founders if they are formally employed in the start-up) must hold a PhD, or at least two thirds must have a master's degree. This sample is, therefore, suitable for testing our theory by covering a representative sample of start-up firms potentially oriented to innovation activities but certainly at different intensities.

The survey comprises rich data on various dimensions relevant to our study. In its first part, the survey reports details about each founding member (e.g., experience, founding motivations, demographics, education). It also lists any employees in the firm by the end of 2015. Founding members are defined as initial individual shareholders with an active role in the firm, while employees correspond to wage earners with a job contract in the firm, who are not shareholders.³ The second part includes questions about investors and other organizations as shareholders, while a third section gathers data on the innovation activities of the firm.

The survey was sent via email to all Italian YICs, which comprised 5,150 start-ups as of December 31st, 2015. The response rate was 44 percent. We restrict our sample to the nascent stages (the first three years of activity) of start-ups with complete information about the variables of interest. Our final sample has 1,549 start-ups with no missing information and Chi-square tests do not detect any significant difference between our sample and the full population of Italian YICs as regards their distribution across locations, industries, and legal forms (Appendix A.1 to A.3).

³ Most start-ups (85%) in our sample had not experienced any addition of owner-managers to the founding team by the time of the survey. Human capital variables were computed based on the data on all owner-managers at the time of the survey. We use the labels “founding team” (or “founder”) and “entrepreneurial team” (or “entrepreneur”) interchangeably in the paper.

3.2 Variables and methods

3.2.1 *Dependent variable*

Our dependent variable (*Early-Stage Hiring*) is a dummy variable equal to one if the start-up employs any employees (who are not owner-managers) at the time of the survey, zero otherwise. Nearly 62% of the firms in our sample hired at least one employee within three years after entry.⁴

3.2.2 *Independent variables*

We measure two types of competences that, per our Hypotheses 1 and 2, can ease a start-up's mobilization of human resources in its early stages. Start-ups will exhibit greater *internal competences* if at least one of their founders has prior entrepreneurial experience from previous start-ups (*Entrepreneurial Experience_FT*). This is the case for nearly 31% of the start-ups in our final sample. Start-ups can also gain access to relevant resources through the presence of *Corporate or University Shareholders at Entry*; this is the case for 48% of the sample: 46% of the start-ups have *Corporate Shareholders at Entry* and 3.6% have *University Shareholders at Entry*. We control for the presence of other specific typologies of shareholders (e.g., VCs, business angels, banks, and/or family members) in all estimations (see Table 1).

We also operationalize two circumstances under which those competences and resources are expected to play a stronger role in early-stage hiring. The first refers to founders' innovation-based motives, a *pre-founding* indicator of a start-up's innovation orientation. The respondents were asked about their motivations for founding the firm (multiple answers were possible), which included the aspiration for a highly profitable business, the idea for a novel product or service, the desire to work independently, the ambition to apply academic research, the intention to

⁴ The patterns we find in our data are in line with those found in similar datasets such as the Kauffman Firm Survey, where 60% of the represented US start-ups have hired at least one employee. Conditional on hiring, start-ups have three employees on average. Within the subsample of hiring firms, employment size remains small at different percentiles (e.g., the 50th, 75th and 95th percentiles are, respectively, two, four, and 12 employees).

Table 1 List of variables and descriptive statistics

Variables	Description	Mean	SD	Min	Max
Early-Stage Hiring	Dummy = 1 if the start-up reports at least one employee beyond the founding team by the time of the survey, 0 otherwise	0.619	0.486	0.000	1.000
Entrepreneurial Experience_FT	Dummy = 1 if at least one founding member has founded another company in the past, 0 otherwise	0.309	0.462	0.000	1.000
Corporate or University Shareholders at Entry	Dummy = 1 for start-ups that had one or more firms and/or universities in the list of shareholders at entry, 0 otherwise	0.480	0.500	0.000	1.000
• Corporate Shareholders at Entry	Dummy = 1 if the start-up had any other firm as shareholder at entry, 0 otherwise	0.463	0.499	0.000	1.000
• University Shareholders at Entry	Dummy = 1 if the start-up had any university or research center as shareholders at entry, 0 otherwise	0.035	0.184	0.000	1.000
Innovation Motivation_FT	Dummy = 1 if the majority of founding members (50% or more) has reported aspirations of high profits <i>and</i> of pursuing the idea for an innovative product/service as motivations to start the business, with no founder reporting necessity motives (need for an occupation), 0 otherwise	0.469	0.499	0.000	1.000
High R&D Intensity	Dummy = 1 if the investment in R&D (in % of total expenses) is above the sample median, 0 otherwise	0.546	0.498	0.000	1.000
Other Equity Investors at Entry	Dummy = 1 if the start-up had any equity investors (VC, business angels, or banks) as shareholders at entry, 0 otherwise	0.057	0.234	0.000	1.000
Family Shareholders at Entry	Dummy = 1 if the start-up had any family members shareholders at entry, 0 otherwise	0.117	0.321	0.000	1.000
PhD Education_FT	Dummy = 1 if at least one founding member has a PhD degree, 0 otherwise	0.191	0.393	0.000	1.000
Managerial Experience_FT	Dummy = 1 if at least one founding member had a management job in the past, 0 otherwise	0.423	0.494	0.000	1.000
Work Experience Abroad_FT	Dummy = 1 if at least one founding member had worked abroad before, 0 otherwise	0.465	0.499	0.000	1.000
Female Presence_FT	Dummy = 1 if there is at least one female founding member, 0 otherwise	0.301	0.459	0.000	1.000
Number of FT Members	Number of active shareholders in the start-up by the time of the survey	2.261	1.421	1.000	10.000
Firm Age	Number of years elapsed since start-up entry, by the time of the survey	1.651	0.809	0.000	3.000

$N = 1,549$. In addition to the variables listed above, we also include indicator variables for the start-up industry. Most firms (70.6%) operate in knowledge-intensive services or manufacturing industries (18.5% of the sample). A smaller number of firms (2.2% of the sample) operate in energy or construction sectors. The remaining firms (8.7%) are distributed across services industries of relatively lower knowledge intensity. All estimations control for the industry of the firm

benefit from any fiscal or public monetary incentives, the need to find an occupation, or other reasons. To test Hypotheses 3a and 3b, we compute the variable *Innovation Motivation_FT*, which is equal to one if most (50% or more) founding members were driven

by the idea for a novel product/service *and* the aspiration to establish a profitable business, *and none* mentioned the need to find an occupation as the reason to found the firm. The reason for considering both the idea for a novel product or service *and* the aspiration

to establish a profitable business is the assumption that these motives are, to some extent, complementary, if a start-up attempts to *credibly* launch a new product or service with a high degree of novelty to the market. For example, founders who wish to pursue novel ideas that are truly attractive to the market must also design and follow a business plan to guarantee a successful go-to-market strategy.⁵ With this measure, we also aim to identify founding teams that are, overall, innovation- and success-driven and do not have conflicting motivations (e.g., they primarily launch a firm because they lack a job).

The second factor refers to the innovation intensity of the business, a *post-founding* indicator of a start-up's commitment to innovation. To test Hypotheses 4a and 4b, we use the variable *High R&D Intensity*, which is equal to one if the start-up's R&D investments (relative to total expenditures) exceeds the sample median (i.e., 30%).⁶

3.2.3 Control variables

Previous literature shows that the competences available within a founding team can be captured by several human capital dimensions beyond entrepreneurial experience (e.g., Baptista et al., 2014; Colombo

& Grilli, 2005, 2010; Colombo et al., 2004; Criaco et al., 2014; Kato et al., 2015). We distinguish highly educated founding teams from others based on the variable *PhD Education_FT*, which is equal to one if at least one of the founders has a PhD degree, and zero otherwise. We also account for founders' experience in management jobs (*Managerial Experience_FT*) and work experience abroad (*Work Experience Abroad_FT*), as both might shape their ability to attract employees in early stages. Since founding teams might behave differently than solo entrepreneurs (Eisenhardt & Schoonhoven, 1990), we control for the total number of individual shareholders with an active role in the start-up at the time of the survey (*Number of FT Members*). Finally, we account for the presence of women in the founding team (*Female Presence_FT*), the presence of *Family Shareholders* and *Other Equity Investors* at founding, *Firm Age*, and firm industry (dummy variables distinguishing between knowledge-intensive services, energy and construction, manufacturing, less knowledge-intensive services, and other (miscellaneous) service industries). Table 1 provides the definition and some statistics for all the variables described. A matrix of pairwise correlations can be found in Table 2.⁷

3.2.4 Methods

Given the binary nature of our dependent variable, we use Probit models with robust standard errors to estimate the relationship between our key variables of interest and a start-up's propensity to hire employees in early stages. All analyses are performed at the firm level. We start by estimating a baseline model for all start-ups in our sample, where we test the validity of

⁵ Indeed, our data show that founders motivated by an idea for a new product or service often co-exist with founders motivated by profits. Teams of founders motivated by only one of these aspects are rather rare, suggesting that some founding motivations may be complementary. While it is outside the scope of this paper to go deeper into these possible complementarities, we conduct robustness checks with different measures for founding motivations. For example, recoding this variable and making it equal to 1 if *all* (or *at least one of the*) founding members reported to be driven by a novel idea *and* aspire to a highly profitable business, and 0 otherwise, does not significantly change the results. Second, recoding this variable to include founders motivated to "apply academic research" did not change the results either. Finally, we have extended our baseline model to account for other founding motivations (i.e., autonomy motives, fiscal or public monetary incentives, the ambition to commercialize academic research, or the need for an occupation). Adding these variables did not add enough explanatory power to our model and did not change the key coefficients of interest. We return to these tests in Section 4.2 and report the results in Appendix Tables A.4 and A.7.

⁶ In robustness checks, we have recoded this variable and made it equal to 1 if the R&D investments of the firm were above the sample mean (36.2%), 0 otherwise, but the results were virtually the same.

⁷ It is worthwhile to note that the correlation between *Innovation Motivation_FT* and *High R&D Intensity* is positive but moderately low. A closer look into our data revealed that R&D investments are more frequent and intensive as the firm gets older – within our sample, 69% report some investments in R&D in their first year of activity, and this share increases to 84% by their third year. The intensity of these investments seems to increase with firm age too – firms surveyed in their first year of activity report that 34% of their expenditures are, on average, channelled to R&D activities, whereas firms already active for three years report R&D investment shares of 42%. In line with this, we also observe larger positive correlations between innovation motivations and R&D investments as the firm matures. Our focus on very early-stage firms may partly justify the low correlation between these two variables.

Table 2 Correlation matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Early-Stage Hiring	1.000											
(2) Entrepreneurial Experience_FT	0.053*	1.000										
(3) Corporate or University Shareholders	0.056*	0.040	1.000									
(4) Innovation Motivation_FT	0.050*	-0.011	-0.007	1.000								
(5) High R&D Intensity	0.082*	0.001	0.012	0.037	1.000							
(6) Other Equity Investors at Entry	0.051*	0.069*	-0.009	0.035	0.058*	1.000						
(7) Family Shareholders at Entry	0.029	-0.009	-0.267*	0.065*	0.005	-0.004	1.000					
(8) PhD Education_FT	0.030	0.119*	0.036	-0.049	0.048	-0.014	-0.090*	1.000				
(9) Managerial Experience_FT	0.045	-0.186*	0.056*	0.037	0.000	-0.026	-0.011	0.035	1.000			
(10) Work Experience Abroad_FT	0.076*	0.067*	-0.031	0.043	0.069*	0.064*	0.043	0.086*	0.057*	1.000		
(11) Female Presence_FT	-0.010	0.055*	0.021	-0.058*	-0.054*	-0.065*	0.051*	0.132*	0.047	0.037	1.000	
(12) Number of FT Members	0.032	0.234*	0.078*	-0.053*	-0.007	0.009	-0.053*	0.260*	0.176*	0.117*	0.297*	1.000
(13) Firm Age	0.162*	0.003	-0.067*	-0.043	0.065*	0.031	-0.012	0.139*	0.027	-0.001	-0.035	0.011

* $p < 0.05$. $N = 1,549$

Table 3 Baseline models for early-stage hiring (Probit models)

	(1)	(2)
Entrepreneurial Experience_FT	0.156 ** (0.076)	0.154 ** (0.076)
Corporate or University Shareholders at Entry	0.199 *** (0.069)	
Corporate Shareholders at Entry		0.190 *** (0.069)
University Shareholders at Entry		0.169 (0.190)
Innovation Motivation_FT	0.126 * (0.067)	0.128 * (0.067)
High R&D Intensity	0.162 ** (0.066)	0.164 ** (0.066)
Other Equity Investors	0.214 (0.149)	0.216 (0.149)
Family Shareholders	0.170 (0.111)	0.167 (0.111)
PhD Education_FT	0.001 (0.090)	-0.009 (0.093)
Managerial Experience_FT	0.116 (0.071)	0.116 (0.071)
Work Experience Abroad_FT	0.160 ** (0.068)	0.161 ** (0.068)
Female Presence_FT	-0.023 (0.076)	-0.023 (0.076)
Number of FT Members	0.006 (0.027)	0.005 (0.027)
Firm Age	0.272 *** (0.043)	0.272 *** (0.043)
Log Pseudolikelihood	-986.35	-986.32
Wald χ^2	79.66	80.37
Pseudo R2	0.042	0.042

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. $N = 1,549$. Robust standard errors in parentheses. Controls for each firm's industry included

Hypotheses 1 and 2. We then repeat this analysis for sub-samples of start-ups based on founding motivations and innovation intensity to test the validity of our remaining hypotheses.

4 Results

Table 3 reports the results from baseline Probit models predicting the probability of hiring employees within three years after founding. Model (1) confirms that both internal competences and external resources assembled at entry are positively associated

with early-stage hiring. The average marginal effects of *Entrepreneurial Experience_FT* and *Corporate or University Shareholders at Entry* are, respectively, 0.057 and 0.073, which represent a 9.2% and 11.7% increase in the observed probability of early-stage hiring (which is equal to 0.619, as reported in Table 1). Thus, we find strong support for our Hypotheses 1 and 2. Model (2) differentiates between corporate and university shareholders and shows that early investments by incumbent firms (i.e., Corporate Venture Capital) are the type of external resources that most strongly predict early-stage hiring. The participation of universities as shareholders does not seem to significantly change the probability of early-stage hiring for the average start-up in the sample, though we should recognize that these are much rarer than corporate shareholders in our data (cf. Table 1). The presence of other investors (VCs, business angels, banks or family members – among our control variables) is not significantly associated with early-stage hiring either.⁸ Overall, we conclude that having corporate shareholders plays a distinct role in infusing new ventures with competences and resources necessary for hiring employees in the early stages of the venture.

Innovation-based founding motives and high R&D intensity are both positively related to a start-up's

propensity to hire within three years after entry. As regards the remaining control variables, start-ups are more likely to hire as they mature and when at least one of the founders has accumulated work experience abroad. Other dimensions of founders' human capital (namely management experience and PhD education) are not significant predictors of early-stage hiring. These analyses confirm that not all human capital dimensions are equally important when it comes to screening, recruiting, and managing human resources. In line with our theory, entrepreneurial experience endows founding teams with specific competences that can be effectively deployed when mobilizing new members to the firm, and these competences are distinct from those eventually accumulated in other managerial roles or formal education and training.

4.1 The heterogeneous role of start-ups' resources and competences in early-stage hiring

Table 4 reports Probit models predicting the likelihood of early-stage hiring in sub-samples of start-ups with and without pre-founding orientation towards innovation, based on their founders' aspirations for a profitable and innovative business. We report models separately for start-ups that have the majority of their founders driven by innovation and profit motivations (and no founder driven by conflicting, i.e., necessity, motives related to the lack of employment), and those with founding teams driven by other motives. In innovation-driven start-ups, we confirm the positive and statistically significant association between internal competences stemming from founders' entrepreneurial experience and the likelihood of early-stage hiring (Models 1 and 3). As anticipated in H3a, in innovation-driven start-ups, the role of entrepreneurial experience is amplified compared to the baseline (theorized in H1). More precisely, the average marginal effect of *Entrepreneurial Experience_FT* is 0.125 in this sub-sample, which implies a 20% increase in the average probability of hiring observed in our data (i.e., twice as large as the effect estimated in Table 3). Interestingly, we find no significant correlation between *Entrepreneurial Experience_FT* and *Early-Stage Hiring* in the subset of start-ups founded by other aspirations than innovation and profits. This suggests that in the absence of these potential signals of commitment and quality, internal competences

⁸ Professional equity investors are often perceived as key players in the financial support network (Clarysse et al., 2014), able to "professionalize" new ventures (Hellmann & Puri, 2000) and shape their organizational design (DeSantola & Gulati, 2017). While our findings suggest that innovative start-ups might derive greater benefits from other types of shareholders when it comes to hiring the first employees, this does not imply that equity investors have no role, direct or indirect, in human resource mobilization. VCs and business angels might still be influential in steps other than early hiring such as business model design, or their influence in hiring processes might be more visible in the long run. Indeed, research shows that VC investments spur the employment growth of high-tech start-ups (e.g., Bertoni et al., 2011; Colombo & Grilli, 2010). We also note that our analysis focuses on equity investors who are involved at entry, while some studies include investors who join at later stages. The attributes of grand-standing and impatience that often characterize equity investors (Gompers, 1996; Gompers & Lerner, 2004; Mazzucato, 2018) may vary depending on when they invest, and if so, seed and pre-seed investments are probably a category on their own for financial operators (e.g., Klingler-Vidra, 2016) and may respond to a different, more patient, logic. Future research could enlighten us in this regard.

Table 4 Early-stage hiring depending on founding motives (split samples; Probit models)

	(1) Innovation-based motives		(2) Other founding motives		(3) Innovation-based motives		(4) Other founding motives	
Entrepreneurial Experience_FT	0.362	***	0.005		0.357	***	0.002	
	(0.114)		(0.104)		(0.114)		(0.104)	
Corporate or University Shareholders at Entry	0.227	**	0.190	**				
	(0.105)		(0.093)					
Corporate Shareholders at Entry					0.264	**	0.136	
					(0.105)		(0.093)	
University Shareholders at Entry					-0.208		0.347	
					(0.348)		(0.229)	
High R&D Intensity	0.179	*	0.160	*	0.170	*	0.166	*
	(0.099)		(0.091)		(0.099)		(0.091)	
Other Equity Investors	0.116		0.268		0.109		0.274	
	(0.214)		(0.212)		(0.215)		(0.212)	
Family Shareholders	0.209		0.010		0.219		0.082	
	(0.155)		(0.162)		(0.155)		(0.162)	
PhD Education_FT	0.111		-0.072		0.133		-0.118	
	(0.137)		(0.121)		(0.139)		(0.127)	
Managerial Experience_FT	0.205	*	0.045		0.201	*	0.046	
	(0.104)		(0.097)		(0.104)		(0.097)	
Work Experience Abroad_FT	0.062		0.245	***	0.059		0.242	**
	(0.099)		(0.093)		(0.100)		(0.093)	
Female Presence_FT	-0.043		-0.008		-0.036		-0.015	
	(0.114)		(0.103)		(0.114)		(0.103)	
Number of FT Members	-0.063		0.045		-0.060		0.043	
	(0.044)		(0.034)		(0.044)		(0.035)	
Firm Age	0.310	***	0.252	***	0.318	***	0.252	***
	(0.066)		(0.058)		(0.066)		(0.060)	
Number of Observations	727		822		727		822	
Wald χ^2	47.26		46.64		48.73		47.83	
Log Pseudolikelihood	-447.2		-530.6		-446.1		-530.5	
Pseudo R2	0.054		0.043		0.057		0.043	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors in parentheses. Controls for each firm's industry included

revealed by founders' start-up experience may not be sufficient to endow founders with early employment growth aspirations or to encourage potential employees to join.

Hypothesis 3b anticipated a stronger association between the presence of corporate or university shareholders at founding and the odds of hiring in early stages when founders are driven by innovation-based motives. Although we do not find immediate support for this hypothesis in Models 1 and 2, we delve deeper into the possibly distinct value of corporate and

university shareholders in Models 3 and 4. We find that start-ups backed by corporate investors at entry are more likely to hire in early stages, but this association is only significant in innovation-driven start-ups. The presence of university shareholders is not a significant predictor of early-stage hiring in any of the sub-samples. This offers only tentative partial support for H3b.

Next, we test how internal competences and external resources predict early-stage hiring depending on a start-up's innovation strategy post-founding, measured by its investments in R&D. Table 5

Table 5 Early-stage hiring depending on firm R&D intensity (split samples; Probit models)

	(1) R&D Intensity above median		(2) R&D Intensity below median		(3) R&D Intensity above median		(4) R&D Intensity below median	
Entrepreneurial Experience_FT	0.328	***	-0.043		0.322	***	-0.044	
	(0.106)		(0.112)		(0.106)		(0.112)	
Corporate or University Shareholders at Entry	0.209	**	0.185	*				
	(0.095)		(0.102)					
Corporate Shareholders at Entry					0.165	*	0.214	**
					(0.096)		(0.102)	
University Shareholders at Entry					0.785	**	-0.234	
					(0.361)		(0.254)	
Innovation Motivation_FT	0.137		0.108		0.151		0.109	
	(0.091)		(0.098)		(0.092)		(0.099)	
Other Equity Investors	0.088		0.447	*	0.103		0.439	*
	(0.184)		(0.252)		(0.183)		(0.252)	
Family Shareholders	0.137		0.204		0.119		0.208	
	(0.149)		(0.167)		(0.149)		(0.167)	
PhD Education_FT	-0.010		0.011		-0.060		0.066	
	(0.122)		(0.134)		(0.123)		(0.142)	
Managerial Experience_FT	0.062		0.175	*	0.054		0.170	
	(0.097)		(0.105)		(0.097)		(0.105)	
Work Experience Abroad_FT	0.161	*	0.163		0.163	*	0.162	
	(0.093)		(0.100)		(0.093)		(0.100)	
Female Presence_FT	-0.024		-0.026		-0.045		-0.019	
	(0.107)		(0.111)		(0.107)		(0.111)	
Number of FT Members	-0.001		0.016		-0.008		0.020	
	(0.037)		(0.039)		(0.038)		(0.039)	
Firm Age	0.268	***	0.286	***	0.262	***	0.291	***
	(0.058)		(0.065)		(0.058)		(0.065)	
Number of Observations	845		704		845		704	
Wald χ^2	45.61		42.45		47.96		44.17	
Log Pseudolikelihood	-520.05		-458.07		-517.98		-457.20	
Pseudo R2	0.044		0.046		0.048		0.047	

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Robust standard errors in parentheses. Controls for each firm's industry included

reports results for start-ups with R&D investments below and above the sample median. As anticipated in H4a, founding teams with prior start-up experience are more likely to hire in early stages than novice entrepreneurs, especially when the firm demonstrates a relatively high R&D intensity (Models 1 and 2). Under these circumstances, start-ups with at least one serial founder have an 18% higher chance of hiring employees within their first years of activity compared to founding teams lacking this experience. However, similar to what we found in Table 4,

those competences alone are not enough to mobilize employees if not combined with a tangible commitment to innovation. Thus, we confirm Hypothesis 4a.

Regarding external resources assembled through corporate or university shareholders, there is only partial evidence suggesting that they play a more significant role in human resource mobilization when the start-up pursues an innovation-intensive strategy, as predicted in H4b. We find interesting nuances when distinguishing between these two types of shareholders in Models 3 and 4. The presence of corporate

Table 6 Early-stage hiring and interaction effects between start-up competences and firm's innovation orientation (Probit models)

	(1)	(2)	(3)	(4)
Entrepreneurial Experience_FT	0.040 (0.101)	-0.040 (0.108)	0.152 ** (0.076)	0.151 ** (0.076)
Corporate Shareholders at Entry	0.191 *** (0.069)	0.190 *** (0.069)	0.147 (0.092)	0.212 ** (0.099)
University Shareholders at Entry	0.181 (0.191)	0.173 (0.191)	0.317 (0.221)	-0.197 (0.241)
Innovation Motivation_FT	0.055 (0.080)	0.130 (0.067)	* 0.100 (0.091)	0.133 ** (0.067)
High R&D Intensity	0.166 ** (0.067)	0.054 (0.080)	0.161 ** (0.067)	0.153 * (0.091)
Entrepreneurial Experience_FT*Innovation Motivation_FT	0.250 * (0.145)			
Entrepreneurial Experience_FT*High R&D Intensity		0.369 ** (0.144)		
Corporate Shareholders at Entry*Innovation Motivation_FT			0.090 (0.136)	
University Shareholders at Entry* Innovation Motivation_FT			-0.470 (0.395)	
Corporate Shareholders at Entry* High R&D Intensity				-0.039 (0.133)
University Shareholders at Entry*High R&D Intensity				0.930 ** (0.413)
Log Pseudolikelihood	-984.9	-983.1	-985.4	-993.5
Wald χ^2	83.41	86.39	82.13	83.21
Pseudo R2	0.043	0.045	0.043	0.045

* $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. $N = 1,549$. Robust standard errors in parentheses. All control variables included as in Table 3

investors at founding is positively associated with early-stage hiring but not differently for startups with higher and lower R&D investments. In contrast, in line with hypothesis H4b, the most R&D intensive start-ups seem to derive greater complementarities from university shareholdings.

4.2 Robustness checks and supplemental analyses

In Table 6, we report alternative models testing the validity of H3a to H4b. These cover the full sample and include interaction terms between entrepreneurial experience, corporate shareholders, university shareholders and our proxies for start-up innovation orientation. As regards founders' entrepreneurial experience, the coefficients of both interaction terms (i.e., *Entrepreneurial Experience_FT*Innovation Motivation_FT* and *Entrepreneurial Experience_FT*High*

R&D Intensity) are positive and statistically significant, but entrepreneurial experience per se no longer predicts early hiring (Models 1 and 2). As interaction terms in non-linear models can be difficult to interpret (Ai & Norton, 2003; Hoetker, 2007), we compute marginal effects and provide a graphical representation in Figs. 2 and 3. Both figures confirm that early-stage start-ups with and without experienced entrepreneurs hire employees at different rates only when these start-ups portray themselves as more innovative, either via innovation-based motivations of their founders or post-founding investments in R&D. We thus find strong support for both Hypotheses 3a and 4a in split samples (Tables 4 and 5) and when testing interaction effects (Table 6).

The remaining models include interaction terms between corporate/university shareholders and each proxy for innovation orientation. Model 3 does not

Fig. 2 Predicted probabilities of early-stage hiring for founding teams with experienced entrepreneurs, depending on founding motives

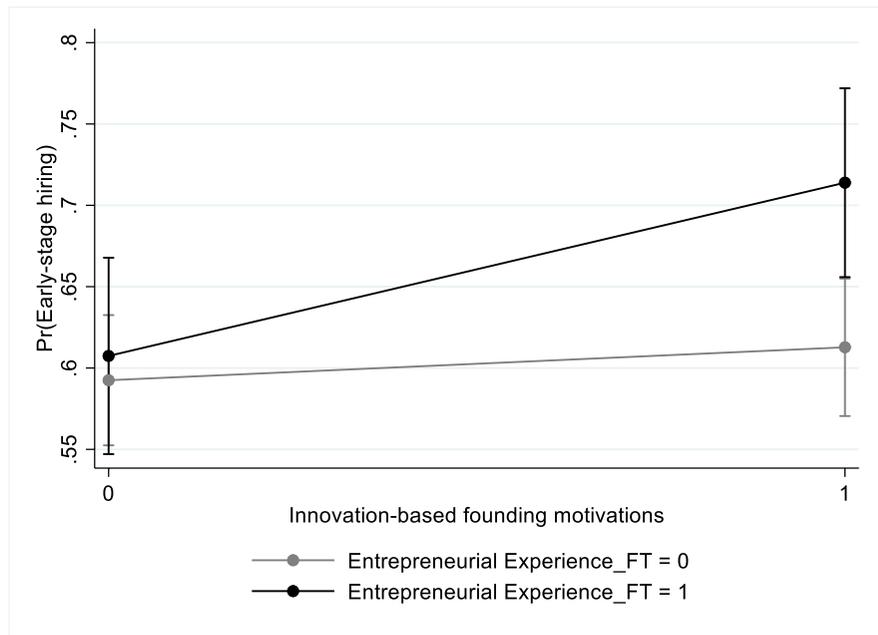
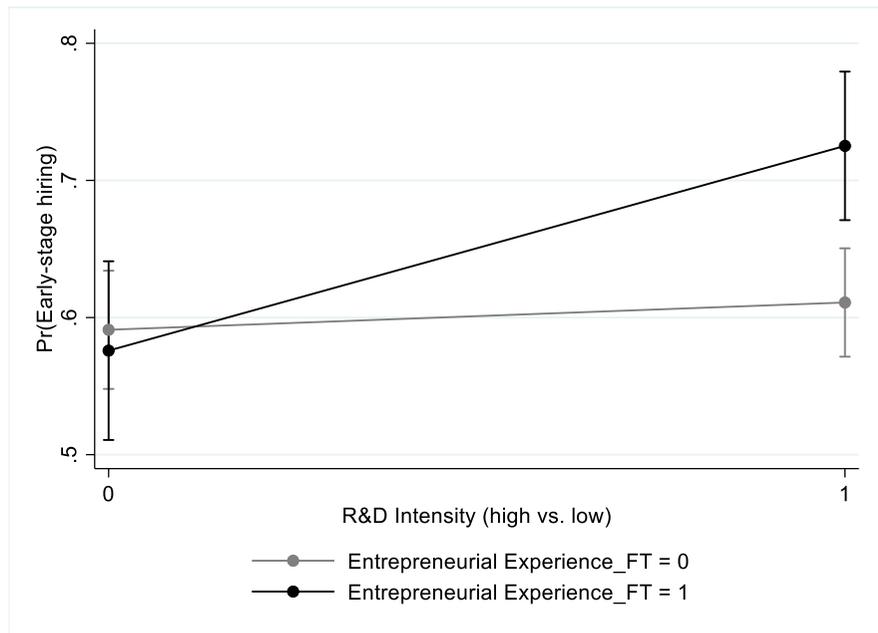


Fig. 3 Predicted probabilities of early-stage hiring for founding teams with experienced entrepreneurs, depending on the firm R&D intensity

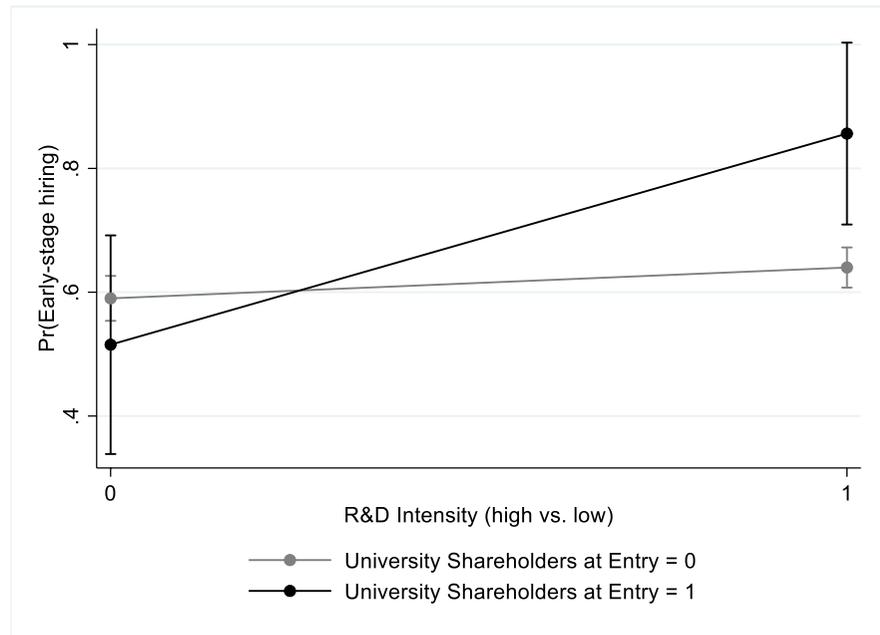


offer evidence of any significant moderation effects between either type of shareholders and innovation-based motives. The only tentative support for H3b found in Table 4 is not confirmed, so we do not find enough evidence to validate this hypothesis in our data. Model 4 shows that early-stage hiring is more likely when R&D intensive start-ups have universities

among their initial shareholders (see Fig. 4). This finding is in line with Table 5 and corroborate the partial support for H4b (i.e., confirmed for university but not for corporate shareholders).

We also test the sensitivity of our results to alternative operationalizations of our key variables. Our results remain unchanged when we use comparable

Fig. 4 Predicted probabilities of early-stage hiring for start-ups receiving university investment at entry, depending on the firm R&D intensity



operationalizations for *Entrepreneurial Experience_FT* and *Innovation Motivation_FT*, i.e., when both measures capture whether “at least one founder” or “the majority of the founders” have entrepreneurial experience and innovation-based motivations (see Appendix Table A.4). Likewise, our findings are virtually the same when we measure the presence of any type of shareholders by their ownership share at entry (Appendix Table A.5), or when we use another proxy for a start-up’s innovation strategy, i.e., the adoption of formal intellectual property rights (IPR) or of other more informal mechanisms to protect innovation (e.g., secrecy). The latter estimations (in Appendix Table A.6) confirm that both internal competences and external resources (and for the latter, resources stemming from corporate shareholders in particular) are important predictors of early-stage hiring, but only for start-ups that have taken some strategic actions to protect their innovation already at the time of the survey.

We conduct additional tests in which we control for the various motivations of founding members besides any ambitions to derive profits from an innovative idea. Appendix Table A.7 reports models similar to those in Table 4 but including controls for other motivations of the founding team – fiscal or public monetary incentives, desire for autonomy,

need for an occupation, or the ambition to commercialize academic research. Controlling for these different motivations holds the original findings virtually unchanged, i.e., entrepreneurial experience and corporate shareholders continue to be significant predictors of early-stage hiring, but only in innovation-driven start-ups. With the exception of fiscal/monetary incentives (though only in less innovation-oriented start-ups), no other founding motives seem to be significantly related to early-stage hiring.

Appendix Table A.8 restricts the attention to nascent firms (not older than 2 years) and estimates count models for the total number of employees working at the firm. In these alternative models, we continue to find significant associations between entrepreneurial experience or the presence of corporate shareholders and early-stage hiring, but only in start-ups that either report innovation-driven motives or that already invest substantially in R&D activities. Therefore, the support of our hypotheses holds even when we use a different measure for early-stage hiring and different estimation methods applied to a restricted sample of brand-new firms. Our findings are therefore not driven by relatively more mature startups that have accumulated experience with recruitment.

Lastly, we explore the link between a start-up’s initial characteristics and the quality of the employees hired. If start-up’s resources and competences have

indeed some role in activating labor supply, we should observe an assortative matching such that start-ups with better initial endowments are matched with higher quality employees. Indeed, prior studies (e.g., Bublitz et al., 2017) have found an assortative matching between highly skilled founders and highly skilled employees. This final robustness check is, thus, meant to confirm this result and to explore whether the presence of corporate or university shareholders also correlates with specific dimensions of employees' human capital. We leverage existing details about the human capital of each employee in the start-up at the time of the survey to construct a few measures of general and specific human capital, namely whether the respective employee has a) a high level of education (a master's degree or above); b) a university degree in science, technology, engineering and/or mathematics (STEM); c) industry experience (work experience in the same industry as the start-up); and d) entrepreneurial (or self-employment) experience. We expect these human capital dimensions to be particularly valuable for innovative start-ups.

We estimate Heckit Probit models at the employee level to explore the relationship between a start-up's resources and competences and employee human capital, while correcting for any potential selection bias driven by the fact that our dependent variables are only observed for start-ups that have already hired at least one employee.⁹ Table 7 reports the results. Our estimations corroborate that start-ups with richer competences and resources tend to match with more skilled employees on average. We find that employees joining start-ups with serial entrepreneurs are more likely to have industry or entrepreneurial experience or a STEM degree. Different types of shareholders correlate with different dimensions of employee human capital, suggesting that most shareholders can add some value in the process of attracting talent to early-stage ventures, either by augmenting the necessary resources to do so or by providing quality

signals to prospective joiners. Finally, teams with highly educated founders seem to consistently attract better quality employees. Although it is beyond the scope of this study to delve deeper into these patterns, this analysis suggests that assortative matching may indeed occur – with some nuances – between most skilled founders, resource-abundant startups, and highly skilled employees.

5 Discussion

Our collective findings reveal an important interplay between a start-up's set of initial resources and its innovation orientation in predicting hiring in the early stages of a venture. Experienced entrepreneurs are more likely to hire employees in the early stages of the firm but only when they convey a strategic orientation towards innovation, either based on their founding motives or through more objective steps such as considerable R&D investments. Our results also suggest that resources assembled via different ownership structures may facilitate early-stage hiring contingent on the very same factors but also the type of shareholder involved in the firm at founding. In particular, having universities and research institutions as shareholders is positively related to early hiring in start-ups that are R&D intensive already in their nascent years, while corporate shareholders seem more complementary to the hiring processes of start-ups that aspire to be innovative based on their founders' motivations, even if they are not (yet) very R&D intensive.

We interpret these findings in the light of Clarysse et al.'s (2014) view on how knowledge and business ecosystems provide resources and capabilities to entrepreneurial firms. Start-ups may draw greater support from research-intensive organizations such as universities, especially when they pursue highly innovative ideas that require greater R&D investments and perhaps novel technologies. This may increase both the demand and the supply of human resources and also signal a stronger alignment between the set of resources available to the start-up and the innovative activities for which those resources are needed. Being part of a business ecosystem can also help hire employees already in early stages. When founders aspire to build a successful business based on an innovative idea, having incumbent firms as initial shareholders may assist the start-up in mobilizing the

⁹ The first stage of each model is similar to model 1 in Table 3. As an exclusion restriction we use a family-rooted imprinting that may incentivize early-stage hiring but is not necessarily connected to the characteristics of new hires: whether founders have entrepreneurial parents. This variable proved to be a strong (i.e., correlated with early hiring) and valid (i.e., insignificant in the second steps) exclusion restriction in our data.

Table 7 Start-up competences and early employees' general and specific human capital

	High education level ^a	STEM graduate ^b	Industry experience ^c	Entrepreneurial/ Self-employment experience ^d
Entrepreneurial Experience_FT	-0.063 (0.079)	0.230 (0.076)	*** 0.247 (0.131)	* 0.376 (0.088)
Corporate Shareholders at Entry	0.173 (0.071)	** 0.085 (0.067)	0.092 (0.179)	0.137 (0.095)
University Shareholders at Entry	0.182 (0.199)	0.115 (0.160)	0.367 (0.246)	0.439 (0.211)
Innovation Motivation_FT	0.035 (0.067)	0.083 (0.067)	0.040 (0.112)	-0.023 (0.085)
High R&D Intensity	0.120 (0.068)	* 0.166 (0.067)	** 0.148 (0.106)	0.091 (0.084)
Other Equity Investors	0.137 (0.120)	0.222 (0.124)	* 0.111 (0.231)	0.042 (0.143)
Family Shareholders	0.062 (0.107)	-0.045 (0.107)	0.071 (0.180)	0.241 (0.130)
PhD Education_FT	0.508 (0.129)	*** 0.236 (0.093)	** 0.371 (0.114)	*** 0.337 (0.115)
Managerial Experience_FT	0.040 (0.070)	0.056 (0.069)	0.112 (0.096)	-0.114 (0.090)
Work Experience Abroad_FT	0.229 (0.068)	*** 0.010 (0.067)	0.031 (0.112)	0.021 (0.083)
Female Presence_FT	0.075 (0.078)	-0.152 (0.078)	* -0.042 (0.088)	-0.108 (0.089)
Number of FT Members	0.008 (0.030)	0.040 (0.027)	-0.069 (0.036)	* -0.049 (0.035)
Firm Age	0.174 (0.048)	*** 0.234 (0.042)	*** 0.026 (0.204)	0.102 (0.082)
Log pseudo-likelihood	-2,348.10	-2,315.90	-2,183.30	-2,103.50
Rho	0.886	0.998**	-0.134	0.241
Sample average	0.492	0.599	0.300	0.248
Standard deviation	0.500	0.490	0.458	0.432

$N=2,309$. Probit models adjusted for sample selection based on the "Heckit" model (the standard Heckman selection model but applied to binary outcomes). Estimates reported refer to the second stage of each model, with the first stage being similar to the baseline model reported in Table 3, and including a dummy variable indicating whether any of the founders have entrepreneurial parents (exclusion restriction used for identification; it is a significantly predictor of early-stage hiring, but not directly related to the characteristics of employees hired). Standard errors in parentheses are clustered at the firm-level. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$. Industry controls included. The dependent variables are dummy variables equal to 1 if the employee has a) a master degree or above; b) university training (bachelor or above) in STEM fields; c) work experience in the same industry (1d NACE) as the start-up; d) prior entrepreneurial/self-employment experience; and 0 otherwise

required human resources. In other words, the fact that an innovative start-up is sponsored by an established firm can provide both the necessary resources to initiate recruitment and powerful signals to prospective employees, even if the observable innovation investments are still emerging. In this case, outsiders

may discern the existence of complementarities between the incumbent and the start-up, which are deemed vital for the success of a corporate investment (Dushnitsky & Lenox, 2006). While we cannot unravel the exact mechanisms through which these different shareholders help start-ups hire in the early

stages of their lifecycle, a combination of privileged access to different pools of resources (e.g., labor) and signaling value that reduces employees' uncertainty about firm quality are likely at play.

In summary, these findings speak to the benefit of integrating insights from resource- and competence-based views (Colombo & Grilli, 2005; Grant, 1996) and signaling theory (Connelly et al., 2011; Spence, 1973) with a contingency perspective (Eesley et al., 2014; Grilli et al., 2020) in the analysis of a start-up's propensity to hire in nascent stages: the very same bundles of initial resources can shape the odds of hiring differently depending on specific circumstances, where innovative orientation is an important contingency at work, shaping the ultimate strategic outcome of an organization. We show that the likelihood of early-stage hiring depends on how a start-up's set of initial resources and competences align with their innovation strategy. Thus, our results add to the contingent view in strategic management by complementing Posch and Garaus (2020) which show how innovative orientation constitutes an important boundary condition in the relationship between strategic planning and organizational ambidexterity. The combination of all these findings has also important theoretical implications for the imprinting thesis (Beckman & Burton, 2008; Boeker, 1988, 1989; Stinchcombe, 1965), by demonstrating the relevance of contingent factors when investigating the link between start-ups' initial inputs and subsequent outputs. Failing to account for those contingencies may lead to erroneous conclusions by either hiding circumstances in which bundles of initial resources will likely be underutilized or overestimated in their value.

6 Concluding remarks

Early-stage hiring is crucial to secure a competitive advantage for most firms (Honoré & Ganco, 2023; Phillips & Gully, 2015; Ployhart et al., 2014). However, start-up firms face unique challenges with resource mobilization in general (Clough et al., 2019) and employee onboarding in particular (Brymer & Rocha, 2023; Fairlie & Miranda, 2017; Leung, 2003). Virtually any young firm faces difficulties in hiring their first employees due to their lack of legitimacy and resources, and the so-called liabilities of newness and smallness that exacerbate information gaps in

the labor market (Freeman et al., 1983; Moser et al., 2017; Stinchcombe, 1965; van Werven et al., 2015). Finding actionable solutions for these challenges is vital because early employment growth is deemed a key stepping-stone for firm survival (e.g., Gjerløv-Juel & Guenther, 2019).

This paper integrates insights from the resource- (and competence-) based view and signaling theory to advance our understanding of why some start-ups hire in nascent stages while others do not exhibit any employees beyond the founding team in the same period. We contend that start-ups benefit from bundles of internal competences and external resources as these alleviate both supply and demand side constraints which hinder recruitment processes in nascent stages. We focus on two sets of resources that already create heterogeneities in start-ups at entry and can become imprinted in subsequent decisions and performance (Beckman & Burton, 2008; Boeker, 1988, 1989; Fern et al., 2012; Geroski et al., 2010): internal competences accumulated in founders' previous start-up experiences and external resources assembled via corporate or university shareholders. In doing so, we theorize that these competences and resources will increase the odds that start-ups hire within their first years of activity, especially when start-ups demonstrate to be innovation-driven either based on their founding motives and post-founding R&D investments.

Using survey data from a representative sample of Italian innovative start-ups, we find that founders' entrepreneurial experience is a key predictor of early-stage hiring, especially when founders are innovation-driven or when start-ups exhibit a substantial commitment to innovation via R&D investments. However, in the absence of this innovative orientation, the role of founders' experience in employee onboarding processes seems limited. Regarding external resources drawn from corporate and university shareholders, our results reveal some interesting nuances. Corporate shareholders seem to ease the hiring process of start-ups in general, even if they are not (yet) R&D-intensive, while university shareholders are more strongly associated with early-stage hiring rates of innovation-intensive start-ups. This indicates that start-ups may draw different benefits from the business and knowledge ecosystems surrounding them, depending on their innovation strategy.

These results can also offer important practical and policy implications. Our findings resonate with policy efforts encouraging entrepreneurship among

experienced individuals, who are often expected to perform better as founders (Delmar & Shane, 2006; Dencker et al., 2009). However, the mechanisms underlying this positive link remain obscure. By uncovering initial competences that can enhance a start-up's propensity to hire, we highlight a channel through which capabilities assembled at entry may boost start-up performance. Moreover, by showing *when* those competences can be more effective levers for early hiring, we offer evidence about some of the conditions that should be in place in order to unlock their potential when start-ups try to attract their first employees. Similarly, our findings echo the need to align founders' and shareholders' utility functions (Huang & Knight, 2017) so that different shareholders can maximize their ownership and timing competences (Foss et al., 2021) when investing in start-up firms.

We concede some limitations, which may pave the way for future research on start-up hiring using different data and methods. Firstly, we have not explored all possible dynamic relationships that may exist between internal competences and external resources (e.g., Sarasvathy, 2009) in assisting start-ups' early-stage hiring. For example, it could well be that experienced entrepreneurs are perceived to be more capable and credible to university or corporate shareholders, in which case complementarities may exist between internal competences and external resources.¹⁰ Relatedly, different types of shareholders may be more attracted to invest in start-ups depending on their founders' ambitions or motivations. While there is extensive documentation on how founders' human capital influences VC funding and other external investments (e.g., Gimmon & Levie, 2010;

Nofsinger & Wang, 2011; Zhang, 2011) and how these, jointly, drive start-ups' growth (e.g., Colombo & Grilli, 2005, 2010), there is much less evidence on how internal competences and (other) external resources interact and possibly explain start-ups' early hiring or other post-founding strategies. Although these questions fall outside the scope of our study, our data would not allow to delve deeper into why different types of shareholders match with different types of start-ups and founders. Therefore, our findings are correlational and not causal, but studying these complex dynamics, theoretically and empirically, constitutes a promising research avenue. Likewise, we have focused on entrepreneurial experience but other measures of human capital or internal competences (e.g., founding team diversity in terms of education background or functional experience) could be explored in future studies. We foresee many opportunities in this space to expand our understanding of the mechanisms through which founders mobilize human or other resources in the early stages of their ventures, with different data and methods.

Secondly, our findings indicate that innovative start-ups equipped with richer resources and competences are more likely to hire in early stages, but our data do not allow to fully disentangle the underlying mechanisms driving our results. In particular, we are unable to discern whether the realized outcome of early-stage hiring is dictated by an "ability" (i.e., whether some start-ups and their founders *can* hire in the early stages of the firm because they have the necessary competences and resources to do so) or a "willingness" effect (i.e., whether those start-ups and founders *wish* to hire early). Both mechanisms are likely at play and may be interdependent (i.e., some firms and their founders may wish to hire, but they need the resources and competences to do so); further, these resources and competences may expand both the demand for labor (more firms will be ready to hire) and the supply of labor (more individuals will be willing to join start-ups because their endowments and innovation orientation reduce the uncertainty about firm and job quality). In this respect, we recommend the use of both qualitative and (longitudinal) quantitative analyses to ascertain the role of founders' motivations in determining "actual growth", since their ability and willingness to grow can easily be intertwined. Relatedly, due to data limitations, we have focused on the "realized" outcome, i.e., early-stage hiring, and were not able to model a proper two-sided matching process in which employers select employees

¹⁰ In extra analyses, we have tested whether the association between founders' past experience as entrepreneurs and early-stage hiring was different in firms with and without corporate or university shareholders at entry. We found tentative evidence (though weakly significant from a statistical standpoint) of a stronger association between the two variables in firms that have such type of organizations (established firms or universities) among their shareholders, which could point to some complementarities or interdependencies between the two (e.g., experienced founders might be better able to utilize the resources provided by those shareholders given their previous experience with utilizing networks and combining different resources under capital constraints). Unfortunately, our data are limited to assess these dynamics in more detail, but we hope that further research can be conducted on this topic in the future.

and vice-versa. Distinguishing these effects could help us to better understand the whole phenomenon.¹¹

Thirdly, we do not distinguish part-time from full-time employees and, given the cross-sectional nature of our data, we are unable to investigate employee retention or long-term performance. Recent evidence shows that early hiring improves firm success, but only if turnover is prevented (Gjerløv-Juel & Guenther, 2019). Future studies could hence investigate whether the initial resources and competences of a start-up also contribute to retain the best fits within the firm and, ultimately, improve the long-term performance of the firm.

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¹¹ Important guidance on how to model these two-sided matching processes, for hiring or other settings, can be found in finance (e.g., Sørensen, 2007) or strategic management literature (e.g., Chen et al., 2021; Honoré & Ganco, 2023).

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