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REVIEW

"The company I keep is not corporate enough": exploring the specificities of University startups

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Abstract
If universities produce the best scientific research, should university startups produce the best entrepreneurs? The answer is no, when looking at the empirical evidence, and also (as done here) when considering the matter from a theoretical angle. This paper compares University Startup Entrepreneurs (USEs) with Corporate Startup Entrepreneurs (CSEs) using a variety of theoretical lenses. Our theoretical analysis highlights that USEs are incentivised towards being opportunity entrepreneurs, while CSEs are incentivised towards being lifestyle entrepreneurs. USEs have to overcome a profound transition from a scientific identity to a profit-seeking identity, which puts them at a disadvantage compared to CSEs. USEs are also further from their customers when compared to CSEs (and a fortiori, when compared to user startups), but this disadvantage is not considered to be insurmountable because experimenting with the market and learning from users should not be beyond the reach of diligent USEs.

Keywords University startups · Corporate startups · Academic entrepreneurship · Knowledge base · Entrepreneurial motivations

JEL Classification L26 · I23 · O31 · O32

1 Introduction

Entrepreneurship has an important role in technology transfer, serving as the mechanism through which new technological innovations can be brought to the masses, leading to economic development and productivity growth (Audretsch & Keilbach, 2008). Moreover, university research is a leading source of breakthrough scientific discoveries, where leading academic researchers receive extensive support from proactive universities to launch their high-tech ventures (Belitski & Sikorski, 2024). Therefore, why are university research

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contexts, so important for basic research and scientific progress, not the origins of the most successful entrepreneurs? Should we expect more from university startups?

University Startup Entrepreneurs (USEs) are often associated with scientific knowledge, while Corporate Startup Entrepreneurs (CSEs) have business experience. What do these labels mean exactly? What are the implications of having "scientific knowledge" or "business experience"?

This paper goes in-depth and unpacks the differences beyond repeating simple clichés that CSEs are brimming with management experience, while USEs are devoid of commercial and managerial capabilities.[1]

We contribute to the literature by providing an in-depth and broad overview of the differences between university and corporate entrepreneurship. Our comparison of USEs and CSEs is carried out by applying a variety of theories and perspectives relating to areas such as incentives, employment conditions, culture, notions of personal identity, search routines, knowledge endowments, and characteristics of the relevant knowledge base. This article is part literature review, and part "appreciative theorizing" or perhaps even "theory construction as disciplined imagination" (Weick, 1989, see also Weick, 2016). The "disciplined" part comes from applying rigorous theoretical frameworks from the previous literature (e.g. the distinction between opportunity-, necessity-, and lifestyle-entrepreneurship; analysis of characteristics of the knowledge base), and among the outputs is a set of hypotheses for future work.

Our analysis highlights that USEs are incentivised towards being opportunity entrepreneurs, while CSEs are steered towards being lifestyle entrepreneurs. This is surprising, because CSEs often have superior outcomes in terms of post-entry growth and performance. USEs have to overcome a profound transition from a scientific identity to a profit-seeking identity, which puts them at a disadvantage compared to CSEs. USEs are also further from their customers than CSEs (and a fortiori, compared to user startups), but this disadvantage is not considered to be insurmountable because experimenting with the market and learning from users is no longer in the domain of "rocket science".

The paper unfolds as follows. Section 2 contains our definitions of the terms USE and CSE. Section 3 focuses on dimensions such as entrepreneurial motivations, incentives, culture and identity. Section 4 explores differences between USEs and CSEs in terms of search routines and the knowledge base, while Sect. 5 focuses on differences in management practices. Section 6 discusses how USEs behave in collaborative teams. Section 7 looks at previous empirical evidence on the comparative performance of USEs and CSEs. Section 8 groups together suggestions for future empirical research, and Sect. 9 concludes.

[1] According to popular stereotypes, academics are often portrayed as socially awkward, impractical "eggheads", that can ponder the equations governing origin of the universe, while being unable to tie their own shoelaces; akin to Professor Calculus from Herge's "The Adventures of Tintin", or the players of the Philosophy Football World Cup Final from Monty Python's legendary sketch (e.g. available here, https://www.youtube.com/watch? v=LfduUFF_i1A [Duration: 3 m47; last accessed 28 th July 2024]).

2 University startups and corporate startups

Entrepreneurs can come from various backgrounds. Entrepreneurs who were previously in the labour market can come from the private sector (Corporate Startup Entrepreneurs) or the university sector (University Startup Entrepreneurs), from the public sector (Özcan & Reichstein, 2009) or from a recently-entering entrepreneurial firm (the case of serial entrepreneurship). Entrepreneurs who were not previously in the labour market may be entering from unemployment (often referred to as necessity entrepreneurs) or entering entrepreneurship from parental leave (e.g. the case of "mumpreneurs", Lewis et al., 2022). An important category identified by previous work is the category of startups by user innovators (Agarwal & Shah, 2014), which may of course overlap with other categories such as Corporate Startups. Further categories could potentially be mentioned too. This paper focuses on the contrast between USEs and CSEs. To distinguish between the cases (mentioned above) of Corporate Startups and serial entrepreneurship, we consider that CSEs come from firms that are old enough and large enough not to be considered as startups themselves, although (in keeping with previous literature such as Sauermann & Stephan, 2013) we do not give precise details on the cutoff for distinguishing between what is meant by "old enough" and "large enough".

Regarding the case of University Startup Entrepreneurship (USE), we begin with the definition from Agarwal and Shah (2014, p1114):

> "Academic entrepreneurship (also referred to as university spinoffs or academic spinouts) is defined as new venture formation by faculty, staff or students who innovate in an academic or non-profit research context, and subsequently found a firm that directly exploits this knowledge (Shane, 2004)."

While some studies focus on "spinning out" formal IP out of the university, this is considered by some to be too restrictive, because academic entrepreneurs may benefit from tacit knowledge, informal knowledge not yet registered as IP, and a whole host of other transferable skills. As such, a broader definition of University Startup Entrepreneurship considers that the valuable knowledge is unobserved.

Various terms can be found, including academic entrepreneurship, university spinoffs, academic spinouts, and university startup entrepreneurship (Agarwal & Shah, 2014; Mathisen & Rasmussen, 2019; Coad et al., 2021). The term spinoff is sometimes associated with incumbent firm divestitures (e.g. Ganco, 2013, p675). This article considers these terms to be largely synonymous (in the sense that we do not seek to unpick the differences between these terms at length), but prefers the term "University Startup Entrepreneurship" or USE (Coad et al., 2021). In this paper, USEs can come not only from Universities, but also Public Research Institutes (PRIs) and Higher Education institutes.

Which individuals can be university spinoffs? The prototypical USE would probably be a tenured professor in a STEM department. However, previous empirical papers have been less restrictive, extending the definition of USE to include junior faculty or staff (Agarwal & Shah, 2014), as well as graduate students (Dorner et al., 2017; Hayter et al., 2017; Wright et al., 2017), with some samples even including university administrators (Roche et al., 2020) and also alumni startups (Müller, 2010; Siegel & Wright, 2015, their Table 1).

Table 1 Incentives for entrepreneurs

	University Startup (tenured)	University Startup (untenured)	Corporate Startup
Opportunity Entrepreneurship			
Support from the parent organization	High	High	Low
Patent and IPR enforcement	Encouraging	Encouraging	Discouraging
Employment risk	Favorable	Favorable	Unfavorable
Lifestyle Entrepreneurship			
Need for autonomy, "being one's own boss"	Low	Medium	High
Escaping a "bad boss"	Low	Medium	High
Startup due to reduced options for employment elsewhere	Low	High	High

Source: our elaboration based on Coad et al. (2021, Table 2)

Research into the career motivations of science professionals has investigated samples of PhD students (Roach & Sauermann, 2010) or PhD biologists (Stern, 2004).

We now turn to the definition of Corporate Startup Entrepreneurship (CSE). CSE here refers to entrepreneurs who start up their business coming from previous employment in a private firm. It is assumed that CSEs benefit from knowledge gained from their previous employment (Yeganegi et al., 2024).

While the term "Corporate Spinoffs" may refer to divestitures from incumbent firms, and while the term "employee mobility" has been used to describe employees that bring with them formal IP into their new startup (Ganco, 2013), the definition used here is far broader. We focus on CSEs as any startup formed by an individual (or founder team) coming from employment in a private firm, because we focus on contrasting CSEs with USEs.

3 Environment, culture, and behavior

3.1 Motivations

Academic entrepreneurs are motivated by various factors such as financial rewards, reputation and career rewards, and the intrinsic satisfaction of problem-solving (referred to as 'gold', 'ribbon' and 'puzzle' in Lam, 2011), as well as the desire to have an impact on others (Cohen et al., 2018) and lifestyle considerations (Civera et al., 2024). That said, university employees generally tend to have a "taste for science" (Stern, 2004) which serves as an intrinsic motivation towards investing in challenging and uncertain long-term research projects. University employees are likely to operate according to a norm of open science, whereby the rewards for their work come in the form of being the first to publish journal articles and books on the topic. University employees are relatively unlikely to seek to appropriate the gains of their scientific breakthroughs though IP protection methods such as patents. University employees may make a scientific discovery, publish it in order to make the new knowledge freely available, and then (instead of engaging in the hard work of transforming the new scientific knowledge into a marketable product) go back to work on the next intellectually-stimulating problem. Regarding collaborative research projects, academic researchers prioritize projects that are intellectually challenging, and the most

decisive factor for choosing research projects is the expected publication of research in scientific journals (van Rijnsoever & Hessels, 2021).

Scientific knowledge production is costly to monitor and subject to expropriation, hence unless there is some kind of intrinsic motivation towards science, then knowledge production might not occur. Profit-seeking individuals might lack the patience and motivation to work hard in such circumstances.

Corporate employees are more motivated by financial rewards, as well as factors such as overcoming the frustrations of the corporate workplace. Disagreement with a supervisor regarding strategic decisions has been mentioned as a motivation for spinning out of a firm (Dahl & Sorenson, 2014).

3.2 Risk-aversion

Risk aversion is an important theme for entrepreneurship (e.g. Kihlstrom & Laffont, 1979). How do USEs and CSEs compare regarding risk aversion?

Regarding USEs, a first idea would be that academics might be risk takers, because academic jobs are highly competitive and there are limited vacancies. In this sense, risk-averse individuals would not want to go into academia.

There are probably life cycle considerations, however. Once academics have received tenure, their risk aversion may solidify, as vividly illustrated here:

> "The juvenile sea squirt wanders through the sea searching for a suitable rock or hunk of coral to cling to and make its home for life. For this task, it has a rudimentary nervous system. When it finds its spot and takes root, it doesn't need its brain anymore, so it eats it! (It's rather like getting tenure.)" (Thagard, 1996, p82).

The average employee (in both university and corporate contexts) may be quite different from the employee who self-selects into entrepreneurship, however.

Myers et al. (2023) discuss risk-taking by university faculty, and observe that more applied faculty are less risk-averse (page 18): "personal risk-taking is one of the best predictors of doing more applied, Edison-like work." While theoretical academics (in the mold of Niels Bohr) may be averse to the uncertainty surrounding entrepreneurship, applied academics (in the mold of Thomas Edison) may thrive in entrepreneurial settings. Future work could investigate the link between academic risk-taking (e.g. risk-taking activities of academics in terms of their personal lives, their research style, applications for competitive funding schemes) and academic entrepreneurship.

Many employees in private sector employment are probably risk averse too. Roach and Sauermann (2010) present survey data from over 400 science and engineering PhD students and observe that, while academic jobs and private-sector jobs in large firms are roughly equally-appealing career options, nevertheless working in a startup seems far less appealing. The main attributes that were considered as possible advantages of working in a startup were a sense of responsibility, and intellectual challenge (Roach & Sauermann, 2010, p426).

3.3 Incentives for entrepreneurs

This section applies the lens of opportunity entrepreneurship and lifestyle entrepreneurship to the analysis of University Startups. In the case of tenured faculty, necessity entrepreneurship is assumed not to be relevant, because tenured faculty can presumably continue with their previous jobs instead of launching a startup. That said, within a university there may be many untenured employees with precarious employment situations that may have less autonomy over their work tasks (Hayter & Parker, 2019) and may be more vulnerable to being exploited by administrators or research team coordinators (Principal Investigators; Hayter & Parker, 2019), and who may feel pressure to launch their own startup out of necessity. Civera et al. (2020) focus on the phenomenon of necessity entrepreneurship among USEs.

The incentives and motivations seem to be heavily stacked in support of University Startups (especially for tenured faculty), and against Corporate Startups. From the lens of incentives and motivations, we could expect that USEs could be more common and outperform CSEs.

Entrepreneurs coming from university backgrounds have strong institutional support to explore new business opportunities, but motivation to start a business in order to establish a relaxed lifestyle seems less relevant (Table 1). Unlike the situation for CSEs, USEs often receive the blessing of the parent organization (Walsh et al., 2021), which may even give resources to help the USE get a flying start. USEs can often take patents and IP with them, and if the business idea does not work out, they can often return to their previous employer. USEs are unlikely to be founded for lifestyle reasons, however, because academics often enjoy high levels of autonomy (although not necessarily in the case of post-doc researchers, Hayter & Parker, 2019). USEs are less likely to form as a response to escaping a "bad boss", because academics are usually not closely monitored (notwithstanding exceptions such as post-docs working in well-defined roles in a PI's laboratory; Hayter & Parker, 2019). Also, no-compete agreements generally do not prevent academics from moving to a rival university.

Corporate startups, however, are strongly discouraged from the lens of opportunity entrepreneurship, but may be encouraged for lifestyle motivations. Linked to the prerogative of private companies to protect their intellectual assets using mechanisms such as secrecy and IP, firms will seek to block CSEs, will engage in aggressive measures against former employees to enforce IP, and will not welcome back employees that previously left to explore business ideas. While employees will find it difficult to apply ideas developed at the company to a new venture, they may instead pursue lifestyle motivations, in pursuit of autonomy, escaping the high-pressure monitoring from a bad boss, or entering entrepreneurship because of restrictions on finding jobs in other firms in the same sector (due to no-compete agreements). Lifestyle motivations may be particularly salient for CSE entry into sectors such as retail (Dahl & Sorenson, 2014).

3.4 Employment conditions

Table 2 compares the background contexts (University vs. Corporations) with regards to employment conditions. No doubt these employment conditions will influence the norms, culture, and mindset of USEs and CSEs.

Table 2 Employment conditions

	University Setting		Corporate Setting
	Tenured faculty	Untenured employees	
Job security	High	Low	Low
Pay	Low	Low	High
Profit motive	Low	Low	High
Autonomy	High	Medium	Low
Monitoring of employees	Low	Medium	High
Firing of low performers	Low (culture of tenure)	Medium	High (device for discipline and motivation)

Tenured USEs have comparatively high job security, although this is less true for untenured USEs. Academics in general have relatively low pay (e.g. Roach & Sauermann, 2010), which is no doubt linked to university-wide norms of foregoing a focus on pecuniary matters and instead pursuing a "taste for science" (Stern, 2004). Compared to corporate employees, academics are less motivated by money: "While salary and other forms of pecuniary benefits have always mattered to academics … they were typically seen as less important than in commercial science." Roach and Sauermann (2010, p423). That said, even if financial gain is not the primary driving force, academic entrepreneurs are aware that their efforts have value, and would be displeased if that value was awarded to others: "For me, I don't mind doing work in the public interest, for which I don't directly get compensated, but if somebody else is earning a large profit on it that seems a little wrong to me." (Jain et al., 2009, p926). University employees usually have high levels of autonomy, and tend to choose their research projects based on personal curiosity along the paths of their research programs.

Monitoring of employees in universities is relatively low, because university researchers tend to be experts in their narrow research areas, with long multi-year projects and complex criteria for evaluating daily outputs. As such, monitoring is low. In corporate settings, employees are less autonomous with regards to choosing their work tasks, instead following orders from the hierarchy, and therefore monitoring is relatively close.

Job security is higher in university contexts compared to private firms, at least for tenured faculty, although not so much for untenured university employees. This could potentially be linked to risk aversion among tenured university employees. Untenured university employees, however, may be more affected by the necessity entrepreneurship motivation, with USE founding being related to local unemployment conditions (Horta et al., 2016). Overall, however, the main reasons for job security among university employees are linked to norms such as the principle of academic freedom, difficulty in monitoring and evaluating faculty, and the associated culture of tenure (where tenured employees are in principle employed for life).

3.5 Attitudes to promotion

Academics often complain about their administrative duties. Administrative roles increase rapidly after academics obtain tenure, according to large-sample survey evidence (Myers et al., 2023), which seems to be an unavoidable side-effect of research success, rather than something actively pursued. Compared to corporate employees, university researchers are

relatively uninterested in promotion in the hierarchy. The dream of university researchers usually involves success in their research, rather than striving to become department head. "It was always portrayed as a miserable career option", writes Cassell (2024, p2) regarding being promoted to Dean. In their study of UK business school deans, Brown et al. (2021) frame the promotion to dean as a traumatic "loss" or deprivation. Moving into a deanship can be an unintentional move, "not least because other well-qualified potential candidates are often unwilling to serve" (Brown et al., 2021, p827). Deans explained that "other professors perceived it as some sort of second-rate academic job", with one dean stating that "[i]t was the most unpleasant year of my life by a million miles" (Brown et al., 2021, p831). In academic circles, promotion can be considered as a last resort (Brown et al., 2021, p832):

> "There's sometimes none too thinly concealed, snidey comments from colleagues that you were Dean because you couldn't do research.".

> "This refers to a switch of identity, right, so you are an academic, a scholar, a researcher and now you have gone to the dark side….so there's a saying 'those who can, do, those who can't, teach, and those who can't teach, they become deans'."

While corporate employees often measure their success in terms of job title and rank, the view of authority of academics is similar in spirit to that presented by an ancient poet in Appendix A: which could be paraphrased thus: "leave me alone to work my craft: I'm too busy to rule over others." USEs are satisfied to work in their own area, being valued by their community, and do not seek to lord it over others. As such, they often take a back seat in corporate power structures. One example would be Steve Jobs and Steve Wozniak: Woz had the technical scientific skills, but captured less value (Isaacson, 2011).

Reluctance to manage need not necessarily imply incompetence at management, however. According to Steve Jobs in 1984: "You know who the best managers are? They are the great individual contributors who never, ever want to be a manager but decide they have to be … because no-one else is going to … do as good a job." (Podolny & Hansen, 2020, p90).

3.6 Culture

Research in management (Fauchart & Gruber, 2011) has suggested the following trichotomy for understanding how cultures differ across entrepreneurial organizations:

- **DARWINIAN**: focus on financial performance, emphasis on solid business principles. Openness to starting a business in another domain if it could be profitable. Focus on outperforming rivals.
- **COMMUNITARIAN**: engaged in serving community members, by developing and making an authentic product shaped by their unique insights.
- **MISSIONARY**: desire to set up a firm to effectuate change in society, to be a role model, and to advance causes (often of a social or environmental nature). Missionaries advocate new social practices they believe to have universal scope.

This tripartite distinction was picked up by Clarysse et al. (2023), who apply it to the analysis of the differences between USEs and CSEs, as summarized in the top panel of Table 3.

Table 3 Culture and organization

	University Startup	Corporate Startup
Cultural Style (Fauchart & Gruber, 2011)		
Darwinian		×
Communitarian	×	
Missionary	×	
Organization and Culture		
Hierarchy	Flat	Command-based, strict hierarchy
Autonomy	High	Low
Communication channels	Open	Closed
Visibility	Open (the employer pays for you to have your own website that signals your achievements)	Closed (employees cannot signal their productivity well, even within the firm; it depends on their colleagues and whether their boss steals the credit)

Table 3 repeats the idea that USEs are less interested in financial performance, and more interested in peer evaluation (in terms of being valued in the community), and serving as a role model in the pursuit of public goods (consistent with the "missionary" orientation). Indeed, academics have different motivations to private sector employees. Connecting with the "Communitarian" orientation, USEs could arguably be encouraged not only from a profit-seeking lens, but also from a community angle, if university departments could celebrate their previous USE success stories (with pictures on the walls, or USE prizes, etc.), and help nurture the idea that academics could make their home community proud by becoming successful USEs and getting social esteem from this.

The bottom panel of Table 3 presents aspects of Organization and Culture. The university environment is characterized by a relatively flat hierarchy and high levels of autonomy, on average (although scientists in non-tenure-track positions may have lower levels of research freedom and pay; Sauermann & Stephan, 2013, p893). In line with the ideal of Open Science, academics take it as granted that they can communicate directly to discuss scientific matters with peers throughout the world, on the basis of research interests and personal credentials. In the corporate world, in contrast, communications are relatively closed. For example, in the corporate world, to communicate with person X, you might ask your boss to write to X's boss who then puts you in contact with X. Compared to universities, firms are historically closed and secretive organizations (Roach & Sauermann, 2010, p424).

Another cultural difference could be that USEs might have different behaviours with regards to legality. El-Awad et al. (2022, p2) write that:

> "individuals with scientific training often develop a mindset, in which precision and accuracy are paramount, resulting in a tendency to stay well within the letter of the law. Managers, in contrast, especially those with entrepreneurial experience, are more likely to experiment and interpret rules more flexibly"

In contrast, those with backgrounds in management sometimes see things differently compared to USEs:

Table 4 Sets of permissible strategies for different cultural styles

	Communitarian	Darwinian
Focus	Serving society with authentic products	Financial performance
Win-win situations	✓	
Zero sum games		✓
Negative sum games		✓
Grey areas of ethics and law		✓

> "There is a saying: Sometimes it's better to ask for forgiveness than ask for permission! So sometimes we were like, "Why not launch a product and if the government says blah, blah, blah, we could say, 'Oh, we are sorry,'" but just to try if the market is there. (Leif, manager)" (El-Awad et al., 2022, p2).

Table 4 builds upon the distinction between Communitarian and Darwinian cultural styles (Fauchart & Gruber, 2011; Clarysse et al., 2023) to consider how different types might pursue different sets of business opportunities. Communitarians, who are motivated by serving the community at large, and creating value for society, would be interested in discovering win-win situations, but would probably show restraint in the face of opportunities resembling zero sum games, or negative sum games. A zero sum game here refers to a situation whereby the gain for the entrepreneur is exactly offset by the loss for another, creating zero value for society in the aggregate. A negative sum game would be an action which leads to a gain for the entrepreneur that is relatively small compared to the losses faced by others. Examples of negative sum games could include business activities in ethical grey areas, pushing the limits of the divide between the unethical and the downright illegal, and doubtlessly even engaging in illegal activities (where punishments either fail to materialize, or are too lenient).[2]

It seems reasonable to conjecture that USEs correspond better to Communitarians, while CSEs correspond more to Darwinians (Clarysse et al., 2023). To illustrate, consider the case of the biosciences professor and company founder cited in Lam (2011, p1364):

> "…I think we as academics have a responsibility, especially in University X, to the nation really, we're in a very privileged position. And our money comes from the State or from charities."

Such an individual, who presumably corresponds better to a Communitarian than a Darwinian, would probably not stoop so low to engage in negative sum games for personal gain, because it would be inconsistent with their pro-social values.

If there is a gap between Communitarians and Darwinians in terms of financial performance, one possible explanation (illustrated by Table 4) could be that it is not a "fair game" given that Darwinians have a larger set of strategies at their disposal. Furthermore, such a gap in performance between Communitarians and Darwinians should not necessar-

[2] Examples could include fraud, the spreading of misinformation, erosion of trust, environmental degradation, taking advantage of the good intentions of others, the destructive exploitation of public goods, aggressive pursuit of whistleblowers, and the exploitation of vulnerable employees, suppliers, customers, and other stakeholders. Excessive activity in negative sum games in legal grey areas could result in costly public consequences such as the collapse of markets and institutions, expensive clean-up operations, new investments in public goods, and new regulations to protect the environment or children or employees or stakeholders.

ily be interpreted as a disappointing performance by Communitarians, because they have self-selected into a different business environment that could be overall more beneficial for society. As such, the relatively poor financial performance observed by USEs (compared to CSEs) need not necessarily imply that USEs are making a smaller contribution to society. An implication would be that the strong enforcement of existing laws is needed to ensure that Darwinians do not have unfair advantages over Communitarians. Previous research has indeed observed that successful entrepreneurs are often "smart and illicit" individuals with a track record of rule-breaking activities such as shoplifting, robbery, and assault (Levine & Rubinstein, 2017). As such, a large gap between the financial performance of Communitarians and Darwinians could potentially be a clue that Darwinians are getting ahead through unlawful business practices.

3.7 The liminal process of reinventing one's identity as an entrepreneur

The academic career path "typically involves an arduous and lengthy training and socialization process" (Jain et al., 2009, p924) and academics may be reluctant to turn their backs on their hard-won academic identities. The switch from university employee to entrepreneur can be understood as a "liminal process" of deconstructing one's identity as a "scientist" and reconstructing a new identity as an entrepreneur (Hayter et al., 2022). USEs undergo a temporary transition, fraught with uncertainty and tensions, as they undertake identity work to question their academic habits and reflexes, become aware of the misalignment between academic and entrepreneurial environments, and explore new behaviours related to the logic of commercialization (Hayter et al., 2022).

Jain et al. (2009, their Table 1) describe the differences between the norms of the academic and entrepreneurial role identities. Academic norms include Communalism (sharing of knowledge for the public good), Disinterestedness (lack of emotional or financial attachments to one's work); and Organized Skepticism (the need to wait for all the facts before making judgments). These three norms differ dramatically from those of an entrepreneurial identity: Private property (knowledge is hoarded and exploited for private gain); Passion (tenacity and vision for the venture); and Optimism (e.g. for resilience, contagious motivation, and conviction).

Switching from private sector employee to entrepreneur can also be understood as a transition towards a new identity, but it could be argued that this transition covers less "distance" (in terms of changes in logic and values that are guided by being validated by market forces), because of the logic of commercialization that generally supersedes any logic of scientific research in the context of private firms.

For CSEs, the transition to entrepreneur is more likely to be fully completed (rather than lingering unfinished) if there is no going back to the former employer. For USEs, however, there is often the option to return to the previous employer, and USEs may also continue with their academic identities for tasks such as mentoring graduate students, peer review, finishing off research projects, and perhaps even continuing with their academic jobs in parallel throughout the startup process. (Siegel & Wright (2015, p582) state that USEs continuing to work for the university is the "usual" scenario.) Such activities may be useful for USEs in terms of providing reassurances and options amid an uncertain environment, but such activities may also be problematic because they prolong the academic identity and could prevent a clean transition from the academic mindset to fully adopting the entrepre-

neurial identity. Continuing with two identities (academic and entrepreneur), or hesitating about going back to the former identity (when a USE reverts to the academic identity) may be associated with cognitive and emotional loss, low self-esteem, shame, withdrawal, and stigmatization (Hayter et al., 2022).

USEs therefore may be under pressure to continue with two identities in parallel (academic as well as entrepreneur) at least to some extent (Cantner et al., 2024), which comes at the cost of a coherent holistic identity. USEs may try to maintain an academic identity because of notions of maintaining their absorptive capacity, and keeping one's foot in the academic literature to keep abreast of scientific developments. However, this may come at the cost of psychological strain of maintaining two conflicting identities, and could be associated with lower success (lower survival, lower financial performance) of the startup.

Starting a new business is hard enough, without the additional psychological work of having to fundamentally reimagine one's core identity. Furthermore, STEM academics from the "hard sciences" may not fully recognize the power of "soft" variables such as psychological pressure linked to a change in one's core identity, and may fail to appreciate the importance of such factors on overall motivation and well-being.

There could be a role for supporting institutions to monitor the progress of the transition from an academic to an entrepreneurial identity. When asked what is their core identity, USEs should have a clear answer. Replies such as "I'm a scientist but also an entrepreneur" should be seen as a red flag, because it could signal unresolved conflicts and an unclear identity. Better would be a reply such as "I'm an entrepreneur with a background in academia". USEs could also be periodically reminded of the hidden costs of retaining an identity as an academic. USEs could also be "buddied up" to a network of other USEs at comparable stages of the transition from academic identity to corporate identity, to facilitate the liminal process. Finally, USEs may benefit from having role models in their locality, who succeeded in the transition from University to Startup.

4 Knowledge

4.1 Search routines and learning

The top panel of Table 5 compares the search routines for USEs and CSEs.

USEs and CSEs vary in terms of search procedures, approach to knowledge and learning, and gestation activities. Preparing to launch a startup requires searching for new knowledge, but entrepreneurs vary in terms of which questions they ask, which knowledge gaps they are more aware of, and modes of learning. For USEs, learning the knowledge needed for their startup might involve reading a book or article or report, whereas for CSEs, such learning might involve asking for advice, and paying for phone calls with consultants and experts.

The knowledge gaps for USEs often involve tacit knowledge that may not be written up in a codified form: such as knowledge of market opportunities and knowledge of production processes. USEs should be careful to use the relevant mechanisms (conversations with experts, factory visits, advice from experts) to effectively fill in these gaps in their knowledge.

Entrants often neglect many potentially useful gestation activities (Bennet and Chatterji, 2023). USEs, in particular, may be biased towards learning about scientific/technical aspects

Table 5 Knowledge, search, and gestation

	University Startup	Corporate Startup
Search Routines, USEs vs. CSEs		
Search routines	Suppositions and abstract representations, learning before doing (Savage & Ziedonis, 2024)	Interactions with knowledgeable people, listening to advice, paying for consultants
Comparative advantage regarding knowledge	Scientific knowledge base	Production processes and routines, management practices, and also market opportunities (Savage & Ziedonis, 2024)
Gestation activities	Technical/scientific details, refining technical knowledge, technology development	Market opportunities, production costs, supplier networks, industry analysis, testing market demand
Sources of learning	Learning by reading (books, academic journals), academic conferences, learning through reasoned deduction	Conversations with friends and experts, learning by doing, learning by imitating, trade fairs, peer learning through trade associations
Search and Learning During Gestation		
Scientific knowledge	Already got	Not got; if too complex then launch a simpler product in a different industry
Knowledge of market opportunities	Often overlooked. If this knowledge is tacit, then team up with industry partner?	Already got
Knowledge of management and production	Often overlooked. If this knowledge is tacit, then team up with industry partner?	Already got
User knowledge	Easy to obtain through MVP and experimentation. Users are willing to share.	Easy to obtain through MVP and experimentation. Users are willing to share.

of the new product offering at the expense of testing the market to see if customers are hungry. In this vein, the USA's National Science Foundation (NSF) Innovation Corps (I-Corps) program sought to improve commercialization outcomes from academic entrepreneurs, for example advising them to avoid building things that the market does not care about (Hayter et al., 2022, p1481).

The bottom panel of Table 5 suggests that searching for user fit (launching a product offering that addresses customer pain points) is often overlooked. Nevertheless, achieving a good product/market fit, and ensuring that the product/service connects well to market needs, is an important activity that has received much emphasis from entrepreneurship

scholars in the area of lean startup and scaling (e.g. Furr & Ahlstrom, 2011; Ries, 2011; Gil, 2018; Blank & Dorf, 2020).

Although testing the product-market fit is often overlooked, and constitutes a specific advantage of user-based startups (Agarwal & Shah, 2014), nevertheless learning about users is not "rocket science" and it is not usually presented (in the "lean startup" entrepreneurship literature) as something difficult that only "user innovators" can achieve. Instead it involves a deliberate exploration of customer needs and pain points, and customer willingness-to-pay, with crude prototypes and MVPs (minimum viable products) that allow the entrepreneur to pivot towards a more relevant product offering. Product market fit is not something that can be proven or deduced from first principles, it requires experimenting with real-world customers, and hence might not be the usual working style of academics. Nevertheless, it is an important activity that USEs should be encouraged to undertake.

4.2 Knowledge endowments

Table 6 contrasts USEs with CSEs with regards to knowledge endowments. USEs benefit from knowledge endowments in terms of scientific knowledge related to their disciplinary areas, although such domain-specific knowledge may have low fungibility and cannot easily be applied to new areas. USEs also benefit from various kinds of knowledge provided by institutional support from the parent university (Meoli & Vismara, 2016). However, university contexts provide few opportunities for learning about things like market opportunities and industrial production processes.

CSEs arguably are less specialized and better endowed with generalist skills. CSEs possess knowledge of business principles that are relatively fungible across industries. CSEs have specialist skills, such as knowledge of market opportunities and within-industry networks, which is valuable in cases of startups in the same industry as the parent organization. But CSEs are imprinted with a deep understanding of a commercial logic and business processes, which could be useful even when diversifying across industrial sectors, that may not be the case for USEs. USEs bring general-purpose research skills as a knowledge endowment, as these transferable skills could help boost absorptive capacity and improve the efficiency of managing research projects: such skills relating to long-term visions however might not be so valuable for startups struggling with immediate challenges threatening their survival.

Large private-sector firms have many departments and many hierarchical layers. A CSE who did not have a managerial position cannot be assumed to bring superior managerial

Table 6 Knowledge endowments

	University Startup	Corporate Startup
Fungibility of knowledge	Knowledge of scientific areas that is non-fungible across domains	Business principles that are somewhat fungible across industries
Specialist skills	Expertise in their domain of scientific knowledge	Knowledge of market opportunities, procedures and players in their industry
Transferable skills	Familiarity of the research process, which could boost absorptive capacity and allow for faster/cheaper innovation projects.	Deep understanding of how business activities must respect market pressures (financial viability), and that organizations follow orders from the hierarchy

skills as a knowledge endowment from their corporate background, for example. A CSE who was active in the marketing department may not necessarily have deep knowledge of industrial manufacturing processes. Hence, while CSEs may have various skills because of their corporate backgrounds, specific skills cannot be taken for granted because corporations are organizations with specialized departments, and not all CSEs will have the same specialized background. For example, claiming that CSEs are better than USEs in terms of marketing capabilities and manufacturing knowledge presupposes that the same CSE individual has experience in the marketing department as well as the manufacturing department, which will not always be the case.

4.3 Characteristics of the knowledge base

The technological regime affects the rate of entry in an industry, and the intensity and style of innovation (Nelson & Winter, 1982; Breschi & Malerba, 1997). As such, it seems worth applying concepts from the analysis of technological regimes to the study of USEs and CSEs.

Table 7 compares USEs and CSEs according to a number of dimensions. Regarding technological opportunity conditions, USEs may be able to draw on opportunities in the relevant scientific research area, while CSEs may better respond to gaps and opportunities in the current market. Such opportunities may vary in pervasiveness, leading to a niche market or a broad set of related product markets. USEs differ from CSEs with regards to the

Table 7 How characteristics of the knowledge base differ for uses and CSEs, and how this can be the source of specific advantages

	University Startup	Corporate Startup
Opportunity Conditions		
Level	Depends on opportunities in the scientific area	Depends on gaps and opportunities in the current market configuration
Variety	Depends on the available research directions and techniques	Depends whether the industry is still turbulent, or whether it has stabilized (e.g. converged around a "dominant design")
Pervasiveness	Depends on whether scientific breakthroughs have implications for many product/market outcomes	Depends on whether new industry/market knowledge affects multiple products and markets
Sources	Scientific research, advances in equipment, instrumentation, and research methods	In-house R&D and learning, suppliers
Appropriability Conditions		
Level	Low	High
Means	Research papers, sometimes patents; established reputation and scientific credentials, lead time	Patents, trade secrets, lead time and continuous innovation, control of complementary assets
Cumulativeness of Technological Knowledge		
Cumulativeness	Advanced research capabilities enhance cumulativeness	Production capabilities and lead time can enhance cumulativeness
Nature of the Relevant Knowledge Base		
Nature of knowledge	Codified, specific, complex	Tacit, perhaps complex
Means of knowledge transmission	Scientific publications, university education, conferences	Employee mobility, face-to-face communication, learning-by-doing

Applying concepts from Breschi and Malerba (1997) to the case of USEs and CSEs

sources of technological opportunity, hence USEs and CSEs may respond differently to new opportunities and vary in sensitivity to technological developments.

A key area in which USEs differ from CSEs regards the means of appropriation of intellectual property. USEs come from an environment with norms of open publication of research findings (Sauermann & Stephan, 2013), whereas CSEs come from an environment characterised by protection of IP using patents, trademarks and trade secrets. Hence, CSEs may respond better than USEs in the face of threats of appropriability. USEs may also differ from CSEs in terms of their motivations for patenting: "A scientist who patents in order to improve social welfare, for example, may be willing to share knowledge more freely than a scientist who patents in order to appropriate financial returns." (Cohen et al., 2018, p13).

Both USEs and CSEs may benefit from cumulativeness that protects their competitive advantage. Cumulativeness will be higher for USEs that have spent many years investing in their capabilities for scientific research, and such capabilities are hard for newcomers to master. Cumulativeness may also be high for CSEs that draw on a rich background of tacit knowledge of complex business processes, as well as factors such as knowledge of downstream distribution and market channels (Chatterji, 2009), and the ability to manufacture complex components (Argyres & Mostafa, 2016).

4.4 Problem-solving approaches

Considering their differences in culture and search routines, USEs and CSEs may differ in terms of problem-solving approaches.

USEs may tend to face new problems with an analytical approach, breaking down the problem into constituent components and then trying to work things out from first principles. USEs may feel a need to have a solid understanding that comes from knowing the foundations and deducing the answer as a logical process based on first principles. USEs may also enjoy the challenge of scientific problem-solving, and dislike the short-term focus of startups (Jain et al., 2009, p928):

> "At the company you have to be so focused on applications you can't really do basic science."

> "When I was at the university, I was working on 20 different things and having a lot of fun. Once I went into a start-up environment, I necessarily had to focus my effort. You can't afford to work on things that are not offering commercial value in the near term."

USEs may also focus on achieving impressive functionality in technical dimensions, even though such functionality may not always be needed by the market (Park et al., 2024).

CSEs may be able to "engineer" a working solution in a different way. CSEs may be less accustomed to working in isolation, and may have a more social approach to problem-solving, not hesitating to get on the phone and reach out to their networks. CSEs may also be more pragmatic in the sense of tinkering a solution that works, even if the underlying scientific principles may not be worked out in detail.

It has been observed that CSEs better navigate regulatory processes (Chatterji, 2009), presumably because they take a more discursive understanding of regulation. USEs might take rules as fixed, not endogenous. USEs may therefore be unlikely to enter markets with regulatory uncertainty, such as Uber which continued launching its ride-hailing business

without being sure of whether what it was doing was legal, and actually helped to shape the relevant regulations relating to its business, while also morphing into a business what was unrecognizably different from what it looked like at the start (Stone, 2017).

CSEs that are eager to scale up their business may be more amenable to following the paradoxical logic of "doing things that don't scale".[3] For example, Airbnb are well-known for their highly scalable flat-sharing platform, but to reach critical mass they would walk from door-to-door, recruiting new users and helping existing ones improve their listings, for example by taking professional-level photographs of hosts' properties for them. USEs may not have such a practical and unsophisticated approach towards gathering momentum for their business.

5 Management practices

It is often said that CSEs have better management capabilities than USEs. It is not obvious that this should be the case, because management roles can be found in any organization, including universities: "research in industry as well as in academia may involve management, be it as team leader in a firm or as lab director in academia" (Roach & Sauermann, 2010: p430). Private firms do not have a monopoly on management. Sauermann and Stephan (2013, p897) show some summary statistics which suggest that academic scientists supervise more people than their counterparts in industry, which challenges the idea that academics know nothing about management.[4]

Many individuals in firms may not actually be in management positions, hence it is not clear if they actually have management skills. We should heed the suggestion in Sauermann and Stephan (2013, p889) that differences between industrial and academic sectors are overstated, while differences within sectors (academic vs. corporate sectors) are ignored. The distinction between USE and CSE for management experience might be less helpful than distinguishing between the hierarchical position of individuals in USEs and CSEs, e.g. department heads, committee heads in universities, and whether a potential entrepreneur in a private sector firm is merely a line-worker or actually has some management responsibilities.

Similarly, top-down hierarchical command-and-control is not only found in CSEs, but also in academic settings, e.g. being employed as research assistant or post-doc on a PI's project (Hayter & Parker, 2019), co-authoring with a supervisor, and being enslaved to the whims and fads of research councils, journal editors, and (perhaps worse) peer reviewers. Academics may not have as much autonomy as they would like, if they choose their research topics in terms of what is most likely to be publishable.

Hence, when we hear that CSEs have more management experience than USEs, what does this mean? It could arguably be due to different styles of management. University management does not have the best of reputations. Roach and Sauermann (2010, p427, emphasis in original) show some illuminating quotes from survey respondents, such as: "many scientists are NOT good at starting up businesses!"; and "Professors are AWFUL managers and don't try to improve." Another quote they show is on the theme of how academic project managers are torn away from their beloved research project by their management duties: "Too much management involved: you are the team leader, instead of the researcher."

[3] https://paulgraham.com/ds.html [last accessed 31 st August 2024].

[4] See also their footnote 8.

Further hints that the academic management style is less than perfect comes from Sayre's Law:

"Academic politics is the most vicious and bitter form of politics, because the stakes are so low."[5]

A useful lens for thinking about management practices comes from the World Management Survey (e.g. Bloom & Van Reenen, 2010), which is an interview-based evaluation tool that surveys firms from many different sectors, and quantifies firms' performance according to scores for management practices. These management capabilities scores are aggregated over 18 areas that are put into 3 groups ('Monitoring' of what happens inside firms, for purposes of continuous improvement; setting the right 'Targets' and tracking outcomes; and managing 'Incentives' to promote and reward employees based on performance and to hire and retain talent). Box 1 gives a list of these 18 dimensions of management practices, in these three groups (Monitoring, Targets and Incentives).

5.1 Box 1: 18 dimensions for measuring management practices, in Bloom and Van Reenen (2010)

MANAGEMENT PRACTICE DIMENSIONS: Scores from 1 to 5 are given by survey respondents according to their firms' degree of development in each of these 18 areas.

GROUP 1: Monitoring

- Introduction of modern manufacturing techniques
- Rationale for introduction of modern manufacturing techniques
- Process problem documentation
- Process problem documentationw
- Performance review
- Performance dialogue

GROUP 2: Targets

- Target balance (balancing financial and non-financial targets)
- Target interconnection
- Target time horizon (short term vs long term)
- Targets are stretching
- Performance clarity (are performance measures clear and well-defined)

GROUP 3: Incentives:

- Consequence management (whether failure to meet targets has consequences)
- Managing human capital
- Rewarding high performance
- Removing poor performers
- Promoting high performers
- Attracting human capital
- Retaining human capital

[5] https://en.wikipedia.org/wiki/Sayre%27s_law [last accessed 30 th July 2024].

Source: based on Bloom and Van Reenen (2010). For details, please see Bloom and Van Reenen (2010).

USEs may be more motivated by the intellectual appeal of work tasks, rather than responding purely to financial incentives and the desire for power in the organization (El-Awad et al., 2022). Hence, USEs may be less interested in tasks that require repetitive actions relating to mundane administrative areas. Therefore, USEs may be less interested in implementing and enacting routinized tasks such as (looking at Box 1): managing the procedures for documenting process problems; checking up on the performance reviews of employees; engaging in regular performance dialogue with employees; setting targets for employees; and following routines for rewarding high performers. Some particular management practices may be somewhat taboo from the perspective of academic culture: such as removing poor performers; fixing performance targets for others; and evaluating others. Academic culture generally avoids direct monitoring (albeit with exceptions such as the relationship between PIs and post-docs/research assistants; Hayter & Parker, 2019), and academics may be unfamiliar with the task of fixing targets and incentives for subordinates, because such tasks are less common in university contexts compared to corporate contexts.

6 Roles in teams

6.1 Sequential ordering of basic and applied research

Compared to corporate R&D, academic research is oriented more towards basic research as opposed to applied R&D (as discussed in Sect. 4.2). Sauermann and Stephan (2013, p896), in their survey of academic and industrial scientists, observe that "roughly two-thirds of academics are engaged in basic research, whereas more than 90% of industrial scientists work on applied research or development".

As such, academic research can be compared to corporate research in terms of the linear model of innovation, shown below in the flowchart in Fig. 1. "The 'linear model' has been repeatedly criticized, in our view *far too much*" (Dosi, 2023, p137, emphasis in original) – because it nevertheless offers a useful first approximation to the innovation process, even if it is (like all models) an oversimplification (Balconi et al., 2010).

Basic research in pushing forward the bounds of scientific knowledge is an upstream investment. Findings from basic research will be passed on downstream by university researchers, who usually operate from the logic of open science, freely publishing their findings in journal articles rather than seeking to control the related intellectual property. Game theory can be a useful tool for understanding how the gains are shared. Consider a variation of the well-known "ultimatum game"[6] in Fig. 2. In the first stage, academia invests in research, and while the majority of attempts may fail, nevertheless sometimes academic research successfully delivers a potentially valuable invention. (Note that these costs of failure will be borne by academia and not by industry.) Then, in the second stage, industry partners launch the process to bring the invention to market, while making an offer for splitting the pie in a way that may be unfavorable for academia. Industry is in a strong negotiating position, because the invention from academia has now been published, and the costs of academic research have already been paid, while industry has expertise regarding the path-

[6] See https://en.wikipedia.org/wiki/Ultimatum_game (last accessed 30 th July 2024).

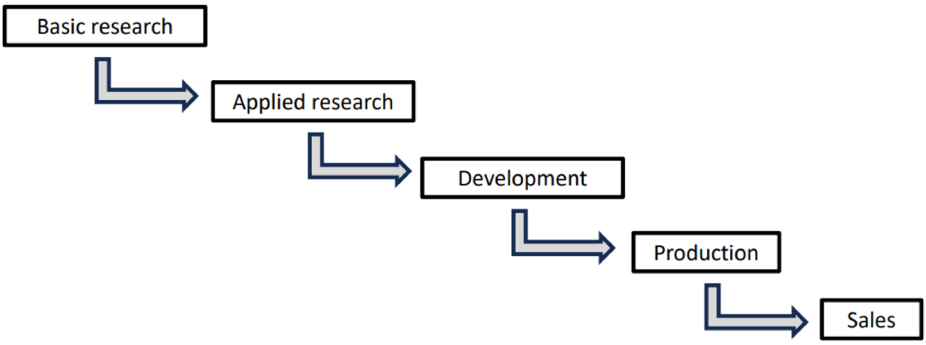

Fig. 1 Linear model of innovation (following Balconi et al., 2010)

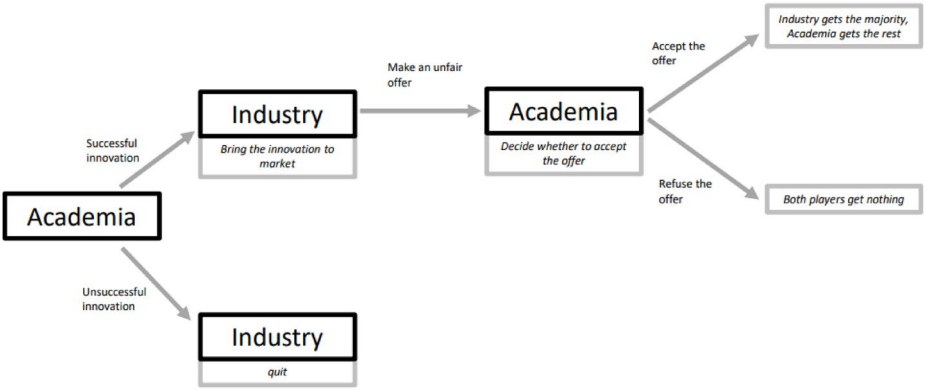

Fig. 2 The well-known ultimatum game, applied to our context of academic and industry entrepreneurship.Source: our elaboration

ways for bringing the invention to the market that it has not yet undertaken. Academia can be expected to accept the offer from industry, even though academia gets a small minority share. Academia is especially likely to accept the low offer from industry, if we recall that academia operates on Communitarian and Missionary principles, rather than profit-seeking Darwinian principles (Fauchart & Gruber, 2011).

Figure 2 therefore serves as a warning that, by pairing up with industry partners, academic spinoffs may receive an unfair share of the rewards, as their expertise is undervalued. One remedy could be to invest in management training for USEs in order to facilitate their transition down the linear model, as illustrated by the culture at Apple:

> "Apple is not a company where general managers oversee managers; rather, it is a company where experts lead experts. The assumption is that it's easier to train an expert to manage well than to train a manager to be an expert." (Podolny & Hansen, 2020, p90).

Training academics to become managers is therefore not considered an insurmountable task per se, although there is the additional problem of whether academics genuinely see themselves thriving in a management role.

6.2 Specialization and roles in teams

Following on from the distinction between USEs (and basic research) and CSEs (and applied research) we can think about how USEs and CSEs might interact if they were put together on the same founding team. Could it be that putting them together on the same founding team would solve all problems by combining their complementary skill sets?

One problem would be that university entrepreneurs would be in a weak negotiating position, because of their upstream investments that they bring as endowments to the venture, paid for by sunk costs, and hence taken for granted. University entrepreneurs may also be less interested in gaining control of the venture, because of their aversion to bureaucratic tasks and repetitive tasks, their disinterested position regarding authority positions, and their relative indifference towards financial compensation (linked to their identity as communitarian and missionary actors instead of Darwinian profit-seekers; Clarysse et al., 2023). El-Awad et al. (2022) describe how their focal USEs willingly gave up power in the venture to focus instead on the more academic activities of technological problem-solving. Academic founders cede power to non-academic founders not only for the sake of avoiding conflict and maintaining harmony: indeed the extent of their abnegation may actually trigger dysfunctional collaborative dynamics (El-Awad et al., 2022, p12). As such, we could expect that USEs would take a back-seat regarding the corporate governance of the new venture (Table 8), preferring to focus on the technical details (rather than the outwards-facing roles) and maybe even accepting lower pay for such a role. As such, "profit-maximizing firms might exploit science for their own purposes" (Stern, 2004, p838), and USEs might accept this outcome.

Another consideration is that the scientific advances made by university research might not "connect" well with CSEs, for example if university research is not perceived as useful or relevant for private firms (Bikard, 2018). One reason for this could be that scientific knowledge from university contexts may be exploratory in nature, and may require additional development prior to being ready for commercialization (Clarysse et al., 2011).

7 Performance of USEs and CSEs

Table 9 summarizes the relevant empirical literature. USEs and CSEs are similar in terms of characteristics of the founders (Coad et al., 2021) and productivity (Pöhlmann et al., 2021). However, USEs have significantly lower performance than CSEs for other outcomes such as sales growth (Wennberg et al., 2011), survival (Park et al., 2024), and successfully reaching a liquidity event (Roche et al., 2020). There is also evidence that USEs have different

Table 8 Pairings with other founders

	University Startup	Corporate Startup
Dominating		✓
Submissive	✓	

knowledge bases and capabilities (Zahra et al., 2007) and benefit from different strategies relating to technological focus (Clarysse et al., 2011).

8 Hypotheses and recommendations for future research

Our broad discussion of USEs and CSEs leads us to the following suggestions of topics that, while being of theoretical interest, have received insufficient attention from empirical research. The following refer to areas such as remuneration, organizational hierarchy, work practices and problem-solving routines.

- When comparing pay in the university sector and corporate sector, how does within-sector variance compare to between-sector variance? For example, is the variation in pay the university sector dwarfed by the differences between pay in the university sector and the corporate sector?
- For USEs and CSEs: a crucially important dimension is the hierarchical level of the person. E.g. if a corporate vice-president or university dean form a startup, this would be very different than if a corporate secretarial assistant or a university bachelor graduate form a startup. Could the hierarchical level be even more important than the USE/CSE distinction?
- What insights emerge from a direct comparison of USEs and CSEs in problem-solving approaches, for example in a laboratory setting? This might shed light on why CSEs often have superior business outcomes compared to USEs.
- Does empirical work find any systematic differences in the search routines, sources of knowledge, and gestation activities of USEs vs. CSEs?
- What are the attitudes of USEs towards useful yet mundane and repetitive tasks such as "things that don't scale" (in Sect. 4.4)? Are USEs different from CSEs in this regard? Are USEs more averse to bureaucratic procedures than CSEs?
- Do academics work on slower timeframes? E.g. are academics slower to respond to emails? What reliable empirical evidence is there?
- What is the link between academic risk-taking (e.g. risk-taking activities of academics in terms of their personal lives, their research style, applications for competitive funding schemes) and academic entrepreneurship?
- User startups are an interesting case (e.g. Agarwal & Shah, 2014; Park et al., 2024). What is the overlap between user startups and CSEs? How would user startups fit in to the USE-vs-CSE tables shown in the present paper?
- Academics need to reinvent their identities as they transition from university to commercial contexts, as discussed. Can these insights be applied to understanding other cases of entrepreneurs reinventing their identities, such as the transition from solo self-employed to employer status, or from informal to formal entrepreneurship (e.g. Laing et al., 2022)?
- It was suggested that USEs stay well within the letter of the law, while CSEs interpret rules more flexibly. Can empirical work detect any relationship between the differential performance of USEs and CSEs, on the one hand, and the degree to which regulations are clear and enforced in different institutional contexts, on the other?

Table 9 Summarizing previous comparisons of uses and CSEs

Reference	Dataset	No. Observations	Dependent variables	Explanatory variables	Results
Zahra et al., (2007)	Mail survey in 5 states, USA	78 USEs, 91 CSEs	Productivity, profitability, revenue growth	Knowledge conversion capability (KCC) indicator, firm-specific controls	The 3 KCC components influence USEs and CSEs differently
Bonardo et al. (2011)	High-tech SMEs that went public in 4 EU countries, 1995–2003	499 high-tech SMEs; 131 of which were university-based firms	Firm valuation, long-run operating performance	Firm and valuation offer characteristics; innovation; TMT advisory roles; ownership; TMT agency roles	An affiliation with a university boosts a firm's valuation, especially when academics are present in the Top Management Team (TMT) at the time of the initial public offering (IPO). In the long run, however, university-based companies have worse operating performance
Clarysse et al. (2011)	Flanders, Belgium 1991–2002	48 CSEs, 73 USEs	Growth of sales and employment	Technology-specific (scope, newness, tacitness, relatedness), age, size, startup capital	CSEs' growth benefits from narrow-focused technologies, while USEs' growth benefits from broad technologies
Wennberg et al., (2011)	Private incorporated companies in Sweden in knowledge-intensive sectors, 1994–2001	528 USEs, 8663 CSEs	Survival, employment growth, sales growth	Parent organization variables, Team human capital variables	CSEs perform better than USEs in both survival and growth. Industry experience matters more than education for CSE & USE performance. The nature of the parent organization matters more for CSEs than USEs

Table 9 (continued)

Reference	Dataset	No. Observations	Dependent variables	Explanatory variables	Results
Hvide and Jones (2018)	All incorporated entrants in Norway, 2000–2007	128 USEs, 452 CSEs, where USEs/CSEs refer to startups by PhD holders	Number of USEs & CSEs, and their survival, sales, employees and profits after the first 5 years	Age, education, marital status, income, and wealth are controlled for but not reported.	Shifting ownership rights from faculty to universities (i.e. abolishing the 'professor's privilege') led to a reduction in number and quality of USEs
Roche et al. (2020)	Crunchbase merged with data on patents, publications, and research recognition	1723 innovative startups in biomedicine, created by 2998 founders	Exit via IPO or acquisition. Also: patents granted, funding raised, receipt of venture capital funding	Patents, funds raised, venture capital funding, team size, gender, state unemployment rate, sector, year	USEs less likely to achieve a liquidity event. However, USEs produce as many patents and receive as much funding as non-academic startups.
Coad et al. (2021)	Danish census data, 2001–2012	443 USEs, 1083 CSEs, and hundreds of thousands of 'stayers'	New firm formation	Rich set of variables on human capital, income and wealth, family background, other personal characteristics, and present employer characteristics	Overall low predictive power: CSEs resemble USEs, few variables are significant. Relatively important role of current employer characteristics

Table 9 (continued)

Reference	Dataset	No. Observations	Dependent variables	Explanatory variables	Results
Pöhlmann et al. (2021)	CSEs vs. "Research-based spin-offs" (RBSOs) from Public Research Organizations (PROs) in Germany	2 separate samples: 177 questionnaires on RBSOs; and 3478 CSEs from the KfW/ZEW Startup panel.	Productivity (i.e. sales/employee)	Age, sector, startup size, firm-level controls	Success factors for RBSOs are similar to those for CSEs
Park et al. (2024)	Population of firms selling commercial CT, MRI, & PET scanners in the USA	81 entrants across 3 subfields of the medical imaging industry: 31 in CT, 30 in MRI, & 20 in PET.	Survival. Unsuccessful acquisitions were coded as exits, while successful acquisitions were coded as survival.	Knowledge sources and other controls. A key distinction is made between USEs, CSEs, and User entrants	User-founded new ventures outsurvive USEs and CSEs. User-founded new ventures often enter niche markets defined by the clinical expertise of their founders and remain in these markets over time.

Source: based on Coad et al. (2021), updated with new references

9 Discussion, recommendations, conclusions

USEs are in an enviable position. They receive generous encouragement, options, and resources from their previous employer to start up their new company (Sect. 3.3). The current setup is such that opportunity USEs are encouraged, while lifestyle USEs are unlikely to appear. However, USEs still seem to under-perform compared to CSEs. Why is this? What can we do about it?

A first problem is that USEs are somewhat out of touch with their customers, more so than CSEs, and a fortiori compared to user startups. How much of a disadvantage is this? Some authors claim that user knowledge is sticky, and cannot easily be acquired, transferred, or used in a new location (Park et al., 2024, p81). The entrepreneurship literature on the "lean startup" approach, however, does not present learning about user needs as an insurmountable barrier; instead it is presented as a necessary yet feasible stage through which all startups should pass (Furr & Ahlstrom, 2011; Ries, 2011; Gil, 2018; Blank & Dorf, 2020). In our view, testing prototypes on the market to find product-market fit is not "rocket science" but is an early-stage activity that is within the grasp of USEs, if they are willing. USEs may have a tendency to withdraw from commercialization activities and revert to focusing on technological problem-solving (El-Awad et al., 2022). While USEs receive broad institutional support in many aspects of their entry activity, it could be argued that a promising area for supporting USEs would be in encouraging them to implement lean-startup principles and overcome the initial liability that they have compared to user

startups, in terms of knowledge of user needs. Policy recommendations could include a role for incubators, accelerators, TTOs, and other supporting institutions (Link & van Hasselt, 2019).[7] Appropriate policy could be that TTOs and similar supporting institutions could encourage USEs to engage more in market testing (validating a customer pain point, and nailing the product design, etc.; Furr & Ahlstrom, 2011; Ries, 2011; Gil, 2018; Blank & Dorf, 2020). This could be done by attaching conditionality to USE support, such that USEs apply modern techniques for exploring customer needs (not necessarily focus groups but testing MVPs (Minimum Viable Products) and seeking customer validation), thereby seeking to erase their performance deficits when compared to user startups.

Indeed, the differences between USEs, CSEs, and user startups need not be symmetric (as discussed in Sect. 6.1). Just because user startups might not be able to acquire the complex scientific knowledge base of USEs, does not mean that USEs would be unable to acquire the knowledge base of user startups (especially when detailed descriptions of the user startup methodology are ubiquitous, e.g. Furr & Ahlstrom, 2011; Ries, 2011; Gil, 2018; Blank & Dorf, 2020).

A second problem holding back USEs is culture and identity. Unlike CSEs, USEs have to fundamentally transform their identity, transitioning from the academic logic of open science, to the corporate logic of closed science. Academics also need to move from a workflow guided by personal curiosity and intellectual appeal, to a workflow of relatively repetitive tasks that are narrowly-focused on short-term financial reward. USEs might lack the patience and motivation for the transition to such a repetitive workflow. USEs might prefer to offload the uninteresting, repetitive and uncomfortable tasks to co-founders and focus on more technical tasks that may be more intellectually challenging (El-Awad et al., 2022) – but such offloading comes at the cost of losing power and authority in the organization, and perhaps even the displeasure of their non-academic co-founders. Other USEs might neglect these important yet repetitive tasks, and miss out on USE growth. USEs will probably reach the stage whether they have to "face the music" and launch into repetitive tasks based on profit-seeking self-promotion. The question is: is this the kind of work that USEs want? Can USEs reimagine and reconstruct their identities in order to make it the kind of work that they actually do want?

The main motivation for USEs is not merely financial incentives. Lam (2011) discusses three motivating forces for USEs: "gold" (i.e. financial rewards), "ribbon" (reputation and career rewards) and "puzzle" (intrinsic satisfaction). Practical implications are that USEs will not be stimulated merely by boosting financial incentives associated with USE success. Academic entrepreneurs might not respond to financial incentives in the same way as employee entrepreneurs. Furthermore, academic entrepreneurs are heterogeneous, and respond to the motivating forces (gold, ribbon, and puzzle) with different intensities, with some being far more motivated by "gold" than others (Lam, 2011). As such, providing support to USEs should not focus on one representative type of USE. Another consideration is that boosting financial incentives for USEs could unwittingly end up encouraging the "wrong" type of entrepreneur, i.e. necessity USEs, formed by untenured university employ-

[7] See however Meoli et al. (2018) for a discussion of how a policy focus on stimulating USEs could be ineffective. A simple focus on boosting the number of startups from universities could lead to a situation whereby USEs enter into non-technical sectors, and respond to local labour market conditions (such as unemployment rates and lack of academic career opportunities) rather than responding to scientific and technological opportunities Meoli et al. (2018).

ees as an escape from precarity, forming non-technical ventures instead of knowledge-based ventures (Meoli et al., 2018).

Asking USEs to engage in advanced learning with users, and to excel in repetitive mundane routine operations and manufacturing seems against their nature. Academics are often driven by curiosity and intellectual appeal, rather than profits. Hence, the transition from academic to entrepreneur is a long and difficult journey, involving more "identity work" than the transition from private sector employee to entrepreneur. Practical implications would be that academic entrepreneurs could be supported (e.g. with mentoring and peer support networks) in the development of a new commercialization-focused entrepreneurial identity. We have developed hypotheses in Sect. 8 that could guide research in this area. There is still a lot to be learnt about the nature of USEs and how they can be encouraged to reach their full potential.

10 Appendix A: a view of authority as a career choice for those who lack pride in their own work: Judges 9: 8–15 (NIV)

https://www.biblegateway.com/passage/?search=Judges%209&version=NIV.

8 One day the trees went out to anoint a king for themselves. They said to the olive tree, 'Be our king.'

9 "But the olive tree answered, 'Should I give up my oil, by which both gods and humans are honored, to hold sway over the trees?'

10 "Next, the trees said to the fig tree, 'Come and be our king.'

11 "But the fig tree replied, 'Should I give up my fruit, so good and sweet, to hold sway over the trees?'

12 "Then the trees said to the vine, 'Come and be our king.'

13 "But the vine answered, 'Should I give up my wine, which cheers both gods and humans, to hold sway over the trees?'

14 "Finally all the trees said to the thornbush, 'Come and be our king.'

15 "The thornbush said to the trees, 'If you really want to anoint me king over you, come and take refuge in my shade; but if not, then let fire come out of the thornbush and consume the cedars of Lebanon!'

11 Appendix B: gestation activities

Bennett and Chatterji, 2023, Appendix 1.

□ Discussed the business idea with a friend, work colleague, or acquaintance.

□ Searched the Internet or stores to explore whether an existing organization already provided the.

service or product that your business would produce.

□ Consulted a friend or acquaintance who was an expert on your target market.

□ Sought out someone you did not already know who was an expert on your target market and discussed the idea with them.

□ Explicitly considered how other firms might respond if you launched the business.

□ Created some sort of document (PowerPoint presentation, executive summary, etc.) to explain the business concept to others.

□ Built a website for the business.

□ Created spreadsheets, financial models, or other numerical analysis to determine feasibility.

□ Wrote a business plan for your proposed business.

□ Made a sale.

□ Built a working prototype or provided the service on a pilot basis.

□ Tested demand for your product or service (i.e., surveys or advertising the business, whether up-and-running or not).

□ Collected feedback from customers who used your product.

□ Used feedback from pilot or demand testing to change business idea.

□ Explored financing options with a bank, investors, or grant program.

□ Applied to an incubator/accelerator program or business plan competition.

□ Registered the business (for a tax ID).

□ Approached a lawyer or accountant or researched the legal or tax implications of starting the.

business.

□ Explored using patents, copyright, or trademark to protect your business idea.

□ Hired an employee (noncofounder).

□ Quit your job to work on the proposed business.

□ None of the above.

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Declarations

Competing interests The authors declare no competing interests.

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