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Spin Doctors vs the Spawn of Capitalism: Who Founds University and Corporate Startups?

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ABSTRACT: We compare individuals presently employed either at a university, or at a firm from a R&D intensive sector, and analyze which of their personal-specific and employer-specific characteristics are related to their choice to leave their present employer for an own startup. Our data set is unusually rich and combines the population of Danish employees with their present employers. We focus on persons who at least hold a Bachelor's degree in engineering, sciences and health and track them over the time period 2001-2012. We show that (i) there are overall little differences between the characteristics of university and corporate startup entrepreneurs, (ii) common factors associated with startup activity of both university and corporate employees are education, top management team membership, previous job mobility and being male, (iii) it is exclusively human capital-related characteristics that are related to startup choice of university employees while (iv) the characteristics of the present workplace are the foremost factors of entrepreneurial activity by corporate employees.

JEL Classification: L26, I23, O31, O32

Keywords: university startups, corporate startups, founder characteristics

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1. Introduction

While there is substantial corporate and university startup activity across the world (Feldman et al. 2002; Gubitta et al. 2016; O'Shea et al. 2008; Peng 2006) and these startups contribute significantly to technological progress (Franco and Filson 2006; Shane 2004; Lockett et al. 2005a,b; Zahra et al. 2007), little is known about the personal characteristics of the founders of these ventures. Similarly, differences in personal characteristics between corporate and university startup entrepreneurs are hitherto largely unexplored. Such a lack of knowledge is surprising since the characteristics of startup founders map into differences in motives and incentives (Åstebro and Thompson 2011; Shane et al. 2003; Sauermann 2017) and differences in the characteristics of entrepreneurs in turn may feed into subsequent performance differentials (Arora and Nandkumar 2011; Ding 2011; Klepper and Sleeper 2005; Morton and Podolny 2002; Sauermann 2017). The knowledge gap makes it difficult for human resource managers to design appropriate employee retention and development policies and for policy makers to design appropriate entrepreneurship promotion schemes that may need to be different for founders from universities and for founders from corporations.

To accurately describe the factors that push scientists, i.e. holders of at least a Bachelor's degree in science, engineering or health, from alternative types of dependent employment into entrepreneurship, we use register data that tracks the entire population of Danish residents between 2001 and 2012. We differentiate between (i) "university startup entrepreneurs" (USEs), individuals who found a firm after a spell in university employment and (ii) "corporate R&D startup entrepreneurs" (CSEs), individuals who found out of an employment spell at a firm in R&D intensive industries. Like Wennberg et al. (2011), who use Swedish register data akin to ours to compare university and corporate spinoffs, our focus is on R&D intensive industries in order to make corporate startup activity similar to university startup activity. While existing work had to focus on fairly restrictive sets of control variables, and even Wennberg et al. (2011) exclusively rely on human capital variables, the richness of our data allows us to include accurate and detailed measures of not only human capital but also of income and wealth, family background and characteristics of the present workplace. The set of variables we consider very closely resembles the type of information contained in CVs that are at the disposal of human resource departments as well as non-governmental and governmental entrepreneurship promotion agencies.

We make three contributions to existing work. First, we add to the literature on the antecedents of transitions into spells of entrepreneurship (Nanda and Sørensen 2010; Sørensen 2007a; Stuart and Ding 2006) and the literature on the characteristics of startup founders (Ouimet and Zarutskie 2014; Sauermann 2017) by linking detailed individual-specific and present employer-specific information to entrepreneurial choice. Other studies, like Clarysse et al. (2011a), Colombo and Piva (2008), Ensley and Hmieleski (2005) as well as Wennberg et al. (2011) also compare university and corporate startups but exclusively deal with performance and use data on more mature firms.[1] Second, we compare founders from universities to founders from R&D intensive industries while existing research has to date mainly focused on university startups to the exclusion of corporate startups (Wennberg et al. 2011). If USEs and CSEs indeed differed from one another in terms of their observed personal characteristics, this may partly explain the observed differences between the post entry behavior of firms that originated in the public

[1] Ensley and Hmielski (2005) even use data selected on the performance variable by comparing fast growing corporate spinoffs to university startups to find that university spinoffs grow faster than corporate spinoffs.

research domain and other high-tech startups (Clarysse and Moray 2004; Colombo and Piva 2012; Ensley and Hmieleski 2005; Klepper and Sleeper 2005). If their personal characteristics are similar, performance differences are likely to be driven by "inheritance effects" — tacit and codified knowledge passed on to the entrepreneur by her previous employer (Agrawal et al. 2016; Clarysse et al. 2011b; Wennberg et al. 2011) — or by unobserved (to us) personality traits. Third, we add to the literature by operating with exceptional high-quality data. The entrepreneurship literature and in particular its strand that deals with university startups has long been plagued by data problems, most importantly biased samples, a focus on specific industries, data provided by technology transfer offices and lack of meaningful comparison groups (Elfenbein et al. 2010; Rothaermel et al. 2007).

We find that only few factors have a significant effect on startup activity, despite our large and comprehensive set of explanatory variables. Factors that are significantly positively associated with both university and corporate entrepreneurship are top management team (TMT) membership, being male and previous job mobility. A Master's degree in engineering, self-employment experience from secondary employment, the number of patents an individual holds and family wealth constitute additional significant variables for university employees. For CSEs we find a positive relation between self-employment choice and a high relative position in the own employers income distribution as well as father self-employment. Own employer size and own employer patent stock are negatively related to self-employment for corporate scientists. USEs and CSEs are overall surprisingly similar to one another in terms of the factors associated with becoming an entrepreneur. The only few variables with significantly different relations to self-employment are the field and the length of education, self-employment experience and the number of own patents. Overall, startup activity by both USEs and CSEs is a rare event, and it is much rarer than in studies not based on population data, as only 0.36 percent of university employees and only 0.64 percent of high tech sector employees found a startup in any given year.

Our paper proceeds as follows: Section 2 provides our theoretical background. Section 3 discusses our data set in greater detail and delivers key definitions. Section 4 provides descriptive statistics and presents estimation results for entrepreneurial choice. Section 5 concludes.

2. Background

Spinoffs occur when employees leave an existing employer to start a new entrepreneurial venture, usually to exploit a new opportunity that was based on knowledge obtained during the time spent with the previous employer. An important feature of spinoffs is the transfer of knowledge (Dahl and Sorenson, 2014), possibly contained in valuable innovations developed at their prior employers. Spinoffs may also benefit from preferential access to resources such as social connections (Dahl and Sorenson, 2014). Another useful distinction is that spinoffs may involve the departure of an individual, or of a team (Ganco, 2013).

We begin by discussing different types of spinoff in Section 2.1 (university spinoffs, corporate spinoffs) before contrasting them in Section 2.2 and developing some broad research questions in Section 2.3.

2.1 Types of spinoff

The previous literature, to which we contribute, has focused on comparing university spinoffs and corporate spinoffs (Clarysse et al., 2011; Wennberg et al., 2011; Zahra et al., 2007), thereby distinguishing between universities and firms as sources of knowledge for entrepreneurship.[2] These two are introduced and discussed in turn.

2.1.1 University Startup Entrepreneurs (USEs)

Academic engagement can take many forms, such as collaborative research, consulting, sponsored research, contract research, patenting, and academic entrepreneurship (Perkmann et al., 2013, their Table 3). In this paper, we focus on academic entrepreneurship, i.e. new firm formation by individuals coming from universities.

We begin with the USO definition put forward by Agarwal and Shah (2014, p1114, emphasis in original): "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 the definition of Agarwal and Shah refers to those who innovate in a research context, others require that the founders (or at least one member of the founder team) must have studied or worked at a university (Dorner et al., 2017, p2).

We define university startup entrepreneurs as persons who are employed at a university in year t and work in a new firm in year $t + 1$. Our mobility-based definition is well in line with existing studies (Clarysse et al. 2000; Druilhe and Garnsey 2004; Fini et al. 2011; Klofsten and Jones-Evans 2000; Rappert et al. 1999; Rogers et al. 2001; Smilor et al. 1990; Steffensen et al. 1999; Visintin and Pittino 2014). It is, however, much broader than in Shane (2004) or much of the existing literature that requires both a mobility event to occur and the formal transfer of IP from the university to the startups (Clarysse and Moray 2004; Colombo et al. 2010; Nicolaou and Birley 2003a,b; O'Shea et al. 2008; Lockett et al. 2005a,b; Roberts and Malone 1996; Rothaermel et al. 2007; Zahra et al. 2007). This is also why we use the term "startup" instead of "spinoff", hence preferring the broader acronym USE (University Startup Entrepreneur) to the more restrictive acronym USO (University Spin Off), where the latter can be considered to be a subset of the former. A key advantage of our broader definition is that it avoids problems with the definition and transfer of knowledge and IP that was developed by the founder during his/her time at the university, and that it does not focus on high-technology industries like software or semiconductors (Braun and Macdonald 1982; Buenstorf and Fornahl 2009; Heirman and Clarysse 2007; Klepper and Sleeper 2000), disk drives (Christensen 1993; Franco and Filson 2006) or, more generally, IP-based startups only.

USEs come in many shapes and sizes. The prototypical USE in the minds of the broader public involves a university professor starting a successful high-tech venture. However, this stereotype need not represent all USEs. USEs could also correspond to junior faculty or staff (Agarwal and Shah, 2014), and also to graduate students (Dorner et al., 2017; Hayter et al., 2017; Wright, Siegel and Mustar, 2017) and may even include alumni startups (Müller 2010; Siegel and Wright, 2015, Table 1).

[2] Agarwal and Shah (2014, p1119) also put forward the third category of knowledge sources for entrepreneurship: user innovators. "User entrepreneurship is defined as new venture creation by individuals based on innovations aimed initially toward satisfying their own needs for a new or improved product or service, and subsequently produced and sold to others". Research into user innovators is still in its infancy and uses small sample sizes (Agarwal and Shah, 2014). Also, comprehensive data on user innovators is not available in archival datasets. In keeping with previous literature, we focus on USEs vs CSEs.

USEs could hypothetically correspond to firms started by administrative staff such as secretaries, according to the definitions above. However, according to the Agarwal and Shah (2014) definition, the administrative staff would have to exploit the knowledge developed at the university. This "knowledge developed at the university" could refer to either the transfer of specific research results, or the transfer of specific skills and competencies acquired (Dorner et al., 2017, p2). These latter are arguably impossible to measure. In our analysis, we only consider individuals with at least a Bachelor's degree, to ensure that only those individuals with a minimum university education and hence with a minimum probability to have actually acquired relevant knowledge are included in the USE (and CSE) category. Furthermore, in our data we are unable to detect whether the USE involves knowledge developed at the university, or whether the new venture is unrelated to the knowledge developed at the university.[3] For example, a researcher from a cancer research institute who started a flower shop would be treated as a university start-up entrepreneur in our analysis. However, we consider that, even in the case of new venture creation based on entirely unrelated technical knowledge, nevertheless the culture and practices at the spawning organization must have had at least some influence on the emerging new venture (e.g. perhaps through a scientific approach to management and logistics, routines for managing accounts, and a collegial atmosphere with a flat hierarchy, at the flower shop). Therefore we focus instead on individuals with at least a Bachelor's degree who were previously employed in a university and who leave to start their own business.

A defining characteristic of universities is their culture of having a "taste for science" and prioritizing science over the pursuit of profit. University employees may adopt a "scientific" mindset, which could mean that they try to step backwards and infer laws and abstract theories from observations of reality, instead of taking the opposite "engineering" approach of reconfiguring resources on a trial-and-error basis ("messy tinkering") to address speculative future market needs (Nightingale, 2014). Furthermore, the relative freedom of university employees from market forces and contact with clients means that they have less management and marketing knowledge. Academics are often criticized for their lack of understanding of the commercial world (Boehm and Hogan, 2014). According to the stereotype, deadlines are less strict, and academia moves along at a glacial pace. There is also a culture of flat hierarchies (at least within academic departments) such that employees are not under constant supervision and monitoring, but are given considerable autonomy to carry out their tasks, the completion of which requires their specific knowledge and initiative. Such a culture of autonomy and "being one's own boss" is normally taken as one of the hallmarks of entrepreneurship (Benz and Frey, 2008). In addition to autonomy, another reason why academics are expected to be "entrepreneurial" by nature is that they must often be "jacks-of-all-trades" because of their various roles in managing research projects and acquiring resources, on top of their traditional roles of teaching, supervision, maintaining scientific awareness, and evaluating opportunities for scientific research (Boehm and Hogan, 2014).

We therefore suspect that few USEs take place because of the motivation of "being one's own boss". In addition, given that universities usually have flat hierarchical structures, that allow considerable autonomy to university employees in a collegial atmosphere, we argue that the proverb *"people don't quit a job, they quit a boss*" (Goler et al., 2018) is less relevant for university employees than for corporate employees. Furthermore, because of the autonomy enjoyed by university employees, and their personal

[3] This remains a difficult challenge for spinoff research. To our knowledge, detailed knowledge on the technologies transferred through spinoffs is not available in any census dataset.

responsibility in choosing their tasks (especially for research staff), they would not leave a job for the oft-heard reason that they felt their skills and strengths were not being used. For these reasons, we expect that present employer characteristics could have a more prominent role for CSEs than for USEs.

This "entrepreneurial" culture is shared by all members of the organization, and therefore we consider that USEs are not exclusively the domain of professors or faculty, but also students, and even potentially administrative staff. This is in accordance with the definitions of university entrepreneurship in Agarwal and Shah (2014) as well as Dorner et al. (2017). However, we expect that few purely administrative staff will spin out of a university to start their own firm if there is no knowledge component, because the organizational norms of collegiality and autonomy reduce the "lifestyle" motivation for entrepreneurship, and university administrative staff does not usually lose its jobs because the culture is often sheltered from the threats of market competition that prevail in profit-seeking sectors of the economy (hence, also reducing the "necessity" motivation for entrepreneurship as an alternative to unemployment). A fortiori, core university faculty with secure, reasonably well-paid employment would not leave their jobs for a high-risk venture unless the expected gain was very high. In robustness checks, we test for any differences that formal education and academic rank may make to the decision to leave academe for a startup.

On the one hand, academics could generally be less likely to start up a new venture. For academics, who are primarily motivated by science, the profit motive is less intense (Stern, 2004). Academics may be reluctant to pursue opportunities if there is no scientific component to the work task: "Particularly when collaborating with the best academic researchers, firms need to take into account that these academics will under most circumstances only work with them if there is also some academic benefit to be derived" (Perkmann et al., 2013, p433). Hence, this might reduce the number of startups from universities as compared to the number of startups from firms. On the other hand, academics could be more likely to start up a new venture. Academics, who are closer to the cutting edge of science, might be in closer contact with the emergence of new technological opportunities, and their scientific training may give them the "absorptive capacity" to better recognize technological opportunities. Overall, therefore, the propensity of academics to start up a new venture is an empirical question.

Academics may be lacking in some more practical areas of high-tech entrepreneurship. For example, while academics may understand emerging scientific principles, there may be a different skill-set in embodying this scientific understanding in technological artifacts and patent-protected business applications of these scientific principles. Indeed, there is no deterministic pathway from science to technology (for example, there are many instances such as aeroplanes where the technology was developed ahead of the underlying science; Nightingale, 2014). Academics are also less familiar with operations and business processes in firms, which could explain why academics are often more likely to generate product innovations rather than process innovations (Agarwal and Shah, 2014).

Finally, academics are less familiar with issues relating to marketing, commercialization and distribution, which are complementary assets that are crucial to the success of innovative firms (Teece, 1986). Entrepreneurs with a university background do not always have the complementary assets to be successful at entrepreneurship (Siegel and Wright, 2015). Mathisen and Rasmussen (2019) suggest that USEs are endowed with weaker product and business development capabilities than CSEs.

Academics may therefore be ill-prepared for the various iterations of innovative products and services that are required to find a good fit with customer needs (Ries, 2011), because customer needs and tastes can be poorly defined, difficult to measure, and therefore "unscientific".

Academics often evaluate opportunities in terms of scientific merit and novelty rather than commercial potential. This could lead them to form business networks of prestigious scientists, and to overlook the importance of including individuals with business experience in their networks. As a consequence, it has been suggested that "it is important for USEs to include in their founding teams individuals who hold relevant experiences outside of the university, but that relatively few teams do so" (Wennberg et al., 2011, p1138).

It has also been suggested that academics lack managerial experience. However, considering that CSEs need not be formed by employees from managerial positions, this could also be said to be true for CSEs.

2.1.2 Corporate Startup Entrepreneurs (CSEs)

CSEs appear under many different labels, such as "intra-industry spin-offs" (Klepper, 2002), "spinouts" (Agarwal et al., 2004), and "employee entrepreneurship" (Agarwal and Shah, 2014), and are defined as "new venture creation when employees of existing firms found a firm in the same industry."

The prototypical CSE as observed by the broader public is probably founded by a patent-holding manager of a high-tech manufacturing firm. However, not all CSEs need to be like this. Many CSEs are founded by individuals who are not managers – and therefore may not even have managerial experience. While some empirical studies have only collected observations on CSEs if the CSE entrepreneurs have patents (e.g. Ganco, 2013), nevertheless this does not necessarily mean that firms can only qualify as CSEs if the CSE entrepreneurs have patented.

We define CSEs as individuals who are employed in a high tech firm in year t and who found a new firm in $t+1$. We hence again apply a broad startup definition that does not take into account the formal transfer of ownership rights as often considered by existing studies on corporate startups (Lindholm, 1997; Parhankangas and Arenius, 2003). because we do not observe the transfer of technology or IP from the initial corporate context to the new venture. Since we do not observe the transfer of technology or IP from the initial corporate context to the new venture, we prefer the term CSE to CSO.

CSEs benefit from various types of useful knowledge, such as entrepreneurial capabilities, industry-specific knowledge, operational knowledge, and technical and market know-how to enable product innovation (Agarwal and Shah, 2014).

Some authors argue that CSEs are valuable because of the managerial experience they may have gained at their previous employer (e.g. Agarwal and Shah, 2014). However, there is nothing in the definition of CSEs that requires that CSEs can only involve managers at firms. CSEs could also include secretaries and administrative staff, according to some empirical operationalizations. Dahl and Sorenson (2014) observed that spinoff entrepreneurs had less managerial experience than non-spinoff entrepreneurs (i.e. those entering industries in which they did not have experience). We think it is worth clarifying that CSEs can notionally be undertaken by secretaries and administrative staff. However, in our empirical analysis, we can disaggregate by subsamples of individuals (e.g. by age,

patentholder status, academic degree) to approach subsamples of individuals that are more likely to have management experience.

One of the valuable assets of CSEs is their social capital that was accumulated during their time at the firm. This can be a source of industry knowledge and networking capital. Dahl and Sorenson (2014) observe that corporate spinoff entrepreneurs are able to hire higher-quality employees.

2.2 Contrasting CSEs and USEs

While the CSE definition refers to startups in the same industry, this does not make sense for USEs, instead there is the notion that USEs should directly exploit the knowledge developed at the university. This latter notion is vaguely defined, however, and open to different interpretations. Dorner et al. (2017) distinguish between USEs that transfer research results and new scientific methods or techniques ("transfer spinoffs") and USEs that transfer specific skills acquired by founders during their university work ("competence spinoffs"). This latter type of spinoff can arguably include all conceivable instances of entrepreneurship by university employees, because skills and practices learnt at one workplace will somehow be transferable to new contexts, even those that appear to be unrelated at first glance. To take into account the different role of knowledge transfer in entrepreneurial motivations, we repeat our analysis on various subsamples (e.g. on subsamples of patent holders, whose new firms presumably have a higher technological component).

Individuals may choose to spin out because of disagreements with the previous employer's management practices or disagreements over the commercial value of the business opportunity (Dahl and Sorenson, 2014, p672; Garvin, 1983; Klepper and Sleeper, 2005; Klepper and Thompson, 2010). This is a feature of CSEs and not USEs, though, because in university settings, researchers often have some freedom to indulge their curiosity about what are potentially promising directions for research.

A commonly-held view is that academic entrepreneurs may lack the leadership experience and management experience that can be found in private sector employment (e.g. Colombo and Piva, 2012). Hence, USEs may have a deficit regarding their leadership and management capabilities. However, this need not be the case, because there are many leadership and management positions in universities as well, and many individuals in private-sector firms are not in management positions either. Furthermore there is nothing in the standard definition of CSEs that restricts CSEs to being founded by those private-sector employees in management positions only.

University spinoffs may correspond to hybrid entrepreneurship (Folta et al., 2010) whereby faculty keep their positions at the university despite being involved in the spinoff (we perform a robustness check to exclude such hybrid entrepreneurs). This is less relevant for CSEs but it is relevant for USEs. In this vein, Nicolaou and Souitaris (2016) distinguish between "academic stasis" and "academic exodus" regarding whether a USE entails the departure of faculty from a university.

Employment at universities may be more stable than employment at private firms, because exit rates at universities are lower than for private firms, and because universities (with their public funding) may be somewhat sheltered from the competitive pressures of market forces. This may raise the opportunity cost for USEs (compared to CSEs) to leave behind a relatively stable job. However, USEs have the option to hold onto their university jobs even after launching their venture, in the context of "academic stasis"

(Nicolaou and Souitaris, 2016). Furthermore, it might be easier for USEs to return to their previous university employment than their CSE counterparts, if USEs can negotiate some type of option to return.

Although CSEs and USEs play a vital role in industrial innovation, and are theoretically interesting phenomena due to how they incorporate knowledge from heterogeneous sources, nevertheless there is relatively little empirical work that compares CSEs and USEs (Agarwal and Shah, 2014).

The literature has traditionally focused on comparing university spinoffs and corporate spinoffs (Zahra et al., 2007; Clarysse et al., 2011a; Wennberg et al., 2011), although some scholars have compared USEs with a comparison group of "new technology based firms" (Colombo and Piva, 2008; Ensley and Hmieleski, 2005; Mathisen and Rasmussen, 2019) or high-tech startups (Dorner et al., 2017). Here we prefer to compare USEs with CSEs, to better capture the notion of transfers of knowledge from the parent organization (universities or parent firms) into a new venture.

Table 1 summarizes the previous empirical literature. A first observation is that most previous studies have focused on small samples (Clarysse et al., 2011a). Also there is a gap in the literature regarding the role of human capital, income and wealth, and family background characteristics. Furthermore, previous studies have looked at firm performance variables (in particular, sales growth) but not the actual startup decision. We therefore contribute to the literature by providing large-sample representative evidence, using a rich set of explanatory variables, to investigate the factors associated with university and corporate startup entrepreneurs.

[Table 1 about here]

2.3 Research questions

Research into USEs and CSEs has a tradition of being empirical and phenomenological rather than theoretical. Perkmann et al. (2013, p425) write that "research on academic engagement has produced predominantly phenomenon-focused studies." Our paper aligns well with this stream of literature. It is an exploratory quantitative analysis of a rich dataset that contains a large number of relatively novel variables relating to human capital, income and wealth, family background, and other personal characteristics. As a consequence, it would not be appropriate to develop a large number of hypotheses regarding the expected results (Helfat, 2007). Nevertheless, we put forward some broad research questions, to orient our analysis and the interpretation of the results.

A first theme is that USEs may lack the resources, social capital, and complementary assets required for taking a novel idea or a scientific invention all the way to the marketplace. USEs have on average little knowledge of operations as well as manufacturing processes and marketing and customer characteristics. Therefore, we expect that USEs whose founders have higher personal income, and higher personal and household wealth, as well as higher social capital and business networks (as proxied by being a member of the top management team) are more likely to overcome these resource constraints and to put together a credible USE business. These factors may be less binding for CSE founders than for USE founders.

A second theme is that the education field is expected to matter. Education fields vary a lot in terms of characteristics of the knowledge base (complexity, knowledge cumulativeness, technological opportunity, and so on) as well as other factors such as

complementary assets and appropriability instruments (Agarwal and Shah, 2014). Ganco (2013) shows that the complexity of knowledge has an influence on the different options faced by potential CSE founders in terms of staying with their employer, switching to a rival firm, or starting a CSE alone or with a team of co-inventors. In some disciplines it is easier to transfer a scientific discovery into a commercial product. In some disciplines, existing mechanisms for the protection of intellectual property can act as a deterrent for entry by small-scale ventures (Hall et al., 2015). In some disciplines, practical experience and availability of complementary assets may be easily available due to institutional factors, for example, if medical researchers are frequently exposed to medical practice in the context of university hospitals. We therefore test how our results vary across educational fields – natural sciences, engineering, and health – in our robustness analyses.

A third theme is that individuals may found a new business for reasons that are not objectively linked to the business opportunity itself, but because of an individual's entrepreneurial spirit.

This could be captured to some extent by an individual's self-employment experience – presumably those with entrepreneurial experience are more alert to business opportunities and less hesitant to exploiting these opportunities through entrepreneurial entry.

Relatedly, the self-employment history of the parents may increase the likelihood of entrepreneurial entry, through channels such as exposure to a role model, and exposure to an entrepreneurial mindset and decision-making (Laspita et al., 2012). Furthermore, it has been shown that work experience at a larger number of workplaces is associated with a higher probability of self-employment, because highly mobile individuals may have a "taste for variety" or discomfort in standard employment contexts that pushes them to start their own businesses (Frederiksen et al., 2016). Therefore we suspect that these variables (years of self-employment experience, mother's and father's self-employment experience, spouse's self-employment experience, and number of different workplaces) will have an impact on USE or CSE formation. Furthermore, we expect that these variables have a stronger role for stimulating CSEs than USEs, because university environments already offer some of the advantages of an entrepreneurial lifestyle in terms of autonomy and "being one's own boss".

3. Data and definitions

3.1 Data

The backbone of our database is the "Integrated Database for Labour Market Research" (IDA) which has been used by social scientists for decades (e.g. Christensen et al. 2005; Eriksson 1999; Dahl and Sorenson 2012; Nanda and Sørensen 2010; Sørensen 2007b; Sørensen and Sharkey 2014; Westergaard and Jensen 1987). IDA is a matched employer-employee register dataset which covers all employers and employees in Denmark from 1980 onwards on an annual basis. The Integrated Database for Labour Market Research was developed in the 1990s on the basis of state pension scheme contributions introduced in 1964 which is obligatory for all employees. The database has been extended ever since, and now includes many dimensions of economic activity and individual background characteristics – the latter being added by means of Danish individual-specific identifiers that have widespread applications in interactions with the public sector, e.g., tax collection, house ownership, healthcare or education.

The firm-level data was initially based on administrative units that identified single employers, but after the introduction of new firm identifiers in 1999, the organizations defined by these identifiers have become the standard mainstay of analyses of Danish firms. Firm register data is mostly collected by the Danish Business Authority and the Danish Tax Authority. These sources feed into the firm data for this analysis, which is supplied by Statistics Denmark, and which is the only provider of firm data that can be matched with detailed person data.

The use of Statistics Denmark data has the benefit that it is standard for Danish entrepreneurship research, and, thus, allows the analysis of two generations of comparable raw data: the Statistics Denmark employer-employee data, and more lately, the Statistics Denmark Entrepreneurship Database.

The general Statistics Denmark employer-employee data based on the Integrated Database for Labour Market Research has been applied, by, for example, Sørensen's (2007b) analysis of the implications of organizational contexts on entrepreneurship, and Eriksson and Kuhn's (2006) analysis of corporate spinoffs.

Unlike older studies like Malchow-Møller et al. (2011) which needed to define startups based on several different data sources, more recent work benefits from a coherent dataset that allows the identification of startups, the Danish Entrepreneurship Database provided by Statistics Denmark which was established in 2005. It has become the standard database for entrepreneurship research on Danish firm register data, and has already found applications in Dahl and Sorenson's (2009) analysis on entrepreneurship location choices, and the importance of location choice for start-up performance (Dahl and Sorenson, 2012). The Entrepreneurship database presently spans the time period 2001-2012.

The Danish Entrepreneurship Database is partly based on Statistics Denmark's data that is inaccessible to researchers or prohibitively difficult or expensive to access and process, and which has found its way into the generation of the Entrepreneurship database – in particular the identification of the individuals to be considered as the entrepreneurs behind the companies.[4]

The main conditions for inclusion in the Entrepreneurship database are that the firms in question are indeed new firms instead of the outcome of mere organizational restructuring, and that their activity levels in terms of employment and turnover are above industry-specific minimum thresholds. The latter implies that the Entrepreneurship Database does not sample new firms that first experience minimum measurable activity in subsequent years.

3.2 Definitions

Given the broad background of our data we now describe how we define USEs and CSEs – the two key definitions employed in our paper before turning to the description of our rich set of explanatory variables we use in our empirical analyses.

[4] The Entrepreneurship Database has the benefit of being a standard data product that can be bought off the shelf from Statistics Denmark, leaving potential headaches of data generation to Statistics Denmark. On the flip side, researchers need to accept DST's sampling conditions and ways of treating the data, some of which are poorly documented.

University startup entrepreneurs

We define university startup entrepreneurs as persons who are employed at a university in year t and appear in the entrepreneurship database in year $t + 1$.[5]

Universities are defined according to NACE Rev. 1. We restrict attention to sector 80.30, "Higher education".

Corporate startup entrepreneurs

Corporate startup entrepreneurs are analogously defined by a mobility event. CSEs are individuals with an employment relationship in a firm from a high tech sector in year t who are founders in year $t + 1$. High tech sectors are defined according to Eurostat as high technology manufacturing industries or knowledge-intensive services.[6]

3.3 Explanatory variables

The richness of our data allows us to draw a detailed and accurate picture of entrepreneurs in Denmark. We consider four main sets of personal characteristics that may explain university startup activity (Shane, 2004) and startup activity more generally (Roberts, 1991; Sauermann, 2017): (i) human capital (Beckman et al., 2007; Blanchflower and Oswald, 1998; Davidsson and Honig, 2003; Evans and Leighton, 1989; Evans and Jovanovic, 1983), (ii) income and wealth (Blanchflower and Oswald, 1998; Holtz-Eakin et al., 1994; Sauermann 2017), (iii) family background (Davidsson and Honig, 2003; Dunn and Holtz-Eakin, 2000; Fairlie and Robb, 2007) and (iv) other personal information like gender, previous job mobility or immigration status. In addition, we study (v) the extent to which an individual's current workplace matters for future startup activity (Elfenbein et al., 2010; Nanda and Sørensen, 2010; Sauermann, 2017; Stuart and Ding, 2006).

Human capital

The quality of the startup team constitutes an important predictor of entrepreneurial choice and startup success as emphasized by Hambrick and Mason (1984), Heirman and Clarysse (2004), Eisenhardt and Schoonhoven (1990, 1996), Mustar et al. (2006), as well as Shane and Stuart (2006). This quality is empirically often measured by age, education, job function and educational background (Amason et al., 2006; Beckman et al., 2007; Landry et al., 2006) which all are elements of an individual's human capital (Davidsson and Honig, 2003).

We consider both the type and the level of formal education as in Elfenbein et al. (2010) and Sauermann (2017). All individuals in our data at least command over a Bachelor's degree, so we additionally account for individuals holding a MA or a PhD. Stuart and Ding (2006) show that holding a PhD degree increases the likelihood of becoming an university startup entrepreneur. More education is related to better analytical skills and information about business opportunities, as pointed out by Casson (1995) as well as Parker (2009), and provides a larger set of personal opportunities (Gimeno et al. 1997),

[5] Our focus on recent mobility events as in Druilhe and Garnsey (2004) is narrow given that McMullan and Vesper (1987) document lags of up to nine years between leaving MIT and starting a firm that is based on knowledge generated during an employment spell at MIT. In another survey-based study Müller (2010) finds that up to 40 years may elapse between university employment and a related startup with a mass that, however, is between zero and ten years.

[6] Eurostat indicators on high-tech industry and knowledge-intensive services. URL: https://ec.europa.eu/eurostat/cache/metadata/Annexes/htec_esms_an3.pdf

including a richer set of outside options and promotion opportunities. A meta-analysis by van der Sluis et al. (2005) shows that the majority of studies finds a negative relation between self-employment choice and education. We distinguish between three different fields of education: natural sciences, engineering and health sciences (Colombo and Piva 2012; Elfenbein et al. 2010).

Past working experience constitutes yet another important part of an individual's human capital by endowing individuals with direct training and providing them with professional contacts (Zahra et al., 2007) as well as social ties more generally (Delmar and Shane, 2004; Nicolaou and Birley, 2003a). Landry et al. (2006) show a positive association between working experience and entrepreneurial activity. We consider an individual's overall years of working experience as well as years of self-employment experience since Shane (2003) associates previous with present startup activity. In addition, we construct a dummy variable that is coded one if a person receives a side-income from self-employment. Such income is typically generated from consultancy side-jobs and we interpret this variable as measuring "some" links to self-employment. The importance of such activities for later entrepreneurship is highlighted by Aldridge and Audretsch (2011) as well as Nicolaou and Birley (2003a). Previous spells of self-employment constitute important heterogeneity among entrepreneurs, since much of the earlier literature assumes that the individuals under investigation are creating a venture for the first time (Mosey and Wright 2007).

We also account for employee age in our rich data setting even though Shane (2003, Ch. 2) points out that working experience should be more informative than age, since the latter explicitly embodies learning. The effect of age is unclear a priori since older employers have accumulated more capital but are also more risk averse (Elfenbein et al. 2010; Sauermann 2017) which is why Levesque and Minniti (2006) include both age and its square. We follow their example. Age did not turn out to have a significant effect on startup acitivity in the studies of Aldridge and Audretsch (2011), Elfenbein et al. (2010) as well as Nicolaou and Birley (2003a).[7]

Our final general human capital variable is employee patenting activity that is shown to be a driver of self-employment by George et al. (2002), Landry et al. (2006), Sauermann (2017), Stuart and Ding (2006) as well as Zucker et al. (1998). The underlying patent data stem from the European Patent Office's Patstat data that we merged to individual inventors by Statistics Denmark. Our measure of individual patenting activity is an individual's patent stock.

While these variables constitute measures of a person's general human capital, we account for years of tenure as a measure for firm-specific human capital as in Elfenbein et al. (2010), Klepper (2001) and Sauermann (2017). We additionally consider a dummy variable that is coded 1 if the individual is looking back to at least three years of employment at the same workplace, since this is the point in time when tenure decisions are typically reached at Danish universities. Nicolaou and Birley (2003a) as well as Roberts (1991) show that having tenure is positively related to university spinoff activity. Another firm-specific human capital variable we consider is membership in a TMT, since leadership experience is likely to be useful in a subsequent self-employment spell as discussed in Subsection 2.2.1. We measure TMT membership by a dummy variable based on the ISCO code that is coded 1 if a person performs leadership work at the highest level (ISCO code 1).

[7] Given that we exactly measure education and working experience we can also include age without it being collinear with education and working experience.

Income and wealth

Income and wealth may play an important role in an individual's decision to become an entrepreneur. Higher income and wealth makes it easier to raise the first funding (Blanchflower and Oswald 1998; Hochguertel et al. 2005; Holtz-Eakin et al. 1994; Sauermann 2017). Wealth also enables pledging collateral for bank loans (Blanchflower and Oswald 1998; Chan and Kanatos 1985; Evans and Leighton 1989; Evans and Jovanovich 1989). Landry et al. (2006) find positive effects of wealth on startup activity while there is no significant association with university spinoff activity in Nicolaou and Birley (2003a). As operationalizations of our income and wealth variables, we include the natural logarithms of (i) personal income, (ii) family income (the total income a family commands over) and (iii) total family assets. To not only consider the levels of income but also relative measures, we include dummy variables for the quintiles of the within-firm income distribution and dummy variables for the quintiles of the family assets distribution in the population.

Family background

We include marital status and the number of children as well as a set of variables that measures the occupations of an individual's parents and partner as variables reflecting a person's family background. Davidsson and Honig (2003) consider them as proxies for social capital which is otherwise empirically hard to precisely measure (Parker 2006, Ch. 4.3). Parker (2009, Ch. 4.5.1) and Budig (2006) report a positive association between having children and being self-employed. Davidsson and Honig (2003) do not find significant effects of marital status on nascent entrepreneurship. We also include mother and father self-employment status to account for inter-generational transmissions of self-employment that are well documented in the literature (Dunn and Holtz-Eakin 2000; Fairlie and Robb 2007; Hout and Rosen 2000) and control for present partner self-employment and wage-employment which is motivated by possible similar transmission mechanisms and since the spouse's employment status reduces the prospective entrepreneurs financial risk exposure, which in turn makes own entrepreneurial activity more likely (Brown et al. 2006; Parker 2008).

Other personal characteristics

We account for nationality by differentiating between native Danes and first as well as second generation immigrants, gender and previous job mobility. Nationality has long been shown to be highly correlated with entrepreneurship (Aldrich and Waldinger, 1990; Borjas, 1986; Evans, 1989; Hammarstedt, 2001; Lofstrom, 2002) as has gender (Landry et al., 2006; Minitti and Naude, 2010; Nicolaou and Birley, 2003a; Verheul et al., 2012). We also include the number of jobs held in the past five years to account for general person-specific mobility (Folta et al., 2010).

Present employer characteristics

We consider a fairly wide range of employer-specific variables that may be associated with an individual's decision to become an entrepreneur (Gompers et al. 2005). We include firm size measured by the number of employees, since employees in large firms may be more likely to leave in order to be more independent than in less rigid bureaucracies (Chatterji 2009; Sørensen 2007a), while employees of small firms may leave because of ability and preferences sorting (Elfenbein et al. 2010; Sauermann 2017). Former co-workers who left one's present employer to become entrepreneurs may also positively influence mobility as shown by Nanda and Sørensen (2010) as well as Stuart and Ding (2006) which is why we account for the share of former co-workers in all

workers who left for self-employment at $t - 1$. We also consider employer patenting activity since the more active the employer is the more knowledge can possibly be transferred to a new workplace both from industry (Kaiser et al. 2016) and university (Kaiser et al. 2018). Dummy variables for the geographical location of the own employer (Fritsch and Falck 2007; Gompers et al. 2005; Klepper and Sleeper 2005) as well as for the employer sector of main economic activity (Hause and Du Rietz 1984; Nocke 2006) constitute a final set of employer-related variables. Our specifications also include year dummies.

4. Empirical analysis

4.1 Descriptive statistics

Our empirical analysis departs from descriptive statistics where we compare the characteristics of individuals in year t who found a startup at $t + 1$ to individuals who do not start a firm. Table 2 displays the means of the respective variables as well as a test for identity of the respective type of startup entrepreneur and those individuals who remain with their present employer, referred to as "stayers" hereafter. We use t-tests for the continuous variables and test for the equality of proportions for the dummy variables. The table shows the corresponding p-values.[8] Table 2 shows that many differences between both USEs and CSEs and the respective group of stayers are statistically significant but economically negligible. We hence define statistically significant differences exceeding 30 percent in absolute values as "economically" significant and discuss them in more detail below.

A major difference to existing studies that use more selected data sets is that the mean number of patents is relatively low. A USE holds 0.43 on average while the related figure for CSEs is 0.39. To compare, Bonardo et al. (2011) find that the median number of university spinoff patents is six while that of independent startups is two. Their data does, however, relate to European high-tech SMEs that went public, while we use much broader population data that, most importantly, does not focus on high-tech startups that had an IPO.

[Table 2 about here]

USEs and stayers

For university employees all differences between USEs and stayers relate to human capital. In particular, holding a degree in engineering and being a TMT member is more prevalent among USEs than among university stayers. The number of own patents is also higher among USEs than among the respective group of stayers. The reverse is true for holding a degree in health and holding a Bachelor's or Master's degree as well as being a first generation immigrant and being female. Overall, the formal level of education is higher for USEs than for university stayers which is in line with Wennberg et al. (2011).

CSEs and stayers

Relating CSEs to corporate stayers shows that overall differences to a much lesser extent correspond to human capital variables compared to university employees. CSEs are less likely to hold a degree in health, to hold a PhD, to be a first generation immigrant, to be

[8] Note that some cells in the table do not contain figures, since they relate to less than ten observations which would violate Statistics Denmark's secrecy restrictions.

situated in the lower deciles of the within-firm income distribution, to be female and to be employed in smaller and less patent active firms. By contrast, CSEs are more likely to be TMT members and have an employer with a higher share of former workers who left for self-employment.

Startup entrepreneurs from either university or business and their respective colleagues who remain in dependent employment hence do not appear to differ much with respect to family income, family assets as well as family background, but differ mostly in terms of human capital and, for corporate employees, income and employer characteristics.

USEs and CSEs

The comparatively small differences between startup entrepreneurs from university or business and their respective groups of stayers are reflected by comparatively small overall differences between USEs and CSEs. USEs are more likely to hold a PhD or a Bachelor, studied a health-related subject, command over more years of self-employment, belong to the 60-80 percent highest earners within their employer, have a wage-employed mother, and to be employed at a larger and more patent-active institution compared to CSEs. By contrast, CSEs are more likely to be TMT members and are more likely to have had colleagues who left for self-employment.

Most of these differences — employment at larger and more patent-active institutions, holding a PhD and TMT membership — are directly related to the inherent institutional differences between universities and corporations, which in turn implies that the only non-institutional differences between USEs and CSEs are the relative position in the employer's income distribution, the field of study and startup activity by former co-workers.

Movers vs stayers and university vs corporate employees

Finally, Table 2 compares all employees who found firms regardless of their origin to those employees who remain with their employer; e.g. we compare columns (2) and (4) to columns (1) and (3). We also provide an overall comparison of university and corporate employees by comparing columns (1) and (2) to columns (3) and (4). We find that there are substantially more differences both between overall movers vs stayers and university vs corporate employees. For both additional comparisons we find economically and statistically sizeable differences in terms of education field and length, number of own patents, years of tenure, gross annual income, number of children, father occupation and all present employer characteristics we consider (size, patents, former employees who became self-employed). The position in the family wealth distribution, gender, marital status and spouse employment are different for movers vs stayers but not between university vs corporate employees. Overall, mobility and selection into university vs corporate employment appear to be related to the same factors.

4.2 Regression analysis

While the univariate statistics discussed above provide a first picture of the characteristics of university and corporate startup entrepreneurs, we use OLS linear probability models in our main analysis. We prefer OLS over logit or probit models since OLS coefficients directly translate into marginal effects. We estimate binary choice probit models in a robustness check and find that there is no qualitative difference at all between them and our main OLS results.[9]

[9] Estimation results are therefore only available upon request.

Our estimations may be affected by endogeneity, whereby workers may sort into university or corporate employment while taking into account their expectations about possible future spells of self-employment. To address this type of endogeneity, we match individuals working at either universities or the private sector according to their observed characteristics using Coarsened Exact Matching (CEM, Iacus, et al., 2012). CEM weighting leaves our main estimation results quantitatively and qualitatively unchanged once we apply "non-exact" matching, e.g. when we match on the quartiles of work experience, age, years of tenure, family wealth and the number of job changes instead of exactly matching on these variables. If we exactly match we even fewer differences between USEs and CSEs compared to our baseline model. We believe this is a natural consequence of making individuals even more homogeneous via matching.[10]

Table 3 presents our OLS estimation results. We first estimate two separate models for university (column (1)) and corporate employees (column (2)) for the propensity to become a startup entrepreneur. We secondly estimate a joint model where we interact all explanatory variables with a dummy variable for being a corporate employee. The non-interacted coefficients and standard errors of that model are identical to the coefficient estimates for the separate university employee model (column (1)). The interacted coefficients displayed in column (3) in the table are deviations from the coefficients for university employees.[11] A positive coefficient means that the respective variable is more strongly related to corporate employees than to university employees (and vice versa).

We include the same set of variables as in our descriptive statistics, Table 2. The omitted base categories of our sets of dummy variables are natural sciences, holding a Bachelor's degree, lowest quintile in the employer income distribution and lowest quintile in the family wealth distribution. We take the logarithm of annual personal and family income, employer firm size and employer patent stock and include squared terms of total working experience, age, tenure, log annual income and log employer size. We cluster standard errors at the present employer level.

Our estimation results largely reflect the differences between USEs and CSEs and the respective groups of individuals remaining with their employer that we discussed in our descriptive analysis already. University employees who are engineers, hold a Master's degree, have gained some self-employment experience on the side, hold more patents, are TMT members, are male and have switched workplaces more frequently are significantly more likely to become USEs rather than to stay at the university. Some of these significant results could relate to knowledge-based theories of entrepreneurship (e.g. having a Master's degree and patents), while other results may have more to do with preferences for entrepreneurship that are distinct from knowledge-based motivations (Frederiksen et al., 2016). In this vein, having previous self-employment experience, as well as having a larger number of previous workplaces, could make individuals more mobile in the pursuit of entrepreneurial opportunities (Frederiksen et al., 2016). In addition, being among the top 40-60 percent in the family wealth distribution negatively affects the self-employment decision, indicating that university employees with either lower or higher family wealth

[10] Estimation are available upon request. We additionally exactly match on the "some" self-employment experience dummy, TMT membership, spouse self-employment and residing in the Greater Copenhagen area. We included all variables in the matching procedure which have a statistically significant effect on both selection into university vs industry and the propensity to become a startup entrepreneur (Dehejia and Wahba 1999).

[11] The results of the interaction model are to be interpreted in a difference-in-difference estimation sense (Donald and Lang 2007) with the first difference being the initial selection into university vs corporate employment and the second difference being the selection into entrepreneurial activity.

are more likely to become founders. One possible interpretation is that having low family wealth pushes an individual to pursue income-generating opportunities, while having high family wealth encourages entrepreneurship by providing an individual with the stability and resources needed to take risks in pursuing entrepreneurial opportunities.

For CSEs we find that being a TMT member, earning a high relative income, having a self-employed father, and being employed at a small firm with few patents increases the likelihood of leaving for self-employment. On the one hand, some of these results suggest that individuals with more (managerial and leadership) experience and greater resources and networks are better positioned to start a new venture. On the other hand, the results could suggest that larger firms with more patents may perform better at retaining their employees, because they can provide them with more scope for exploring opportunities within the firm, as well as more attractive pay and promotion possibilities.

The interaction model in column (3) shows that the effects of holding a Master's degree in engineering, having acquired some self-employment experience and holding own patents on the likelihood of starting an own business is statistically significantly smaller for corporate employees than for university employees. We do not find statistically significantly different coefficients for any of the other variables we consider which implies that there indeed are very little differences between USEs and CSEs in term of their observed characteristics.

[Table 3 about here]

4.3 Robustness analyses

Our main results indicate that there are few variables that distinguish university startup entrepreneurs from university stayers, corporate startup entrepreneurs from corporate stayers, and USEs from CSEs. This finding of non-significance might be driven by (i) our use of a large set of explanatory variables whereby a removal of sets of variables might affect the statistical significance of other sets of variables, even though this issue is alleviated in large samples (O'Brien, 2007) and (ii) our choice of a very inclusive sample of individuals. We discuss the results of our two main robustness checks in turn below.

4.4.1 Selected sets of variables

Our main results consider five main sets of explanatory variables: human capital, income and wealth, family background, other personal characteristics and present employer characteristics. In our robustness checks we additionally distinguish the income and wealth variables. We run 14 (times three – for each comparison USE vs university stayer, CSE vs corporate stayer, and USE vs CSE) additional regressions which leave out these different subsets of variables. These additional regression results are relegated to Appendix A in the Online Supplementary Materials. Our two key findings are that (i) variables which are statistically significant in our main regressions retain their significance in the robustness check regressions, and (ii) there are generally no variables that become statistically significant once subsets of variables are removed. In addition, coefficient sizes remain almost exactly the same across the different estimations. Our finding of insignificant differences in our main analysis is hence not driven by our choice of a large set of explanatory variables.

4.4.2. Subsamples

In our second main robustness check, we attempt to move our sample of individuals closer to the existing literature where, e.g., a stereotypical USE is a high-status research-active

professor of a certain age and career development and not – as in our main analysis – someone with an academic degree who works at an university. We therefore estimate our models on 30 different subsamples according to occupation (specialist or manager), age (below 30, 30-39, 40+), academic discipline (science, engineering, health), academic degree (Bachelor, Master, PhD), TMT membership status, gender (male and female), income (top 20% in the income distribution), patentholder status, and whether an individual holds a university job/corporate job (in addition to holding a corporate/university job, respectively). We relegate the corresponding results to Appendix B in the Online Supplementary Materials.

While it is challenging to summarize a total of 30 (subsamples) times three (types of comparisons) regressions, the results clearly demonstrate that the lack of statistically significance is not due to our use of "too broad" estimation samples. On the contrary, using more selective samples *decreases* the number of statistically significant coefficients. The results also indicate that there are substantial differences in the observed characteristics of different types of individuals that make them more or less inclined to move into entrepreneurship. Importantly perhaps, we find almost no differences between university and corporate startup entrepreneurs once we restrict our samples. We trace this back to an enhanced homogeneity across university and corporate workers due to our conditioning on selected subsamples.

Our finding of insignificant differences in our main analyses is hence not driven by our choice of estimation sample either.

5. Conclusions

Despite the considerable importance of university and corporate startup activity, surprisingly little is known about the characteristics of the founder of those ventures and how they compare to individuals who stay with their employer. We study these characteristics using exceptionally rich data that allow us to account for a wide set of explanatory variables on human capital, income and wealth, family background and present employer characteristics. In order to make meaningful comparisons, we liken university employees to individuals working in the corporate high-tech sector. Our focus is on all individuals with at least a Bachelor's degree in natural sciences, engineering and health.

We document that there are overall very few differences in the factors associated with startup choice when comparing university employees and corporate employees – and even fewer differences exist if more narrowly defined subsamples are considered. This suggests that entrepreneurship promotion measures need not be different between university and corporate scientists. In addition, possible performance differences between university and corporate startups are unlikely to be driven by differences in the observed characteristics of the respective founders, which in turn might suggest that performance differences may be caused by inheritance effects documented by Agrawal et al. (2016), Clarysse et al. (2011a,b) as well as Wennberg et al. (2011) who account for a much narrower set of founder characteristics. Future research should simultaneously consider both these institutional factors and the personal characteristics of the founders to explain possible performance differences between university startup employees and corporate startup employees.

Our estimates show that university startup activity is primarily linked to general human capital, while human capital matters much less for corporate startup activity where present

employer characteristics play an important role instead, as large and patent-active firms are the least likely to lose employees to entrepreneurial activity. This indicates that such large R&D active corporations constitute on average more attractive workplaces for scientists than a possible own startup. They may offer complementary assets and allow specialization. Given that we also show that the corporate employee most likely to leave for entrepreneurship is in a leadership position with a high within firm income – i.e. a corporation's best employees in terms of rank and pay – an effective HR policy to prevent those employees from leaving could include increased R&D efforts to improve on the research attractiveness and sustained firm growth to create promotion opportunities. Firm growth and innovation are at the same time common industrial policy targets. In addition, corporate HR that has the goal of retaining employees could focus on male employees with a self-employed father who have frequently switched workplaces and who hold a degree in health or natural sciences, i.e. information that with the exception of father employment status is readily available to HR managers.

For university scientists, we find that engineers with a Master's degree in leadership positions who hold patents, who have gained some self-employment experience via jobs on the side, are TMT members, with either low or high (compared to median) family wealth and who have been mobile in the past are most likely to leave university to form a startup. By contrast, present employer characteristics do not significantly relate to the startup activities of university employees. Even though this may be related to relatively low variation across universities, it in turn implies that the observed characteristics which distinguish future entrepreneurs from those remaining in university employment are beyond the direct scope of human resource management, policy makers and university administration. Except for family wealth, all characteristics with significant effects on the entrepreneurial decisions of university employees are, however, observable in CVs, which in turn allows policy makers to target specific individuals and university administrators to establish HR policies geared at a well-defined group of university employees.

These results for USEs may be particularly interesting to policymakers, because university-based entrepreneurs may be more responsive to policy initiatives and stimuli. Mathisen and Rasmussen (2019, p14) observed that "USOs are very active users of governmental support programs, including being favored by public VC funds, staying longer as tenants in incubators and using public R&D funding schemes."

A finding common to both university and high tech industry entrepreneurship is that women appear to be less likely to leave for an own startup, despite our focus on a set of fairly narrowly defined individuals, and on Denmark where there are little differences in overall male and female employment rates. Minniti and Naudé (2010) wonder if this well documented gender gap in entrepreneurship is mainly driven by education, wealth, family and employment status. Our study does account for such differences and still finds ample evidence for a wide gender gap in entrepreneurship. This in turn may imply the existence of socio-cultural reasons or discrimination (Neumark and McLennan, 1995) or differences in individual preferences (Kanazawa, 2005). The existence of discrimination would call for affirmative action which is most easily implemented at universities. In addition, at least universities could fairly easily enhance female entrepreneurship by offering entrepreneurship training programs targeted at female scientists that may also successfully alter female preferences for dependent employment (Bullogh et al. 2015).

While our current analysis has focused on personal characteristics and present employer characteristics, future work could investigate in more detail the characteristics of the business idea being developed by the startup entrepreneur, as well as the characteristics

of the intellectual property (IP) or technology being transferred. Such work would require different data sources compared to those used here. In particular, the standard definitions of university spinoff entrepreneurship is rather broad (including not just faculty but also students and employees, and also potentially individuals starting up ventures with no obvious links to knowledge developed at the university). Future work could try to apply a stricter definition of university spinoffs to ensure that entrepreneurs do not enter into unrelated areas, but that they are specifically transferring university-developed IP and technology. However, we caution that such a narrow focus would underestimate the broader contribution of university experience to entrepreneurship.

In general, we observed there are few statistically significant differences in the large set of predictor variables. The management implications are therefore that, overall, it is not easy to predict which individuals will leave their current employer to become startup entrepreneurs. This serves to highlight the difficulties that firms and universities may face in retaining employees, although it should also be kept in mind that university/corporate startup entrepreneurship is a rather rare event. In addition to an individual's knowledge base, labour market experience and personal financial situation, as well as an important role for current employer characteristics, there may be a large role for (hitherto understudied) individual-specific psychological factors as determinants of innovative entrepreneurship. This latter idea is in line with the conjecture that individuals may found a new business for reasons that are not objectively linked to the business opportunity itself, but because of an individual’s entrepreneurial spirit. Our analysis also suggests that there may not be large differences between highly educated STEM workers who self-select into either public (higher education) or private R&D employment.

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