Founders and Joiners: The Role of Individual Characteristics, Social Context, and Commercial Opportunities in Entrepreneurial Intentions

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May 2012

We thank seminar participants at Boston University, Copenhagen Business School, Duke University, the Maryland Entrepreneurship Conference, the Roundtable for Engineering Entrepreneurship Research at Georgia Tech, and the Fox-Kauffman Workshop on Empirical Entrepreneurship, as well as Michael Bikard, April Franco, and Shon Hiatt for their helpful comments and suggestions. We would also like to thank the Georgia Research Alliance and the Marion Ewing Kauffman Foundation for financial support. All errors are our own.

ABSTRACT
Entrepreneurship has emerged as an important driver of economic growth and as an attractive career option for highly trained individuals. While prior research has examined which individuals eventually transition into entrepreneurship, we know little about how intentions to engage in entrepreneurship initially form. Moreover, the prior literature has largely ignored that new ventures require not only founders, but often critically depend upon "joiners" – individuals who are drawn to entrepreneurial ventures as employees and who play distinct, yet complementary roles to founders. Using a sample of 4,282 science and engineering PhD students near their initial career transition, we compare founder and joiner intentions with respect to three sets of potential antecedents: individual characteristics, social context, and perceived commercial opportunities. We find that while individuals with founder and joiner intentions share similar "entrepreneurial" characteristics, different social influences have divergent effects on intentions to be a founder or a joiner. In addition, individuals with a pre-existing orientation toward entrepreneurship sort into entrepreneurial environments, while the entrepreneurial intentions of others are influenced by their social context and the discovery of opportunities. These findings highlight the importance of distinguishing between founder and joiner intentions and provide unique insights into their complex relationships with factors that are central to entrepreneurship theory.

1 Introduction

Entrepreneurship has long been recognized as an important driver of economic growth. More recently, entrepreneurship is increasingly seen as an attractive career option for highly trained individuals (Elfenbein et al., 2010; Campbell et al., 2012; Neff, 2012) as evidenced by the growing number of technology-based ventures (Hsu et al., 2007) and demand for entrepreneurship education at universities. While considerable research effort has focused on explaining who actually becomes an entrepreneur (Ruef et al., 2003; Carter et al., 2004; Gompers et al., 2005; Stuart and Ding, 2006; Hsu, et al., 2007; Sorensen, 2007; Ozcan and Reichstein, 2009; Elfenbein, et al., 2010; Campbell, et al., 2012), we have a very limited understanding of who *wants* to be an entrepreneur in the first place and how intentions to engage in entrepreneurship initially form. Entrepreneurial intentions are not only central to the decision to start a new venture (Shane, 2000; Shane and Venkataraman, 2000), but may also influence the strategy, culture, and ultimate success of new ventures (Bird, 1988; Baron et al., 1996; Hannan et al., 1996). While prior literature has established a strong link between intentions and actions in other domains (Ajzen and Fishbein, 1980; Ajzen, 1988), we suggest that a deeper understanding of the nature and sources of entrepreneurial intentions per se may provide unique and more direct insights into transitions to entrepreneurship. At the same time, looking at intentions as separate from realized entrepreneurial outcomes opens up interesting avenues for future research on the match between entrepreneurial intentions and actual outcomes, including factors that may prevent some individuals from realizing their entrepreneurial intentions, or lead others to engage in entrepreneurship they had not initially planned.

In addition to focusing on entrepreneurial intentions as a relatively understudied phenomenon, we seek to complement the prior literature in a second important way. In particular, we direct attention toward "joiners," employees drawn to working in entrepreneurial firms but who do not intend to be founders themselves. While joiners may possess similar attitudes toward entrepreneurship and make important contributions to new ventures (Boh et al., 2011; Neff, 2012) they are often hidden in the shadows of founders as the more visible agents of entrepreneurship. We contend that the study of joiners is important for a number of reasons. First, attracting motivated and highly skilled employees is one of the key hurdles founders face in their efforts to build entrepreneurial ventures (Hannan, et al., 1996; Baron et al., 2001; Hsu, 2009). Joiners may

share similar preferences as founders in their willingness to trade-off between certain job attributes such as pay and security for greater autonomy and the opportunity to work in an exciting and dynamic work setting. Second, while both founders and joiners are engaged in entrepreneurship in the sense that they contribute to the exploitation of opportunities in new ventures (Shane and Venkataraman, 2000; Shane, 2003), they play quite different roles in the entrepreneurial process. Consequently, the factors that shape joiner intentions may differ from those that shape founder intentions. Distinguishing between founders and joiners conceptually, and examining differences in the antecedents of such intentions may have important implications for future entrepreneurship research, policy, and entrepreneurs themselves.

In our consideration of the antecedents of founder and joiner intentions, we attempt to reconcile two, often disparate streams of research. One body of research, largely based in economics and psychology, suggests that individual characteristics such as preferences for particular job attributes or ability predict transitions into entrepreneurship (McClelland, 1961; Kihlstrom and Laffont, 1979; Busenitz and Barney, 1997; Hamilton, 2000; Elfenbein, et al., 2010). While emphasizing individual-level heterogeneity, this approach often overlooks the influence of the external environment in shaping individuals' transitions to entrepreneurship. Sociological theories, on the other hand, argue that social contextual factors such as institutional norms, prominent peers, and the work environment shape entrepreneurial transitions (Thornton, 1999; Dobrev and Barnett, 2005; Stuart and Ding, 2006; Sorensen, 2007; Nanda and Sorensen, 2010). Yet this line of research tends to neglect that individuals may sort into different social contexts based on their pre-existing preferences (Sorensen, 2007), thus making it difficult to tease apart individual and social drivers of transitions to entrepreneurship. While research in this field increasingly attempts to incorporate both individual and social factors together, (Stuart and Ding, 2006; Sorensen, 2007; Ozcan and Reichstein, 2009; Elfenbein, et al., 2010), to date no study has examined the interplay between individual preferences and social context, and prior research examining how the influence of social context might differ across individuals is limited (Dobrev and Barnett, 2005).

Although less studied, we also incorporate a third stream of research that highlights the role of opportunity recognition on transitions into entrepreneurship. While this line of research suggests that entrepreneurial transitions are contingent upon the—more or less accidental—discovery of an opportunity (Shane, 2000; Eckhardt and Shane, 2003; Shah and Tripsas, 2007),

these studies observe transitions after the discovery of an opportunity and little is known about the relationship between opportunities and entrepreneurial intentions. For example, it remains an open question the extent to which individuals search for opportunities to satisfy their entrepreneurial intentions versus entrepreneurial intentions emerging as a result of the discovery of an opportunity. Moreover, it's far from obvious that all individuals who discover an opportunity want to be a founder, and indeed some may prefer to participate in the entrepreneurial process as a joiner rather than a founder or to forego entrepreneurship altogether.

This paper contributes to the entrepreneurship literature by explicitly examining the relationship between individual characteristics, social context, and opportunities on the entrepreneurial intentions to be a founder or a joiner. In addition, we overcome data limitations prevalent in prior studies by employing a unique survey dataset of 4,282 science and engineering PhD students nearing their initial professional career transition. Our data provide detailed measures of individual characteristics, social context, and commercial opportunities before individuals actually transition into entrepreneurship or alternative careers, and thus are not subject to sample selection or recall biases common in other studies. As such, our data complement and extend prior research by providing novel insights into the antecedents of entrepreneurial transitions using a diverse and representative cohort of individuals just prior to entering the labor market.

Using these data, we first document the pervasiveness of entrepreneurial intentions in science and engineering PhDs, a population that is both a source of numerous novel and valuable discoveries as well as widely believed to increasingly embrace entrepreneurial and commercial activities (Powell et al., 1996; Etzkowitz, 1998; Stuart and Ding, 2006; Bercovitz and Feldman, 2008). We observe that 11% of respondents want to be founders, while an additional 45% show a strong interest in joining a startup as an employee, but not as a founder. Using regression analysis, we compare the profiles of four groups of individuals: those with founder intentions, those with joiner intentions, and those not interested in entrepreneurship who prefer careers outside of entrepreneurship in either academia or industry more generally. We find that individuals who intend to be a founder correspond very closely to the entrepreneurs studied in prior work, even though the respondents in our sample have not yet transitioned into entrepreneurship. While individuals with joiner intentions share many characteristics with those who want to be a founder, we also observe some significant differences in the preference for autonomy and interests in commercialization and managerial activities. More notably, our results suggest that different as-

pects of the social context have differing effects on founder and joiner intentions, respectively. While additional analyses provide evidence that individuals with a pre-existing orientation toward entrepreneurship sort into departments that are more entrepreneurial, we also find that joiner intentions are shaped by norms that encourage entrepreneurship while founder intentions appear to be more resilient to these normative effects and are primarily shaped by the more direct influence of prominent peers as role models. Finally, we find that commercial opportunities predict entrepreneurial intentions, although the link between opportunities and intentions is far from deterministic. More specifically, over 60% of those who want to be a founder do not believe that their current research has commercial value, suggesting that an opportunity is not a requisite for founder intentions. We also find that the majority of individuals who believe that their research has commercial value want to be a joiner, not a founder. Our findings are robust to controlling for individuals' pre-existing interest in entrepreneurship, prior experience working in a startup, expectations of labor market conditions, and parents' occupations in academia or self-employment. Furthermore, additional analyses demonstrate that entrepreneurship is seen as a career option that is quite distinct from industrial employment in established firms, as well as employment in academia.

2 Entrepreneurial Intentions: Founders and Joiners

Many developed societies increasingly celebrate entrepreneurship (Aldrich and Yang, 2012), which is reflected in part by changes in cultural values (Neff, 2012), increasing rates of entrepreneurship (Hsu, et al., 2007), increased attention toward entrepreneurship education, extensive media coverage, and government initiatives to encourage and foster entrepreneurship. We contend that the growing appeal of entrepreneurship has lead not only to an increase in entrepreneurial intentions to be a founder, but it also extends more broadly to include what we call "joiners"—individuals drawn to the allure of working in an entrepreneurial venture as an employee but not as a founder. Unlike helpers such as friends and family (Burton et al., 2009), joiners are full-time employees and make regular and paid contributions to the venture's activities. At the same time, joiners may be distinguished from other startup employees by their specific attraction to working in an entrepreneurial setting. In addition, although joiners may share a similar attraction to entrepreneurship as the founding team, joiners do not hold significant ownership stakes, executive positions, or make key managerial decisions for the new venture (Ruef, et al.,

2003; Carter, et al., 2004). Despite the relative lack of attention to joiners in the prior literature, many new ventures rely critically on the contributions of highly motivated employees who often complement the skills of founders (Baron, et al., 1996; Baron, et al., 2001; Hsu, 2009). This is particularly true for innovation-intensive ventures that rely upon highly-skilled employees, many of whom also have attractive career options in established firms and other high-paying sectors (Thursby and Thursby, 2002, 2004; Campbell, et al., 2012). As such, understanding why joiners are attracted to entrepreneurship can help nascent founders in recruiting talent and may also provide insights for policy makers and educators interested in shaping the supply of human capital for entrepreneurial activity.

While both founders and joiners engage in entrepreneurship, we suggest that the antecedents of founder and joiner intentions may differ for two broad reasons. First, founders and joiners play different roles within entrepreneurial ventures that likely differ with respect to factors such as responsibilities, risks and rewards, and job attributes. As such, different kinds of people may be attracted to one role or the other based on their expectations of how each aligns with their own career identity and goals (Markus and Nurius, 1986; Ibarra, 1999). Second, a line of entrepreneurship research argues that many founders possess a specific "founder identity" (Shane and Khurana, 2003; Shane, 2004) that may be determined by genetics traits (Nicolaou et al., 2008), innate preferences or a "taste" for starting a company (Kihlstrom and Laffont, 1979; Hamilton, 2000; Shane, 2004; Ozcan and Reichstein, 2009; Elfenbein, et al., 2010; Astebro and Thompson, 2011), or shaped by parents or other exogenous forces during earlier stages of life (Aldrich and Kim, 2007).[1] Individuals with a stronger founder identity may have a greater propensity to express entrepreneurial intentions than other individuals.

While prior research has not explored the existence of corresponding "joiner identities", we suspect that any such identity is much less pronounced relative to a founder identity. As such, we argue that joiner intentions reflect primarily an interest to work in a particular type of work setting that is judged to be more attractive than other alternative settings. For example, Neff (2012) argues that social changes in the U.S. labor market over the past thirty years have given rise to a dramatic increase in the appeal of working in entrepreneurial ventures. Driven in part

[1] For example, Shane (2004) founded that many faculty start a university spinoff because they have always desired to be an entrepreneur. As one MIT professor reported, "I always wanted to start a company. It was always in the back of my mind," and another stated "I've been interested for a very long time in starting companies. For better or for worse, I think I have an entrepreneurial inclination."

by the decline of lifetime employment opportunities, individuals are more willing to accept career risks and view jobs in entrepreneurial firms as providing greater opportunities to learn, advance their careers, and receive greater satisfaction from the ownership of their work. To the extent that joiner identities are less prominent than founder identities, we suspect that individuals with founder and joiner intentions will exhibit subtle differences in their individual characteristics and may be shaped differently by social influences or entrepreneurial opportunities. We discuss these differences in greater detail below. However, since our interest is primarily in the intention to engage in entrepreneurship and not actual transitions, we abstract from factors such as opportunity costs, access to capital, and other financial constraints that may play a bigger role in realized entrepreneurial outcomes.

In our consideration of founder and joiner intentions, we develop a conceptual framework that can be applied to a range of entrepreneurial settings. However, the particular roles played by founders and joiners, as well as potential differences in the drivers of founder and joiner intentions, may vary depending on the particular context. As such, we focus our discussion on technology-based ventures that commercialize discoveries emanating from university research, i.e., academic entrepreneurship (Shane, 2004). In contrast to prior work that has examined academic entrepreneurship by faculty members (Etzkowitz, 1998; Zucker et al., 1998; Shane, 2004; Stuart and Ding, 2006; Bercovitz and Feldman, 2008; Ding, 2010), we focus on the entrepreneurial intentions of PhD-trained scientists at the beginning of their career, before they have made their initial career transitions. Academic entrepreneurship generally, and the role of new PhDs in particular, are especially interesting for a number of reasons. First, there is growing interest in the contributions of university-based technologies to innovation and economic growth, and academic entrepreneurship is an important mechanism by which such hopes can be realized (Mowery et al., 2004). Moreover, university-based discoveries are often nascent, emerging technologies that require substantial human capital to commercialize, highlighting the important role of joiners in the venture formation process (Roberts, 1991; Shane, 2004; Boh, et al., 2011). Third, PhDs play an important role in academic entrepreneurship by either building on their own research projects or on their highly specialized knowledge that is critical to successful technology commercialization (Boh, et al., 2011). This role is amplified by the fact that many faculty members have little interest in engaging in the commercialization process themselves (Thursby and Thursby, 2002, 2004), often leaving PhDs who were part of research teams to be key actors in the commercialization of

university discoveries (Boh, et al., 2011). Finally, academic entrepreneurship by junior scientists is of interest not only because PhDs play an important role in startups, but also because startups play an important role as increasingly attractive career option for newly-minted PhDs, especially compared to the traditional careers in academia or established firms (Roach and Sauermann, 2010).

In the following sections, we discuss in more detail how founder and joiner intentions may be shaped by three sets of factors: individual characteristics, social context, and commercial opportunities. As discussed above, we expect that individuals' identification with the role of a founder or a joiner, respectively, will explain similarities and differences between these two entrepreneurial intentions.

2.1 Individual Characteristics: Preferences, Ability and Interest in Work Activities

While there are a wide range of individual factors that may relate to entrepreneurship, we limit our attention to factors that we believe are most strongly associated with entrepreneurial intentions generally, while also potentially having different relationships with the intention to be a founder versus a joiner. First, it is widely believed that individuals with a preference for autonomy are attracted to entrepreneurship because new ventures allow them to exercise greater freedom and more control over their own activities and business decisions (Roberts and Wainer, 1971; Boswell, 1973; Shane, 2004). While most new ventures provide both founders and joiners with a certain degree of autonomy, as owners and top decision makers of new ventures founders can expect to have greater autonomy than other new venture employees such as joiners. Similarly, while individuals with a greater preference for wealth may be attracted to startups by the availability of stock options and opportunities for rapid promotion (Shane, 2004), founders can expect to receive greater wealth in return for their investments in money and effort relative to joiners, assuming that a venture is successful. At the same time, inherent in all startups is a considerable degree of risk relative to other career options. While individual who have a greater preference for risk—or who are less risk averse—may be more attracted to startups as either a founder or a joiner (Begley and Boyd, 1987; Seth and Sen, 1995; Sarasvathy et al., 1998), founders can expect to bear a greater share of these risks relative to employees such as joiners. Thus, although we expect that preferences for autonomy, wealth, and risk predict an interest in entre-

preneurship generally, we also expect that these preferences are more strongly related to founder intentions than to joiner intentions.

Another individual characteristic that has been related to entrepreneurship is ability (Hamilton, 2000; Elfenbein, et al., 2010; Astebro et al., 2011; Astebro and Thompson, 2011; Campbell, et al., 2012; Carnahan et al., 2012). Research using general population and more focused samples suggest that both low and high ability individuals are more likely to be self-employed, though for different reasons (Hamilton, 2000; Astebro, et al., 2011; Astebro and Thompson, 2011; Carnahan, et al., 2012). In particular, low ability individuals may enter self-employment and entrepreneurship because they lack alternative career opportunities and may thus engage primarily in subsistence entrepreneurship. High ability individuals, on the other hand, may prefer to work in small firms (either as founders or as joiners) because this setting more strongly links compensation and rewards to higher performance (Zenger, 1994; Elfenbein, et al., 2010). At the same time, high ability PhDs may prefer an academic employment setting where the payoffs to their higher ability may deter transitioning to a different career setting like entrepreneurship (Astebro, et al., 2011; Campbell, et al., 2012). In considering the role of ability in our context, it is important to keep in mind that PhD-trained scientists are likely to come from the upper end of the ability distribution relative to the overall population, and general unemployment among PhD trained scientists is very low (National Science Board, 2010). Thus, we expect that "subsistence entrepreneurship" will play a minor role for PhD-trained scientists, even among low-ability scientists. In contrast, high-ability scientists may believe that they will be more successful at commercialization and can reap significant financial rewards, leading them to exhibit greater intentions to engage in entrepreneurship as a founder. Given that being a founder may require greater ability to build a business relative to working in one, we expect that ability is more strongly related to founder intentions than to joiner intentions.

A less explored class of attributes is an individual's interests in specific work activities such as research, commercialization, and managerial tasks. Among these three, we believe that an interest in commercializing ideas into tangible, useful products is most strongly associated with entrepreneurial intentions. In interviews of academic entrepreneurs at MIT, Shane (2004) found that many individuals engaged in entrepreneurship primarily to bring their technologies to market. For some this was driven by a passion to see their discoveries put into practice, while for others it was out of concern that existing firms were either unwilling or unable to successfully

commercialize their discoveries. For example, Shane (2004) recounts that one faculty inventor stated: "I had a relationship to these discoveries and wanted to be involved in the actual conversion of the early stage intellectual property into something practical." This same desire may extend to joiner as well. In our own interviews, a PhD research scientist in an energy startup from MIT stated that he joined the venture because wanted to make a difference in solving the world's energy problems. Moreover, he felt that his prior academic research did not have a direct connection to solving these problems, and being a joiner allowed him to commercialize research discoveries into practical technologies. While the desire to engage in commercialization may be shared by founders and joiners alike, their interest in research or management activities may be quite different. Considering again the roles that founders and joiners will occupy in new ventures, founders are expected to engage in a wider range of managerial activities such as business development, financing, and assembling human capital (Lazear, 2005; Astebro and Thompson, 2011). PhD trained employees, on the other hand, are more likely to participate in research and development activities. Thus we expect that individuals with a stronger preference for management to have greater founder intentions, while those with a strong interest in conducting research may prefer to be joiners.

2.2 Social Context: Institutional Norms and Prominent Peers

Sociological research suggests that institutional norms and prominent peers may also play important roles in shaping entrepreneurial intentions. While academia has traditionally been governed by the norms of science that eschew commercial activities such as entrepreneurship, commercialization and entrepreneurship are increasingly accepted as legitimate activities in academic departments (Etzkowitz, 1998; Owen-Smith and Powell, 2001). Recent research has shown that institutional support for commercialization such as general department norms that favor commercial activity, as well the entrepreneurial activities of prominent peers have contributed to increasing rates of academic entrepreneurship (Stuart and Ding, 2006; Bercovitz and Feldman, 2008). While much of this research has implicitly assumed that social forces will influence individuals in similar ways, we suggest that the role of social context in shaping entrepreneurial intentions may differ between founders and joiners. If, as argued above, founder intentions stem from a strong "founder identity", then we might expect that founder intentions are influenced little by general departmental norms regarding entrepreneurship (Dobrev and Barnett, 2005). On

the other hand, to the extent that joiner intentions are not based on a strong entrepreneurial identity, they may be more malleable and influenced by department norms that encourage entrepreneurial activities (Markus and Kunda, 1986). At the same time, becoming a founder might be perceived by PhDs without a founder identity as too great a transition away form the traditional norms of science (Ibarra, 1999; Ding and Choi, 2011), suggesting that general entrepreneurial norms may increase PhDs interest in joining entrepreneurial firms but may not be strong enough to induce intentions of founding one.

Scholars have also considered the influence of prominent peers, which may shape individuals' perceptions of acceptable career activities and serve as concrete role models (Sexton and Bowman, 1985; Podolny and Stuart, 1995; Stuart and Ding, 2006). Within the context of academic entrepreneurship, a PhD's academic advisor acts a role model who can legitimatize certain behaviors such as academic entrepreneurship (Sexton and Bowman, 1985; Ibarra, 1999; Kenny and Goe, 2004). For example, a recent study by Azoulay, Liu & Stuart (2009) find that faculty advisors influence postdocs' engagement in commercial activities, even after accounting for postdocs' prior commercial activities and selection of advisor. Assuming that advisors as role models have a stronger impact on individuals than more diffuse departmental norms, we expect entrepreneurial advisors will positively influence joiner intentions while also strengthening and reinforcing founder intentions.

Up to this point, our discussion has focused on the potential role of the social context in shaping founder and joiner intentions – what could be called "socialization" or "treatment" effects. Of course, it is also possible that individuals with strong pre-existing founder or joiner intentions may sort into departments that support entrepreneurship or seek out advisors who have successfully engaged in entrepreneurial activities in the past. Although Azoulay et al. (2009), as well as our own interviews find little evidence for selection based on pre-existing entrepreneurial intentions, we will consider such selection effects in the empirical analysis.

2.3 Commercial Opportunities

Finally, we turn our attention to the relationship between entrepreneurial intentions and commercial opportunities. Prior research has demonstrated a link between commercial opportunities and founding activity (Bhide, 2000; Shane, 2001; Stuart and Ding, 2006; Ding and Choi, 2011), although the precise nature of this relationship remains unclear. One the one hand, it is

possible that founder intentions emerge only after individuals "discover" an opportunity, i.e., the possession of an opportunity leads to founder intentions (Shane, 2000). On the other hand, individuals with pre-existing founder intentions may also seek to "create" opportunities by choosing research projects that are more likely to lead to commercializable results or otherwise search for opportunities (Roberts, 1991; Shane, 2004; Azoulay, et al., 2009). The latter would be akin to the selection effects discussed earlier with respect to social context. While both mechanisms suggest a strong positive relationship between opportunities and founder intentions, individuals with strong founder identities may also express founder intentions even if they do not currently possess a commercial opportunity, perhaps because they believe that opportunities will emerge in the near future (Roberts, 1991; Shane, 2004). Equally interesting, our interviews of science and engineering PhDs suggests that some individuals who have opportunities have little interest in pursuing them, perhaps because they desire to stay focused on research or because they are deterred by the riskiness of new ventures (Thursby and Thursby, 2002, 2004). Thus, while we expect a positive relationship between opportunities and founder intentions, this relationship may not be deterministic.

The relationship between opportunities and joiner intentions is less clear. Formally, the joiner role does not require the possession of an opportunity – joiners are typically hired to work on the founder's idea. However, one interesting possibility is that people who have a commercial opportunity but who do not wish to pursue it as founders may see becoming a "joiner" as an alternative way to commercialize their research. In that case, the possession of a commercial opportunity may also predict joiner intentions. Despite the latter possibility, we expect that commercial opportunities more strongly predict founder intentions than joiner intentions.

2.4 Summary

In summary, we suggest that founders and joiners play different roles in entrepreneurial firms. Moreover, we argue that founders often have a strong "founder identity", while joiners are likely to think of entrepreneurship as one among many career options. As such, we expect some significant differences in the factors associated with founder intentions versus joiner intentions. More specifically, we expect that individuals with founder intentions will show similar characteristics as the founders studied in prior work. While individuals with joiner intentions may share some of these same characteristics, they are likely to have weaker preferences for factors such as

risk and autonomy, and may have a weaker interest in management. We expect that institutional norms will have a positive influence on joiner intentions but may have little impact on founder intentions. Prominent peers with entrepreneurial experience, in contrast, may serve as important role models that shape both founder and joiner intentions. Finally, we expect to observe a strong, although not deterministic, relationship between commercial opportunity and founder intentions, while the relationship between opportunities and joiner intentions is likely to be weak.

3 Data, Variables & Method

3.1 Data

The data for this study are drawn from the Science & Engineering PhD and Postdoc Survey (SEPPS), which was administered by the authors in spring 2010 and includes responses from science and engineering PhD students at U.S. research universities. To develop our sample of respondents, we first consulted the National Science Foundation's reports on earned doctorates (2008) to identify U.S. research universities with large doctoral programs in science and engineering fields. We selected a subset of institutions based primarily on program size while ensuring variation with respect to private/public status and geographic region. We collected roughly 30,000 individual names and email addresses from listings provided on our target departments' websites. We invited these individuals to participate in the survey using a four-contact strategy (one invitation, three reminders). All surveys were conducted online. Adjusting for 6.3% undeliverable emails, the direct survey approach achieved a response rate of 30%. When individual contact information was not available, we used department administrators as a second channel to approach respondents. In those cases, we emailed administrators with the request to forward a survey link to their graduate students. Overall, 88% of our responses were obtained directly from respondents and 12% were obtained through administrators.

A concern with any surveys is that the particular way in which respondents are approached may lead to sample selection or biased responses (Groves and Peytcheva, 2008). To address this concern, we randomly assigned respondents into different conditions and varied key aspects of the survey invitation, including incentives to participate in the survey. While this strategy should mitigate selection biases by its very design, it also allowed us to explicitly examine the presence and magnitude of such biases. We did not find significant differences across conditions with respect to any of our key variables.

In this study we focus on PhDs in the advanced stages of their respective programs: those who report that they have successfully completed their qualifying exams or equivalent milestones. Focusing on advanced students has several advantages. First, these PhDs are closer to making their initial career decisions—including entrepreneurship—than PhDs in earlier stages of their programs. In addition, advanced PhDs have been in the program long enough to be influenced by their department norms and advisors. Furthermore, this sample complements recent studies using different data sources that have begun to look beyond faculty founders to examine the role of students and recent graduates in entrepreneurial activity (Boh, et al., 2011; Astebro et al., 2012). The final sample used for this study consists of 4,282 PhD students at 39 different research universities across the fields of life sciences, physical sciences, and engineering.

Using survey data on a sample of science and engineering PhDs complements prior empirical work on academic entrepreneurship in important ways. First, while many studies rely upon secondary data such as business plans, research disclosures, patents, and other sources to identify entrepreneurs ex post, the SEPPS provides direct measures of entrepreneurial intentions, which are the primary interest of this study. Moreover, observing individuals *before* they actually engage in entrepreneurial activities controls for potentially confounding influences of the entrepreneurial experience itself on individuals' characteristics and social context (Sexton and Bowman, 1985; Stuart and Ding, 2006; Elfenbein, et al., 2010).

A second advantage of these data is that they contain detailed measures of individual preferences, department norms, advisor activities, and perceptions about commercial opportunities. This not only allows us to consider individual and social factors simultaneously (Sorensen, 2007), but it also enables a more precise and nuanced view than commonly used proxy variables. Moreover, since all our respondents are in one cohort of PhD students who are preparing to enter the professional labor force for the first time (internships and short-term employment aside), our sample is relatively homogenous with respect to factors such as education, prior work experience, and age, allowing for a sharper focus on our featured variables.

Third, while much of the prior research in academic entrepreneurship has focused on faculty entrepreneurs (Roberts, 1991; Zucker, et al., 1998; Shane and Khurana, 2003; Stuart and Ding, 2006), there is emerging evidence that newly-minted science and engineering PhDs also play a critical role in the commercialization of university research (Brostrom, 2010). In addition, while there is widespread belief that attitudes in academia are increasingly commercially-

oriented (Etzkowitz, 1998; Owen-Smith and Powell, 2001; Stuart and Ding, 2006; Bercovitz and Feldman, 2008), much of our understanding of academic entrepreneurship is based on data collected more than a decade ago and empirical evidence on current attitudes remains sparse. Our data provide unique and current insights into this understudied set of individuals.

3.2 Dependent Variable

We employ two survey items to capture entrepreneurial intentions. Both measures were part of a general set of questions asking respondents about future employment after graduation and any potential postdocs**.** In the first question, we asked respondents "How likely are you to start your own company?" and provided them with a 5-point scale that ranged from "definitely will not" to "definitely will". We code respondents who indicated that they likely will or definitely will start their own company (4 or 5 on the scale) as expressing *founder intentions*. The second measure asks respondents to report the attractiveness of working for a startup after graduation.[2] More specifically, we asked "Putting job availability aside, how attractive do you personally find a career in a startup with an emphasis on research or development?" Respondents were provided a 5-point scale that ranged from *"extremely unattractive"* to *"extremely attractive"*. We code individuals who rate a career in a startup as attractive or extremely attractive (4 or 5) but do not intend to be a founder as expressing *joiner intentions*. In our data, 10.8% of individuals have founder intentions and 45.2% have joiner intentions. In auxiliary analyses, we restricted founder and joiner intentions to the highest response on both scales (i.e., 5 out of 5).

The remaining 44% of individuals who report that working in a startup is unattractive are classified broadly as "non-entrepreneurial." We further distinguish between those who are more oriented toward a career in academia and those who are more interested in a career in industry. More specifically, we draw upon additional survey questions that ask about the attractiveness, on a 5-point scale, of careers in academia as a research faculty or in teaching, respectively, and careers in an established firm, government, or other careers such as law or consulting. Individuals who reported a career in faculty research or teaching as more attractive than a career in one of the other categories was coded as *academia*, and all others were coded as *industry*. Although

[2]It is important to note that this measure is not mutually exclusive with other career options, and thus while responding individuals are unlikely to be making tradeoffs between working in a startup over alterative careers paths such as academia or an established firm. Nevertheless, as discussed below we control for labor market conditions and perform robustness test to examine alternative explanations.

this distinction is crude, our objective is simply to construct coarse distinctions between academic and non-academic careers for our non-entrepreneur reference group.[3] Table 1 presents a list of the variables, their description, and summary statistics, while Table 2 reports the correlation matrix. Table 3 presents descriptives for founder, joiner, and both non-entrepreneur groups.

3.3 Independent Variables

Individual Characteristics – To measure individual preferences for autonomy and wealth, we asked individuals to rate the importance of these job attributes on a 5-point scale from "not at all important" to "extremely important". To measure risk aversion, we asked respondents the following question: "Imagine you have the choice between winning $1,000 for sure or winning $2,000 with a 50% chance. Please indicate which option you prefer." Respondents were provided with a 10-point scale that ranged from "strongly prefer a 100% chance to win $1,000" to "strongly prefer a 50% chance to win $2,000." Higher values of this response scale reflect a greater aversion to risk while lower values reflect a greater tolerance to risk. Given that our empirical context is academic entrepreneurship, we measure ability as it relates to research by asking respondents "How would you rate your research ability relative to your peers in your specific field of study?" The scale ranged from 0 (least skilled, lowest percentile) to 10 (most skilled, highest percentile). Unlike prior measures of ability such as an individual's highest degree or salary, our measure reflects the individual's self-perceived research ability, which should be more directly linked to their future career decisions. We also include as a more objective measure of research ability the self-reported number of publications.[4] We measure individuals' interest in work activities on a 5-point scale that ranged from "extremely uninteresting" to "extremely interesting". The set of activities included "commercializing research results into products and services", "management or administration", "research that contributes fundamental insights or theories (basic research)" and "research that creates knowledge to solve practical problems (applied research)."

Social Context – To measure institutional norms toward different careers, we asked respondents to indicate the degree to which PhDs in their lab or department are encouraged or discouraged to pursue a job in a startup with an emphasis on research and a university faculty posi-

[3] To clarify, this does not reflect all individuals with an interest in a career in academia or industry, but rather the subset of these two career paths that are not also attracted to a career in a startup.
[4] Both measures reflect scientific ability and may not capture other dimensions of ability such as managerial or social skills.

tion with an emphasis on research, respectively. The scale for this item ranged from 1 (strongly discouraged) to 5 (strongly encouraged). To measure the entrepreneurial activities of prominent peers, we asked respondents to tell us if, to the best of their knowledge, their faculty advisor had founded an entrepreneurial venture. The response scale was yes, no, or don't know. We coded all responses as 1 if the response was yes, and all other responses as 0. While some respondents may report "no" or "don't know" even though their advisor may have founded a venture, we expect that only behaviors observed by the respondent should have an influence on their intentions.

Commercial Opportunity – We measure commercial opportunity by asking respondents to assess the potential commercial value of their current research on a 5-point scale, from not valuable to extremely valuable. The mean response was 2.47. As expected, the distribution is skewed with 53.8% of respondents reporting that their research has little value (response of 1 or 2), while 21.5% report that their research is of high value (4 or 5). Consistent with prior research (Stuart and Ding, 2006; Bercovitz and Feldman, 2008), we also use the number of patent applications on which the respondent was listed as an inventor as an alternative opportunity measure. While both measures should be good proxies for commercial opportunities emanating from a respondent's own research, they do not necessarily reflect opportunities resulting from other research projects or opportunities that are not technology-based.

3.4 Control variables

We include several control variables. First, we include controls for individual's demographic background, including gender, age, and nationality. One potential determinant of early career preferences is the parents' career, which may influence a respondent's values and career choices. In particular, PhDs who have a parent who is an entrepreneur may also find entrepreneurship more attractive (Aldrich and Kim, 2007). We thus include a variable that equals 1 if at least one parent is self-employed and 0 otherwise. Similarly, respondents raised by a parent who is employed in academia are more likely to be socialized into norms that value academic research over commercial activities, and thus may find entrepreneurship less attractive. We include a variable that equals 1 if at least one parent is working in academia and 0 otherwise. Finally, individuals with prior work experience in a startup may differ from other PhDs in unobservable ways and we include a measure that equals 1 if a respondent has worked for a startup and 0 otherwise. Regarding the measure of opportunities, we recognize that PhDs whose re-

search is funded by industry sources may not have the option to commercialize their research because the rights to any output may be assigned to the firm. As such, we include a binary variable that equals 1 if respondents' research is industry funded, and 0 otherwise. To account for the possibility that entrepreneurial intentions reflect perceptions of the availability of different of jobs, we asked respondents to provide subjective estimates of the probability that a PhD in their field could find a job in academia, a startup, or an established firm, respectively. We include these estimates as additional controls. Finally, we control for university and field effects by including dummies for 39 unique universities and 10 aggregate fields of science and engineering.

4 Analysis

Our first set of analyses uses multinomial regression to examine similarities and differences between the profiles of individuals with founder and joiner intentions on the one hand, and those without entrepreneurial intentions on the other. Complementing this analysis, we directly contrast individuals with founder intentions and those with joiner intentions using logit regression. We then use a measure of individuals' pre-PhD interest in entrepreneurship in an effort to disentangle selection and treatment effects. In a final set of analyses, we explore alternative mechanisms and conclude with robustness tests. While we seek to rule out alternative explanations and endogeneity, all results should be interpreted as correlational in nature.

4.1 Predictors of founder and joiner intentions

We first compare individuals who want to be a founder to those who want to be a joiner to examine the extent to which these two groups share similar entrepreneurial intentions relative to PhDs who are not interested in entrepreneurship. To accomplish this, we performed a series of multinomial logistic regressions that compare the profiles of those with intentions to be a founder, a joiner, or to work in academia to the reference group of those with intentions of working in industry. The featured results are presented in Table 4. While we report results for each set of factors separately, we focus our discussion on the full specification in Model 5. Model 6 reports logistic regression results that directly compare individuals with founder intentions and those with joiner intentions.

Focusing first on individual characteristics, we observe that both founders and joiners have significantly stronger preferences for autonomy, as well as lower levels of risk aversion

than individuals seeking industry careers (omitted category). However the effect sizes between the two differ markedly. For example, a one standard deviation higher preference for autonomy is associated with a 75% higher likelihood of being in the founder group versus the industry group, while a one-SD higher score increases the likelihood of being in the joiner group over the industry group by 28%. The logit results in Model 6 show that the differences in preferences between founders and joiners are significant: a one-SD higher preferences for autonomy increases the likelihood of having founder intentions over joiner intentions by 54%, while a one-SD increase in risk aversion decreases the likelihood of having founder intentions by 14%. Somewhat surprisingly, preferences for wealth have no relationship with founder intentions in the full specification, although preferences for wealth are significant when entered separately in Model 1.

The results for interest in specific work activities illustrate that those with founder and joiner intentions share a strong interest in conducting commercialization when compared to those seeking careers in industry. As expected, however, the interest in commercialization is significantly stronger among founders than among joiners: Model 6 suggests that a one standard deviation higher interest in commercialization increases the likelihood of wanting to be a founder over a joiner by 84%. Also as predicted, we find that those with founder intentions have a significantly stronger interest in managerial activities than those who want to be a joiner. It is interesting to note that individuals with founder and joiner intentions are more interested in conducting basic research than those who want to work in industry, perhaps suggesting that science and engineering PhDs with a greater "taste for science" (Roach and Sauermann, 2010) expect startups to provide them with more opportunities to conduct basic research relative to employment in established firms. A possible implication of this relationship is that science and technology-based startups may provide a hybrid employment setting that combine the benefits of both science and commercialization.

The results for ability paint a somewhat more nuanced picture than expected based on the extant literature. The full specification (Model 5) shows no significant relationship between ability and entrepreneurial intentions. Interestingly, however, ability has a significant positive coefficient in Model 1, which includes only individual characteristics. Exploratory analyses suggest that the effect of ability disappears once we include the measure of commercial opportunities, which ability strongly predicts. This observation suggests that higher ability scientists may be more likely to express founder intentions not because they believe that they will be more effec-

tive in running an entrepreneurial venture (Lazear, 2005; Elfenbein, et al., 2010; Astebro and Thompson, 2011), but because they are more likely to possess valuable commercial opportunities. The results regarding ability have to be interpreted in light of the limitation that our ability measure captures primarily research ability and not necessarily other types of ability and skills that might be more important to entrepreneurial transitions. At the same time, we also note that prior studies also do not directly observe entrepreneurial ability as such, and instead proxy for ability using education (Astebro, et al., 2011) or wages (Elfenbein, et al., 2010).

Turning our attention to the social context, we observe that the profiles of founders and joiners are quite different. First, we find that departmental norms encouraging entrepreneurship are not significantly associated with the likelihood of wanting to be a founder, however they do exhibit a strong positive association with wanting to be a joiner. On the other hand, the influence of entrepreneurial advisors is significantly associated with wanting to be a founder but not a joiner. The logit results in Model 6 confirms that these differences hold when we directly contrast individuals with joiner versus founder intentions: a one-SD increase in department norms increases the likelihood of having joiner over founder intentions by 11.5%, while individuals with entrepreneurial advisors are 40% more likely to want to be a founder over a joiner. These results suggest that different social factors are associated in different ways with entrepreneurial intentions. We explore whether individuals sort into social contexts that are more entrepreneurial or whether they are influenced by their social context below.

Finally, we examine the relationship between the commercial value of an individual's research and entrepreneurial intentions. As expected, we find that as the commercial value increases, individuals are more likely to have entrepreneurial intentions, although the relationship is stronger for founder intentions than joiner intentions. For example, a one standard deviation increase in commercial value increases the likelihood of being in the founder group over the industry group by 35%, while the same change increases the likelihood of being in the joiner group by only 14%. Model 6 shows that this difference between the two entrepreneurial groups is statistically significant, although the magnitude of this effect is not as large as we might expect if the discovery of an opportunity were a strong predictor of founder intentions (Shane, 2000).[5]

[5] Although not featured in the analysis, some control variables warrant special mention. First, we find that PhDs who have worked in a startup and males are more likely to have founder or joiner intentions relative to the industry reference group. Second, while individuals whose parents are employed in a university are less likely to want to be a founder or a joiner, consistent with prior research (Aldrich and Kim, 2007)having at least one parent who is self-employed significantly increases the likelihood of wanting to be a founder. Third, PhD students from China and India are more attracted to entrepreneurship than U.S. PhD stu-

In summary, our baseline regressions suggest that individuals with founder and joiner intentions share similar entrepreneurial profiles when compared to non-entrepreneurial types. However, they also exhibit significant differences from each other with respect to preferences for autonomy, risk, as well as interest in managerial work. More importantly, we find that institutional norms and peers have different relationships with the intentions to be a founder or a joiner. Taken together, these results suggest that both joiners and founders are "entrepreneurial" in a general sense, but also highlight the need to consider joiners as a distinct entrepreneurial actor. In the following section, we seek to provide deeper insights into the mechanisms underlying the observed results.

4.2 Sorting versus treatment effects

Our conceptual discussion focused on the factors that might explain who wants to be a founder and who wants to be a joiner. At the same time, we also eluded to the possibility that individuals with pre-existing entrepreneurial intentions may sort into contexts that support or encourage entrepreneurial activity or actively seek out research projects that are likely to result in commercially valuable knowledge. We also discussed the possibility that entrepreneurial intentions may be influenced, or "treated," buy their social context or the discovery of an opportunity. In this section, we seek to disentangle selection and treatment effects by drawing on a survey measure designed to capture respondents' interest in entrepreneurship *prior* to starting the PhD. More precisely, we first asked respondents in what year they started their PhD program. We then asked "Thinking back to when you began your PhD program in [year], how certain were you at that time that you wanted to pursue a career in a startup/entrepreneurial firm with an emphasis on research or development?" Responses were scored on a 5-point scale ranging "certain not to pursue" to "certain to pursue." We dichotomized this variable at the two highest responses to create a categorical variable that reflects respondents' pre-existing orientation toward entrepreneurship.[6] Approximately 34% of the PhDs in our sample reported a strong pre-existing orientation toward entrepreneurship. Of these, 65% express their current intentions to be a joiner and 24% report intentions to be a founder, suggesting that even for individuals with a longstanding orientation toward entrepreneurship many want to be a joiner rather than a founder. Furthermore, of

dents, a result that is somewhat counter to the prevailing notion of Americans as exhibiting especially strong orientations toward entrepreneurship.

[6] We also performed regressions using the 5-point measure instead of the binary measures with substantively identical results.

those who want to be a founder roughly 73% report a pre-existing entrepreneurial orientation while only 50% of joiners report the same. Thus, it seems that, at least descriptively, for many founder intentions are formed at earlier stages in life while joiner intentions emerge in response to social and other environmental influences.

In a first set of regressions, we examine the extent to which this pre-PhD interest in entrepreneurship predicts respondents' social context or commercial opportunities. We interpret significant coefficients of the pre-PhD measure as suggestive evidence of selection effects. Models 1 and 2 in Table 5 report ordered logistic regression results to assess whether individuals sort into departments with norms that favor entrepreneurship. The results show that individuals with a pre-existing orientation toward entrepreneurship are 42% more likely to be in departments that encourage careers in entrepreneurship, even after controlling for individual characteristics. Models 3 and 4 report logistic regressions results to examine whether PhDs with pre-existing entrepreneurial orientation are more likely to have an advisor who has been a founder. They are not. Finally, we examine whether those with a pre-existing orientation toward entrepreneurship are more likely to work on research projects with commercial value. Models 5 and 6 suggest that individuals do choose projects that are more commercially-oriented, but these results are sensitive to the inclusion of the measures of interest in different work activities. In addition, we find that ability is also a strong predictor of commercial value, providing additional evidence that the effect of ability on entrepreneurial intentions is mediated through opportunities, as discussed above. Overall, these results suggest a general pattern of individuals sorting into departments and, to a lesser degree, choosing projects based on their pre-existing orientation toward entrepreneurship.

Next, we seek to more clearly identify "treatment effects"; i.e., the extent to which the social context or commercial opportunities shape entrepreneurial intentions over the course of the PhD program. For that purpose, we limit our analysis to respondents who did *not* have a strong entrepreneurial orientation when starting the PhD, i.e., we use only the 66% of respondents with low scores on the pre-PhD measure (1-3 on the 5-point scale). We interpret significant coefficients as plausible evidence of treatment effects. This is predicated on the assumption that individuals *without* a pre-existing interest in entrepreneurship sort into a department, advisor, or research topic based on factors unrelated to entrepreneurship, such as the prestige or location of the university, or the specific field of research (Azoulay, et al., 2009).Mirroring our baseline re-

gressions in Table 5, we use this smaller sample to estimate multinomial logit models with respondents' current career intentions as the dependent variable (founder, joiner, academia, industry; with industry as the omitted category).[7] The results are presented in Table 6. Consistent with the findings by Azoulay et al. (2009), Model 1a suggests that founder intentions are shaped by entrepreneurial advisors, as well as by research with high perceived commercial value. These results are robust to the inclusion of individual characteristics (Model 2a). Although not reported in Table 7, standardized coefficients indicate that entrepreneurial advisors have a stronger effect on emergent entrepreneurial intentions than the other featured variables – having an advisor who is a founder is associated with 88% higher likelihood of having emergent founder intentions relative to the base group. Model 1b shows that joiner intentions are influenced by departmental norms that encourage careers in startups and possessing commercially valuable research. These results are also robust to the inclusion of individual characteristics in Model 2b.

Taken together, the analyses reported in this section suggest that our baseline results reflect both selection and treatment effects, although selection and treatment appear to play somewhat different roles for the different aspects of social context and commercial opportunities. The strong positive relationship between advisor characteristics and founder intentions appears to be due primarily to treatment effects, while the strong relationship between department norms and joiner intentions appears to reflect both selection and treatment effects. The observed relationship between commercial opportunities and entrepreneurial intentions appears to reflect primarily treatment effects but also – to a smaller extent – selection effects.[8]

In a final exploratory analysis, we return to our conjecture that commercial opportunities may not have a deterministic relationship with entrepreneurial intentions, even though they show a significant relationship in the regression context. In particular, we suggested that some individuals with commercial opportunities remain dis-interested in entrepreneurship, while other individuals with strong founder identities may intend to be founders even if no opportunity is immediately available (for examples see Roberts, 1991; Shane, 2004). To explore these possibilities, we analyzed the distribution of commercially valuable opportunities across respondents with

[7] Of these respondents with initially low orientation toward entrepreneurship, 26% reported founder or joiner intentions at the time of the survey, i.e., they have "emergent" entrepreneurial intentions.

[8] While retrospective questions can be useful if no real-time measure is available, respondents may not always accurately report past behaviors and intentions. It has been suggested, for example, that respondents sometimes assume unrealistic high degrees of stability, resulting in retrospective reports that are more similar to current behaviors and intentions than is warranted (Huber and Power, 1985; Schwarz, 2007). While we are not able to explicitly assess the potential for such biases in our data, they suggest that our analysis may overstate selection effects and understate treatment effects.

founder and joiner intentions. Focusing first on those individuals who believe that their research has commercial value, we find that a full 50% of them want to be a joiner and only 30% want to be a founder. Thus, contrary to what one might expect, not everyone who is attracted to entrepreneurship and possesses a commercial opportunity wants to be a founder. Next, of those who want to be a founder only 38.6% believe that their research has commercial value, suggesting that the majority of PhDs who intend to be a founder do not yet possess an opportunity. We also observe that 24% of joiners believe that their research has commercial value and yet they have no intention of founding a venture to exploit their opportunity. These results provide two key insights. First, for most respondents, founder intentions appear to have formed prior to the discovery of an opportunity. Second, the majority of people with a possible commercial opportunity do not intend be a founder. The latter result raises the question whether and how these commercial opportunities are commercialized, and by whom.

4.3 Robustness Tests

We conducted a number of robustness checks. First, recall that our set of controls includes a variable measuring whether respondents had prior startup experience. This variable strongly predicted entrepreneurial intentions. In an alternative specification, we exclude those respondents with prior startup experience from the sample (10.3% of observations) with no effect on the substantive findings. Second, it is conceivable that our field and university fixed effects absorb some interesting variation on social context factors or commercial opportunities. We excluded these fixed effects but find no significant change in our featured coefficients. Finally, recall that our featured results define individuals who scored 4 or 5 on our intention measures as having founder and joiner intentions. In an alternative analysis reported in Table 7, we use a more stringent cutoff, classifying only those who scored the highest rating of 5. Using this cutoff, our sample includes 4.7% founders, 8.8% joiners, 45.2% industry and 41.3% academia. We then used this new classification to re-estimate both the multinomial regression models as well as the logit models directly comparing founders and joiners. The results of the multinomial models for founder intentions in Model 1a are qualitatively similar to our main specification (Table 5) with respect to individual characteristics, however the influence of advisors and commercial opportunity are no longer significant. In addition, the results for joiner intentions in Model 1b largely dissipate relative to our featured results above. However, a caveat is in order, as the industry ref-

erence group for the multinomial regressions now contains a large share of individuals (55%) who reported working in a startup as attractive (4 out of 5). Thus, the estimates in Model 1b compare those who are *extremely attracted* to working in a startup to those who *attracted* and we have little basis for expecting highly significant differences. Logistic regression results in Model 2 show that even when we restrict the analysis to individuals with very strong entrepreneurial intentions, many individual level differences between those with founder and joiner intentions remain. Interestingly, however, differences between the two groups with respect to social and opportunity factors become insignificant. While the results using this more restrictive classification of respondents should be interpreted with caution due to the relatively small sample size, the weaker effects of social and opportunity factors may reflect that these factors operate primarily for individuals who are on the margin with respect to entrepreneurial intentions rather than for people with very strong entrepreneurial intentions.

As a final test, we recognize that a possible limitation of our measure of attractiveness is that it does not ask respondents to make tradeoffs between other career options. First, this may result in respondents overstating the attractiveness of entrepreneurship. Second, our results may reflect similarities among individuals who find multiple career options attractive, rather than relationship specific to entrepreneurship. Third, our measure of the attractiveness of a career in a startup may simply reflect a general "industry" career option and may not fully distinguish entrepreneurship as a unique career path. To test this, Models 3-5 in Table 7 report ordered logit estimates for the attractiveness of a career in a startup, an established firm, and academia, respectively. Although these measures do not distinguish between founder or joiner intentions, they are independent of one other and provide insights into the relative similarities and differences across these three career paths. Reassuringly, we find notable differences between the attractiveness of a career in a startup relative to a career in an established firm.

5 Conclusion

Entrepreneurship is increasingly seen as an engine of growth and has attracted significant attention from policy makers, educators, and scholars. While much of the research on entrepreneurship has focused on founders, new ventures rely critically on individuals who join founders in their efforts to build successful ventures. Moreover, while much prior work has examined characteristics of entrepreneurs, little is known regarding how intentions to engage in entrepre-

neurship form in the first place. Using a sample of 4,282 science and engineering PhD students near their initial career transition, we first provide descriptive insights into founder and joiner intentions, finding that joiner intentions are much more pervasive than intentions to become a founder. We then employ regression analysis to compare individuals with founder intentions, joiner intentions, and those who are not interested in entrepreneurship at all. Drawing on largely separate streams of prior literature, we simultaneously consider individual characteristics, social context, and perceived commercial opportunities as potential antecedents of entrepreneurial intentions. Our results suggest that individuals with joiner and founder intentions share many similarities when compared to "non-entrepreneurs". However, we also observe significant differences in the role of individual characteristics such as preferences for autonomy and risk, the role of institutional norms and prominent peers, or in the importance of commercial opportunities in shaping the two types of entrepreneurial intentions. These differences highlight the need to complement the common focus on founders with additional work on joiners, who are not simply "founders light", but who seem to be drawn to entrepreneurship for different reasons and who are likely to play quite different roles in entrepreneurial ventures.

In auxiliary analyses, we explored the extent to which these differences reflect selection versus treatment effects. Our results suggest that individuals with pre-existing interest in entrepreneurship self-select into organizational settings that support entrepreneurial activity, although we find no evidence of matching to prominent peers with entrepreneurial experience. We also find some evidence that scientists interested in entrepreneurship choose research projects with higher perceived commercial potential. At the same time, we find evidence that treatment also plays a role: among individuals who start their programs without an interest in entrepreneurship, those who work in departments that encourage entrepreneurship are more likely to develop joiner intensions, while those who work with entrepreneurial advisors are more likely to develop founder intentions. These findings suggest that different aspects of the social context have differing effects on the way people are socialized into entrepreneurship.

Our results should be seen in light of some important limitations. First, while our strategy to sample scientists before they enter particular careers allows us to avoid selection biases common in studies that examine entrepreneurs ex post, our cross-sectional survey data limit our ability to make causal inferences regarding underlying mechanisms. Even when interpreted as correlational in nature, however, our insights regarding differences and similarities between founders

and joiners have important implications. Relatedly, our analysis of selection versus treatment effects relies on a retrospective survey measure and provides only suggestive insights. At the same time, this analysis suggests that selection and treatment effects may operate differently along the three sets of factors considered in this study. As such, it points towards particularly promising areas for future longitudinal studies seeking to determine when and how such selection versus treatment effects explain observed relationships between entrepreneurial intentions on the one hand, and social context or opportunities on the other. Disentangling selection and treatment is particularly important from a policy perspective since they would suggest quite different levers for efforts to increase entrepreneurial activity. Finally, our sample consists if highly trained scientists and engineers and focuses on technology entrepreneurship. While our general discussion of the roles of joiner versus founders is likely to apply to entrepreneurship more generally, our particular findings regarding the role of individual characteristics, social context, and commercial opportunities in shaping founder and joiner intentions may not generalize. Given the increasing interest in academic entrepreneurship among scholars and policy makers, the particularly large potential of technology-based startups in creating economic growth, and the growing interest of science and engineering PhDs in entrepreneurial careers, we believe that our empirical setting is highly relevant and provides important insights.

Our findings suggest several additional areas for future research. First, future work is needed to examine how founder and joiner intentions translate into actual entrepreneurial activity. As eluded to in the introduction, studying intentions separately from realized transition allows us to consider not only the match between intentions and actions but especially the mismatch. For example, it will be interesting to study which individuals with strong founder intentions do not end up being founders, and why. Insights into this question may provide information on the "latent supply" of entrepreneurs and may also allow policy makers to remove obstacles that some of these individuals faced in efforts to implement their entrepreneurial intentions. On the other hand, some individuals may become entrepreneurs even though they have little genuine interest in entrepreneurship. This may be due to the lack of career alternatives, but perhaps also due to opportunities that are simply too good to pass up. We suspect that the degree to which actual founders have long-standing founder intentions vs. reacted more opportunistically to opportunities may have long-lasting effects on the success of the new venture.

Second, our results suggest that there is a strong relationship between commercial opportunities and entrepreneurial intentions. At the same time, we found that this relationship is far from deterministic. More precisely, nearly two-thirds of those who intend to be a founder do not believe that their current research has commercial potential, perhaps indicating that their desire to be a founder originates prior to the discovery of an entrepreneurial opportunity. Furthermore, of all PhDs who believe that their current research possess commercial value, one-fifth intend to be founders. Future research is needed to examine whether and how those individuals with strong founder intentions but without immediate commercial opportunities acquire the opportunities necessary to successfully launch a new venture. It is conceivable that these individuals are willing to launch ventures even with low-quality opportunities, which may have potentially detrimental effects on their entrepreneurial success. Just as important, we need to understand what happens to the opportunities that reside with individuals who have no interest in exploiting them through entrepreneurship.

Finally, several important research questions emerge from the distinction between founder and joiner intentions. How do those who intend to found a new venture identify others interested in joining their efforts? To what extent do the similarities between founders and joiners facilitate the formation of entrepreneurial teams? Do the significant differences we observe with respect to individual preferences and interest in work activities create tensions between founders and joiners, or do they facilitate the division of labor among complementary entrepreneurial roles? We hope that our paper stimulates future research on these and other interesting questions.

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Table 1: Variable descriptions and summary statistics

Variable	Survey Question	Response	Mean	S.D.	Min	Max
Dependent Variable: Career intentions						
Founder	Likely to start own company (4 or 5 on 5-point scale)	Category 1	10.9%	n.a.	n.a.	n.a.
Joiner	Attracted to working in startup (4 or 5 on 5-point scale), but unlikely to start own company	Category 2	45.2%	n.a.	n.a.	n.a.
Academia	Not attracted to working in startup; attracted to career in academia	Category 3	27.7%	n.a.	n.a.	n.a.
Industry	Not attracted to working in startup; attracted to career in established firm	Category 4 (base)	16.2%	n.a.	n.a.	n.a.
Independent Variables						
Preference - Autonomy	When thinking about an ideal job, how important is it to you to be able to choose research projects?	5pt scale	3.99	0.81	1	5
Preference - Wealth	When thinking about an ideal job, how important to you is financial income (e.g., salary, bonuses, etc.)?	5pt scale	3.95	0.72	1	5
Risk Aversion	How much do you prefer winning $1,000 for sure to winning $2,000 with a 50% chance?	10pt scale	2.45	2.49	0	10
Ability	How would you rate your research ability relative to other PhDs in your specific field	10pt scale	6.35	1.65	0	10
Work Interest - Basic research	When thinking about the future, how interesting would you find work activites in conducting research that contributes fundamental insights or theories?	5pt scale	4.00	0.93	1	5
Work Interest - Applied research	When thinking about the future, how interesting would you find work activites in conducting research that creates knowledge to solve practical problems?	5pt scale	4.34	0.67	1	5
Work Interest - Commercialization	When thinking about the future, how interesting would you find work activites thatc ommercialize research results into products or services?	5pt scale	3.34	1.12	1	5
Work Interest - Management	When thinking about the future, how interesting would you find managerial or administrative work activites?	5pt scale	2.90	1.16	1	5
Dept. norms - Academia	In your lab/department, to what extent are PhDs encouraged or discouraged to pursue a university faculty position with emphasis on research or development?	5pt scale	4.20	0.75	1	5
Dept. norms - Entrepreneurship	In your lab/department, to what extent are PhDs encouraged or discouraged to pursue a job in startup firm with emphasis on research or development?	5pt scale	3.27	0.72	1	5
Advisor - Founder	To the best of your knowledge, has your advisor founded an entrepreneurial venture?	Binary	0.10	0.30	0	1
Commercial Opportunity	How would you assess the potential commercial value of your current research?	5pt scale	2.47	1.17	1	5
Num. patents	How many patent applications or issued patents list you as an inventor?	Count	0.21	0.77	0	8
Prior employment in startup	Have you ever been employed in a startup firm?	Binary	0.10	0.30	0	1

Table 2: Descriptive Statistics by Career Intentions

Dependent variable:	(1) Founder	(2) Joiner	(3) Academia	(4) Industry
Attractiveness of Entrepreneurship	4.25	4.19	2.36	2.61
Preference - Autonomy	4.11	3.95	4.22	3.60
Preference - Wealth	4.15	4.07	3.67	4.00
Risk aversion	6.58	7.39	7.99	7.91
Ability	6.81	6.41	6.27	6.00
Work Interest - Commercialization	4.17	3.64	2.58	3.32
Work Interest - Management	3.48	3.04	2.41	2.98
Work Interest - Basic research	3.76	3.97	4.34	3.63
Work Interest - Applied research	4.47	4.42	4.20	4.28
Dept. norms - Academia	4.10	4.14	4.36	4.19
Dept. norms - Entrepreneurship	3.35	3.36	3.13	3.18
Advisor - Founder	0.20	0.10	0.06	0.09
Commercial opportunity	3.04	2.60	2.12	2.35

Table 3: Correlation Matrix

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1) Preference - Autonomy												
(2) Preference - Wealth	-0.11*											
(3) Risk Aversion	-0.08*	-0.01										
(4) Ability	0.20*	0.08*	-0.07*									
(5) Num. publications	0.06*	-0.02	0.01	0.21*								
(6) Work Interest - Commercialization	-0.13*	0.30*	-0.12*	0.12*	-0.02							
(7) Work Interest - Management	-0.19*	0.27*	-0.09*	0.07*	-0.03	0.46*						
(8) Work Interest - Basic	0.35*	-0.14*	0.00	0.12*	0.07*	-0.30*	-0.29*					
(9) Work Interest - Applied	0.11*	0.13*	-0.02	0.12*	0.03	0.27*	0.07*	0.12*				
(10) Dept. norms - Academia	0.05*	-0.01	0.04*	0.01	0.06*	-0.11*	-0.01	0.11*	0.06*			
(11) Dept. norms - Entrepreneurship	0.04*	0.02	-0.06*	0.04	-0.04*	0.12*	0.07*	-0.00	0.06*	0.02		
(12) Advisor - Founder	0.02	0.05*	-0.04	0.04*	0.04	0.12*	0.08*	-0.08*	0.05*	-0.04*	0.12*	
(13) Commercial opportunity	0.04*	0.11*	-0.11*	0.17*	-0.03	0.31*	0.15*	-0.14*	0.21*	-0.10*	0.19*	0.17*

Table 4: Predictors of Founder and Joiner Intentions

Method	Multinomial Logit															Logit
Description	Individual Characterisitics			Work Activities			Social Context			Commercial Opportunity			Full Specification			Entr. Intent
Dependent variable:	Founder	Joiner	Academia	Founder	Joiner	Academia	Founder	Joiner	Academia	Founder	Joiner	Academia	Founder	Joiner	Academia	Founder
	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)	(3a)	(3b)	(3c)	(4a)	(4b)	(4c)	(5a)	(5b)	(5c)	(6)
Preference - Autonomy	0.59**	0.37**	0.80**										0.69**	0.30**	0.61**	0.43**
	(0.09)	(0.06)	(0.06)										(0.09)	(0.06)	(0.07)	[0.10]
Preference - Wealth	0.33**	0.16*	-0.53**										-0.01	0.08	-0.38**	0.08
	(0.10)	(0.08)	(0.08)										(0.10)	(0.07)	(0.09)	[0.11]
Risk aversion	-0.15**	-0.07**	0.02										-0.12**	-0.06**	0.01	-0.06**
	(0.02)	(0.02)	(0.03)										(0.02)	(0.02)	(0.03)	[0.02]
Ability	0.10*	0.03	-0.01										0.04	-0.01	-0.02	0.02
	(0.04)	(0.03)	(0.03)										(0.05)	(0.03)	(0.03)	[0.04]
Work Interest - Basic research				0.38**	0.40**	0.61**							0.22**	0.32**	0.45**	-0.10
				(0.08)	(0.04)	(0.05)							(0.08)	(0.05)	(0.06)	[0.07]
Work Interest - Applied research				0.06	0.14+	-0.20**							-0.11	0.07	-0.30**	-0.02
				(0.13)	(0.08)	(0.07)							(0.14)	(0.08)	(0.08)	[0.12]
Work Interest - Commercialization				0.89**	0.36**	-0.37**							0.87**	0.35**	-0.31**	0.61**
				(0.09)	(0.06)	(0.06)							(0.11)	(0.06)	(0.07)	[0.12]
Work Interest - Management				0.27**	0.04	-0.14**							0.30**	0.05	-0.06	0.26**
				(0.05)	(0.04)	(0.05)							(0.05)	(0.04)	(0.05)	[0.06]
Dept. norms - Academia							0.05	0.00	0.25**				0.02	0.01	0.26**	0.03
							(0.09)	(0.07)	(0.08)				(0.11)	(0.08)	(0.08)	[0.08]
Dept. norms - Entrepreneurship							0.08	0.29**	0.01				-0.01	0.22**	-0.09	-0.17*
							(0.09)	(0.07)	(0.07)				(0.10)	(0.07)	(0.08)	[0.07]
Advisor - Founder							0.76**	0.14	-0.01				0.47*	0.05	0.10	0.40**
							(0.20)	(0.14)	(0.18)				(0.19)	(0.13)	(0.18)	[0.14]
Commercial opportunity										0.41**	0.19**	-0.03	0.26**	0.11*	0.08+	0.15*
										(0.06)	(0.04)	(0.04)	(0.07)	(0.05)	(0.05)	[0.06]
Num. patents										0.06	-0.02	-0.07	0.01	-0.02	-0.04	0.05
										(0.07)	(0.07)	(0.10)	(0.09)	(0.08)	(0.10)	[0.06]
Control variables	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Field fixed effects	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
University fixed effects	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Constant	-6.72**	-2.40**	-1.52*	-9.84**	-4.49**	-1.27*	-4.84**	-2.00**	-1.89**	-4.76**	-1.32**	-0.62	-10.38**	-5.33**	-2.40*	-8.14**
	(0.82)	(0.58)	(0.67)	(0.72)	(0.51)	(0.57)	(0.67)	(0.57)	(0.61)	(0.61)	(0.45)	(0.45)	(1.06)	(0.80)	(0.93)	[0.85]
Obs.		4282			4282			4282			4282			4282		2336
Loglikelihood		-4662.32			-4448.35			-4848.20			-4841.12			-4309.27		-852.88

NOTES: The dependent variable in Models 1-5 consists of four categories: *founder* (intend to start own company), *joiner* (attracted to entrepreneurship but do not intend to start own company), *academia* (not attracted to entrepreneurship and academia-oriented), and the reference group *industry* (not attracted to entrepreneurship and industry-oriented); the dependent variable in Model 6 equals 1 if founder, 0 if joiner and the sample is restricted to only those with entrepreneurial intentions (i.e., either founder or joiner); control variables include number of patents, number of publications, expected job availability, prior startup work experience, gender, nationality, and patents' occupation; all columns report robust standard errors clustered on university reported in parentheses; ** $p < 1\%$, * $p < 5\%$, + $p < 10\%$.

Table 5: Sorting into Department, Advisor, and Commercial Research

Method	Ordered logit		Logit		Ordered logit	
Dependent variable	Dept norms - Entr.		Advisor - Founder		Comm. Opportunity	
Model	(1)	(2)	(3)	(4)	(5)	(6)
Pre-existing Entr. Orientation	0.38**	0.35**	0.15	0.04	0.26**	0.08
	[0.08]	[0.08]	[0.11]	[0.11]	[0.08]	[0.08]
Preference - Autonomy		0.11*		0.20**		0.18**
		[0.04]		[0.07]		[0.04]
Preference - Wealth		-0.05		0.06		-0.02
		[0.04]		[0.08]		[0.04]
Risk aversion		0.00		-0.02		-0.02
		[0.02]		[0.02]		[0.02]
Ability		-0.00		0.03		0.15**
		[0.02]		[0.03]		[0.02]
Work Interest - Basic research		0.18**		-0.15*		-0.17**
		[0.04]		[0.07]		[0.04]
Work Interest - Applied research		0.00		0.02		0.38**
		[0.05]		[0.12]		[0.05]
Work Interest - Commercialization		0.05		0.21**		0.25**
		[0.04]		[0.06]		[0.04]
Work Interest - Management		0.06		-0.02		0.01
		[0.04]		[0.05]		[0.03]
PrePhD Orientation - Academia	0.06+	0.01	-0.01	-0.01	0.05+	0.02
	[0.04]	[0.04]	[0.05]	[0.05]	[0.03]	[0.03]
PrePhD Orientation - Established firm	0.05	0.06	0.15**	0.10	0.24**	0.16**
	[0.04]	[0.04]	[0.06]	[0.06]	[0.03]	[0.03]
Control variables	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Field fixed effects	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
University fixed effects	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Constant			-2.86**	-3.86**		
			[0.56]	[0.82]		
Obs.	4266	4266	4266	4266	4266	4266
Log-likelihood	-4237.58	-4218.76	-1330.07	-1313.57	-5934.01	-5780.00

NOTES: The variable Pre-existing Entrepreneurial Orientation equals 1 if the respondent reported retrospectively that prior to the PhD they were likely to work in a startup upon graduation and is intended to reflect possible selection effects; the dependent variables are as follows: Models 1 & 2 is the extent to which the department encourages careers in a startup on a 5-point scale; Models 3 & 4 is whether the advisor has been a founder (yes=1); Models 5 & 6 is the commercial value of the respondent's research on a 5-point scale; control variables include number of patents, number of publications, expected job availability, prior startup work experience, gender, nationality, and patents' occupation; all results report robust standard errors clustered on university reported in parentheses; ** p < 1%, * p < 5%, + p < 10%.

Table 6: Treatment Effects of Social Context and Commercial Opportunity

Method	Multinomial Logit					
Description	Treatment Variables			Full Specification		
Dependent variable:	Founder	Joiner	Acad.	Founder	Joiner	Acad.
Model	(1a)	(1b)	(1c)	(2a)	(2b)	(2c)
Dept norms - Academia	-0.00	0.03	0.23**	-0.01	0.04	0.24**
	(0.16)	(0.08)	(0.08)	(0.18)	(0.09)	(0.08)
Dept norms - Entrepreneurship	0.03	0.25**	0.00	-0.06	0.17*	-0.12
	(0.15)	(0.08)	(0.08)	(0.16)	(0.08)	(0.10)
Advisor - Founder	0.70*	-0.19	-0.05	0.63*	-0.18	0.03
	(0.33)	(0.16)	(0.20)	(0.31)	(0.18)	(0.20)
Commercial opportunity	0.35**	0.15**	-0.03	0.26*	0.11*	0.09+
	(0.11)	(0.05)	(0.05)	(0.12)	(0.06)	(0.05)
Preference - Autonomy				0.79**	0.35**	0.59**
				(0.13)	(0.07)	(0.07)
Preference - Wealth				-0.27	0.06	-0.36**
				(0.17)	(0.10)	(0.10)
Risk aversion				-0.07	-0.04+	0.03
				(0.04)	(0.02)	(0.03)
Ability				0.08	-0.03	-0.01
				(0.07)	(0.03)	(0.04)
Work Interest - Basic research				0.27*	0.35**	0.43**
				(0.13)	(0.05)	(0.07)
Work Interest - Applied research				-0.46*	-0.02	-0.31**
				(0.21)	(0.09)	(0.08)
Work Interest - Commercialization				0.36**	0.10	-0.01
				(0.12)	(0.06)	(0.06)
Work Interest - Management				0.70**	0.26**	-0.33**
				(0.14)	(0.07)	(0.08)
Control variables	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Field fixed effects	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
University fixed effects	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Constant	-6.50**	-1.92**	-1.05+	-9.99**	-4.84**	-1.53+
	(1.36)	(0.63)	(0.61)	(1.80)	(0.88)	(0.92)
Obs.		2808			2808	
Log-likelihood		-3103.67			-2813.15	

NOTES: All models restrict the sample to only those respondents who reported no interest in working in a startup at the time they started their PhD and thus it is assumed that their entrepreneurial intentions were formed during the PhD; the dependent variable in Models 1 & 2 consists of four categories: *founder* (intend to start own company), *joiner* (attracted to entrepreneurship but do not intend to start own company), *academia* (not attracted to entrepreneurship and academia-oriented), and the reference group *industry* (not attracted to entrepreneurship and industry-oriented); control variables include number of patents, number of publications, expected job availability, prior startup work experience, gender, nationality, and patents' occupation; all columns report robust standard errors clustered on university reported in parentheses; ** $p < 1\%$, * $p < 5\%$, + $p < 10$.

Table 7: Robustness Tests

Method	Multinomial Logit			Logit	Ordered Logit		
Description	Extremely Attracted to Entr.			Comparision	Career Attractiveness		
Dependent variable:	Founder	Joiner	Academia	Founder	Startup	Est. Firm	Academia
Model	(1a)	(1b)	(1c)	(2)	(3)	(4)	(5)
Preference - Autonomy	0.46**	0.10	0.70**	0.47**	0.01	-0.35**	0.81**
	(0.12)	(0.09)	(0.06)	[0.16]	[0.04]	[0.04]	[0.05]
Preference - Wealth	0.20+	0.22*	-0.41**	0.23	0.33**	0.56**	-0.16**
	(0.11)	(0.09)	(0.08)	[0.18]	[0.04]	[0.04]	[0.04]
Risk aversion	-0.09**	-0.02	0.03+	-0.08*	-0.05**	-0.01	-0.03*
	(0.02)	(0.03)	(0.02)	[0.04]	[0.01]	[0.01]	[0.01]
Ability	0.00	0.09*	0.04	-0.04	0.00	0.03	0.15**
	(0.06)	(0.04)	(0.03)	[0.08]	[0.02]	[0.02]	[0.02]
Work Interest - Basic research	0.01	0.04	0.46**	0.19	0.05	0.10*	0.92**
	(0.09)	(0.07)	(0.06)	[0.13]	[0.03]	[0.04]	[0.04]
Work Interest - Applied research	0.56**	0.61**	-0.29**	-0.16	0.39**	0.61**	0.02
	(0.20)	(0.13)	(0.06)	[0.22]	[0.06]	[0.05]	[0.06]
Work Interest - Commercialization	0.90**	0.30**	-0.38**	0.63**	0.62**	0.52**	-0.09**
	(0.15)	(0.07)	(0.04)	[0.20]	[0.04]	[0.04]	[0.03]
Work Interest - Management	0.16*	0.02	-0.11**	0.22*	0.10**	0.06+	-0.16**
	(0.08)	(0.06)	(0.04)	[0.09]	[0.03]	[0.03]	[0.03]
Dept. norms - Academia	0.04	0.12	0.34**	-0.05	-0.12*	0.01	0.11*
	(0.14)	(0.11)	(0.06)	[0.18]	[0.06]	[0.04]	[0.05]
Dept. norms - Entrepreneurship	0.02	0.14	-0.10	-0.14	0.23**	0.07	0.12**
	(0.11)	(0.11)	(0.07)	[0.12]	[0.05]	[0.05]	[0.04]
Advisor - Founder	0.37	0.12	-0.03	0.10	-0.01	-0.18	0.09
	(0.23)	(0.17)	(0.16)	[0.27]	[0.11]	[0.11]	[0.11]
Commercial opportunity	0.14	-0.00	0.01	0.20	0.05+	0.08**	0.10**
	(0.10)	(0.05)	(0.04)	[0.12]	[0.03]	[0.03]	[0.02]
Num. patents	0.10	0.03	-0.04	0.09	0.07*	-0.01	-0.06
	(0.07)	(0.08)	(0.06)	[0.12]	[0.03]	[0.04]	[0.05]
Control variables	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Field fixed effects	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
University fixed effects	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.	Incl.
Constant	-9.84**	-4.49**	-1.27*	-8.33**			
	(0.72)	(0.51)	(0.57)	[1.71]			
Obs.		4282		569	4282	4282	4282
Loglikelihood		-4448.35		-276.18	-5169.66	-4825.32	-4882.33

NOTES: The dependent variable in Model 1 recodes entrepreneurial intentions to correspond to those respondents who reported entrepreneurship as extremely attractive (5 out of 5) to reflect the strongest entrepreneurial intentions; the categories are: *founder* (intend to start own company), *joiner* (attracted to entrepreneurship but do not intend to start own company), *academia* (not attracted to entrepreneurship and academia-oriented), and the reference group *industry* (not attracted to entrepreneurship and industry-oriented); Model 2 restricts the sample to only those respondents who reported entrepreneurship as extremely attractive (5 out of 5); the dependent variable equals 1 if founder and 0 if joiner; the dependent variables in Models 3-5 are, respectively, the attractiveness of working in a startup, and established firm, and a faculty research position; control variables include number of patents, number of publications, expected job availability, prior startup work experience, gender, nationality, and patents' occupation; all columns report robust standard errors clustered on university reported in parentheses; ** p < 1%, * p < 5%, + p < 10.