

**Framework conditions of academic
entrepreneurship:
An empirical investigation at
Swiss Universities of Applied Sciences**

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Summary of content

ACKNOWLEDGEMENT	4
THE MANUSCRIPTS OF THIS DISSERTATION	5
SUMMARY OF CONTENT	6
LIST OF ABBREVIATIONS	7
ABSTRACT.....	8
6. GENERAL INTRODUCTION.....	10
6.1 ACADEMIC ENTREPRENEURSHIP	10
6.2 ENTREPRENEURSHIP IN THE CONTEXT OF SWISS UNIVERSITIES OF APPLIED SCIENCES.....	11
6.3 THEORETICAL BASIS OF THE THESIS	12
6.3.1 <i>Psychological-motivational theories</i>	13
6.3.2 <i>Institutional theory approach</i>	15
6.4 NEED FOR FURTHER RESEARCH	16
6.4.1 <i>Focus of this thesis and research questions</i>	19
7. METHODS	21
7.1 THE SURVEY	21
7.1.1 <i>Study instruments</i>	21
7.1.2 <i>Data collection</i>	22
7.1.3 <i>Analysis methods</i>	23
7.2 PRIMARY DESCRIPTIVE RESULTS OF THE SURVEY.....	24
8. SUMMARY OF MANUSCRIPTS	25
MANUSCRIPT A	25
8.1.1 <i>Introduction</i>	25
8.1.2 <i>Methods</i>	26
8.1.3 <i>Results</i>	28
8.1.4 <i>Discussion</i>	30
8.1.5 <i>Limitations</i>	31
MANUSCRIPT B.....	31
8.2.1 <i>Introduction</i>	31
8.2.2 <i>Methods</i>	34
8.2.3 <i>Results</i>	36
8.2.4 <i>Discussion</i>	38
8.2.5 <i>Limitations</i>	39
MANUSCRIPT C	40
8.3.1 <i>Introduction</i>	40
8.3.2 <i>Methods</i>	42
8.3.3 <i>Results</i>	45
8.3.4 <i>Discussion</i>	48
8.3.5 <i>Limitations</i>	49
9. GENERAL CONCLUSION	50
9.1 STUDIES' CONTRIBUTIONS TO THE FIELD.....	50
9.2 IMPLICATIONS FOR FUTURE RESEARCH	53
BIBLIOGRAPHY	57
CURRICULUM VITAE	71
ATTACHMENTS.....	72

List of Abbreviations

ATT	Attitude towards academic entrepreneurship
AVE	Average variance extracted
BFS	Federal statistical office
CMV	Common method variance
EI	Entrepreneurial intention
ENG	Entrepreneurial engagement
ER	Entrepreneurial rewards
ESE	Entrepreneurial self-efficacy
ETHZ	Swiss Federal Institute of Technology Zurich
FTE	Full-time equivalent
HTMT	Heterotrait-monotrait ratio of the correlation
MAP	Mindset theory of action phases
MLR	Maximum likelihood with robust standard error estimate
MSEM	Multigroup structural equation modeling
OE	Outcome expectations
OLS	Ordinary least squares
PBC	Perceived behavioral control
R&D	Research and development
SCCT	Social cognitive career theory
SEM	Structural equation modeling
SN	Social norm
SNSF	Swiss national fund
SPIN-OFF	Businesses founded in the environment of universities and based on intellectual properties, knowledge, patents originated from research
STEM	Natural and technical sciences
TPB	Theory of planned behavior
TTO	Technology transfer offices
UAS	Universities of applied sciences

Abstract

Operating at the interface between scientific research and commercial exploitation of research, knowledge transfer in the form of academic entrepreneurship is considered integral to the so-called third mission of universities and universities of applied sciences. Spin-off engagement has been studied by both psychological and economic scholars using institutional and motivational theories, yet there is still limited knowledge about how organizational conditions interact with scientist's motivation and drive academic entrepreneurship. This research is urgently needed, as it is known from the literature that a lack of organizational support that addresses scientists' needs can lead to institutional barriers and a lack of academic spin-off engagement.

Motivated by recent data demonstrating female entrepreneurial activity among academics in scientific fields lags behind that of men, the first manuscript presents an analysis of formal and informal entrepreneurial conditions at Swiss universities of applied sciences to identify the status of female entrepreneurship. By addressing the aforementioned gap, the descriptive approach of the first manuscript explored the lack of support for female scientists involved in entrepreneurship and shed light on how to promote their full entrepreneurial potential. Research has shown that while a positive environment promotes entrepreneurship, personal motives and satisfaction with the current work situation may also determine entrepreneurial careers.

The second manuscript is concerned with job satisfaction as a moderator in entrepreneurial decision-making. Individuals make critical choices between employment and self-employment to maximize the benefits of career choice when considering expected outcomes. Prior research identified entrepreneurial careers as an escape from poor work environments; thus, there is a lack of understanding regarding how job-satisfaction triggers entrepreneurship within universities. Informed by Social Cognitive Careers Theory, a multigroup analysis aims to test if job dissatisfaction fosters the re-evaluation of outcome expectations to define entrepreneurial career goals.

The third manuscript examined the robustness of intentional motivation theories in prior entrepreneurship research. By combining the Theory of Planned Behavior and Mindset Theory of Action, this investigation addresses the formation of entrepreneurial intention, focusing on the transition from motivation to implementation in the context of academia. Until recently, research mostly relied on cross-sectional data to predict and measure the strength of entrepreneurial intention in the phase preceding the launch of a new business, without

considering whether participants were in the motivational or actional phase. In turn, this creates a gap of knowledge concerning the cognitive and motivational processes involved in fostering entrepreneurial intention.

The research questions above were addressed using a survey of academics from the Swiss universities of applied sciences. Overall, the thesis contributes new findings to the current literature in three primary ways. First, it highlights the lack of a stimulating entrepreneurial environment at Swiss UAS, thus serving as a basis for decision makers to start future incentives to foster female entrepreneurship. Second, it shows that academics are more likely to engage in entrepreneurial activities than spin-off activities when they have positive outcome expectations toward entrepreneurial actions and are dissatisfied with their current employment. Third, by showing a direct influence of entrepreneurial engagement on intention, a moderation effect of engagement on the Theory of planned behavior predictors and a threshold of intention-growth per the context after the initiation of the first entrepreneurial action, this thesis reignites prior discussion about studying entrepreneurial intention rather than behavior. The findings of this thesis highlight the need to transform intention-based research into action-based research when studying the impact of organizations on the creation of academic spin-offs since much more research untangling the cognitive mechanisms behind the business implementation is required. For policymakers, the results of the thesis are in line with SNSF-project outcomes, calling for new strategies for targeted and personalized support for academics at universities of applied sciences.

Keywords: Institutional framework - entrepreneurial intentions - academic entrepreneurship - Rubicon - gender - job satisfaction

6. General Introduction

6.1 Academic Entrepreneurship

Universities are increasingly becoming hubs of academic entrepreneurship. The traditional teaching and research missions have been adapted and added an active focus on commercial knowledge transfer as the so called “third mission” (Etzkowitz, 2003, 2017; Guerrero & Urbano, 2012; Siegel, 2006). Commercial knowledge transfer takes place when researchers engage in entrepreneurial activities arising from their research findings, generate licenses and patents, participate in contract research for industry or the public sector, and engage spin-off activities (Miller et al., 2018; Schmitz et al., 2017). Spin-off companies are companies that spawn from science-based innovations conducted in universities, universities of applied sciences (referred as UAS) or other public research institutions (Shane, 2004).

As part of their institutional mission, the majority of universities and policymakers now recognize that entrepreneurial activities undertaken by researchers provide invaluable context for technical and social innovation (Etzkowitz, 2017; Meek & Wood, 2016). Policymakers have enacted legislation to create incentives for universities to increase their commercialization activities; for example, by granting them the right to claim ownership of intellectual property resulting from research conducted on campus. The U.S. Bayh-Dole Act of 1980 is probably the best-known legislation to this end and paved the way for similar legal changes in many other countries (Geuna & Rossi, 2011; Leydesdorff & Meyer, 2010; Mowery & Sampat, 2004).

With the commercialization of research as an additional organizational goal, universities are concurrently altering their structures, policies, and incentive systems (Etzkowitz, 2014; Fernández-Nogueira et al., 2018; Kirby, 2006; Shane, 2004). Universities are recognized as key players in shaping favorable entrepreneurial ecosystems (Etzkowitz, 2017; Huyghe & Knockaert, 2015; O’Shea et al., 2008). Also with the Horizon Europe (2020-2027) as an example, funding programs were launched to intensify the transfer of knowledge to society and promoting entrepreneurship in participating European Countries including Switzerland (SBFI, 2021). Extensive investments have been made, offering further training and supporting academic entrepreneurship structures that encourage students and staff to pursue entrepreneurial education (Díaz-García et al., 2015; Rasmussen & Gulbrandsen, 2012). Some universities have invested in new facilities and infrastructure designed to foster faculty entrepreneurship, such as technology transfer offices (referred as TTO), incubators, and technology and science parks (Chapple et al., 2005; Fernández-Nogueira et al., 2018; Grimaldi et al., 2011). Mentoring services, entrepreneurship courses, and other educational initiatives aim to develop an entrepreneurial mindset (e.g., perceives behavioral control, entrepreneurial

passion) and foster creative thinking that support positive outcomes (Kägi et al., 2018; Nabi et al., 2017; Nindl & Kaufmann, 2020).

Universities in Switzerland are responding to growing global demand for innovation, where greater emphasis is being placed on academic entrepreneurship as a means to leverage scientific knowledge. A recently published study examined spin-offs created within the Swiss Federal Institute of Technology Zurich (ETHZ) and reported that the 145 spin-off companies surveyed (2018) created more than 4447.6 full-time equivalent (FTE) and generated CHF 889 million in revenue in 2017. ETHZ spin-offs have significant value and impact on the local economy, as 95% of the companies still operate in Switzerland and in Zurich. Every year, around 30 spin-offs are founded at ETHZ, embodying an important transfer of knowledge to the economy and society (Hofer et al., 2020).

6.2 Entrepreneurship in the context of swiss universities of applied sciences

Since the 1990s, Swiss universities and universities of applied sciences have collectively become more entrepreneurial (Arvanitis et al., 2008; SBFI, 2020). The promotion of science-based spin-offs is becoming an important task of the seven public UAS, as academic spin-offs are explicitly the subject of state innovation funding (Art. 23 para. 1 let. FIFG 2013). The reform of so-called legally anchored fourfold performance mandate of the UASs (education, research & development, continuing education as well as service/consulting), combined with the reform of the UAS in 1995, is considered a call to commercially exploit the outcomes of academic research. UAS researchers are active in several service areas, whereby commercial knowledge transfer is most likely to originate from the research and development (R&D) service areas. Top-down, legislation has created a framework for promoting the transfer of innovation from research to society, including through spin-offs operating within the framework of UAS.

The application-oriented profile of UAS directly benefits from enhanced spin-off activities (Morandi et al., forthcoming-a). Academic entrepreneurship supports the transfer of research to society in the context of the “knowledge-transfer mission” (Walter & Auer, 2009), creating new opportunities for researchers outside established career paths, and contributing significantly to regional development of the decentralized UAS locations across Switzerland. Moreover, the financial revenues associated with spin-offs through licensing and patent fees could become an important source of income for UAS. In particular, the strongly application-oriented character of UAS research, which is often characterized by close cooperation between research and industry, services and administration (KFH, 2014), can itself benefit from spin-offs (in terms of contract research) and simultaneously be assumed to be a good prerequisite for academic entrepreneurship. A high degree of market orientation resulting from intensive

collaboration with non-institutional actors is acknowledged in the literature as an opportunity to identify entrepreneurial opportunities, thus representing a predictor of entrepreneurial activities (Arvanitis et al., 2008; Fischer et al., 2018) and venture success (Buratti et al., 2020).

A specific feature of UAS is the so-called "doppelte Kompetenzprofil" which requires practical experience from the fields of business and administration when hiring academics (Böckelmann et al., 2019; Schöb, 2018). The profile of UAS is strongly enhanced by the diverse competencies in combination with industrial and entrepreneurial experience of the staff (e.g., through role models in teaching or by creating networks in industry and society) (Böckelmann et al., 2019), and thus entrepreneurial passion and experience is described in the literature as a predictor of research commercialization (Obschonka et al., 2018). Drawing on empirical data from academic staff, Morandi et al. (2019-a) recently showed that one-third of UAS researchers surveyed (mostly male faculty) had already gained extensive entrepreneurial experience stemming from outside the UAS context. Their study further indicated substantial positive attitudes and even enhanced intentions towards future spin-off activities among the UAS-staff, suggesting an existing entrepreneurial mindset among the researchers and thus an unrecognized spin-off potential at the UAS. Additionally, it is evident that women in particular are rarely entrepreneurial at UAS (Morandi et al., 2019-a), which is consistent with data from other European countries (Abreu & Grinevich, 2017; Best et al., 2016).

In summary, recent data shows that despite considerable interest in entrepreneurial activities, as well as existing experience of the scientific staff of UAS (Morandi et al., 2019-a) the existing potential is apparently only rarely converted into spin-off projects (SwiTT-Report, 2019). In support of these findings, research points to rather unfavorable support for spin-off activities in the UAS context (Morandi et al., forthcoming-b) and the strong focus of UAS on student start-up activities (Morandi, et al., 2019-b).

6.3 Theoretical basis of the thesis

The individual-opportunity nexus - referring to the interrelation between individual entrepreneurial behavior and objective situational characteristics of a potential entrepreneurial opportunity - is the focus of recent international entrepreneurship research. Establishing a business is considered the result of a dynamic interaction between the individual and the environment (Shane & Venkataraman, 2000), or put another way, the likelihood that scientists engage in entrepreneurship cannot be explained solely by the characteristics of entrepreneurial opportunities. Once a commercial opportunity is identified, the associated economic potential must be evaluated to determine whether it is commercially viable and thus worth the effort

associated with entrepreneurship (Wood & Williams, 2014). The process of spin-off creation is complex, long-term, and dynamic, and is shaped by multiple, interacting factors.

Prior research has investigated aspects of research-based entrepreneurship at both the individual and organizational levels to answer questions of why academics engage in entrepreneurship (see Hossinger et al., 2019, for a review). Endogenous factors such as personal characteristics (e.g., self-efficacy, personality traits, entrepreneurial passion) or work-related skills (Goethner et al., 2012) and non-work-related competencies (e.g., entrepreneurial experiences, Wright et al., 2004), have been studied as drivers of entrepreneurial decisions. Exogenous conditions such as the institutional framework that predict entrepreneurial behavior have also been studied according to institutional approaches using the frame of the “Entrepreneurial University” (e.g., Feola et al., 2019).

In the early 1990s, a stream of research tested intention models (Krueger et al., 2000; Krueger & Brazeal, 1994) sought to predict entrepreneurial behavior. This work was built upon Shapero and Sokol's (1982) model of entrepreneurial events. Later, the theory of planned behavior (TPB, Ajzen, 1991) and its antecedents (Ajzen & Fishbein, 1988) were also employed to study entrepreneurial decision-making (Carsrud & Brännback, 2009; Shook et al., 2003; Tornikoski & Maalaoui, 2019) and found meta-analytical evidence in research (Schlaegel & Koenig, 2014). The gradual evolution of psychological theories was predicated on the assumption that entrepreneurial behavior is inherently intentional; that is, entrepreneurial action is chosen or planned something that people choose or plan (Bird, 1988; Krueger & Carsrud, 1993).

6.3.1 Psychological-motivational theories

Intention-based models consider the setting of goals as an indicator of behavior. The models are designed to assess the desirability and feasibility of goals and assume strong entrepreneurial intention as predictor of entrepreneurial behavior (Krueger et al. 2000). Entrepreneurial intention is defined as “states of mind that direct attention, experience, and action toward a business concept” (Bird, 1988, p. 442) and reflect how intensely one is willing and how much effort one plans to expend to execute entrepreneurial behavior. In recent years, studying intention has become an important tool in entrepreneurship research in general (Liñán & Fayolle, 2015) and in academic entrepreneurship research in particular (Hossinger et al., 2020; Miranda et al., 2018). The intention concept provides a surrogate of entrepreneurial behavior, thus avoiding the time and cost of longitudinal designs (Fayolle et al., 2014).

Prior application of TPB in research supports its utility in predicting behavior in various disciplines (Cooke et al., 2016; Schlaegel & Koenig, 2014; Topa & Moriano, 2010). Given the general nature of the TPB, this framework also applies to the field of academic entrepreneurship (Blaese & Goethner, forthcoming; Feola et al., 2019; Goethner et al., 2012). The core assumption of TPB is that behavioral intentions are a function of three conceptually independent factors describing attitudes, social norms, and perceived behavioral control. Attitudes (referred as ATT) reflect an individual's evaluation, ranging from positive to negative, of performing a particular behavior. Social norms (referred as SN) refer to the perceived normative pressure from a particular reference group to exhibit or not to exhibit a particular behavior (Ajzen, 1991). A growing body of research suggests that scientists feel pressure to engage in commercial exploitation of research and are therefore more likely to do so if they have the impression that their academic colleagues view such activity positively (Goethner et al., 2012). Perceived behavioral control (referred as PBC) is closely related to Bandura's (1997) concept of self-efficacy and reflects the perceived ease or difficulty of successfully performing a particular behavior (Ajzen, 2002). Following the TPB, scientists who do not perceive themselves as capable of implementing entrepreneurial behaviors are unlikely to develop strong entrepreneurial intentions (Cantner et al., 2016). This is supported by entrepreneurship research indicating the relevance of self-efficacy as a mechanism for overcoming perceptions of insecurities (e.g., financial insecurities) often associated with the commercialization of academic research (Newman et al., 2019; Obschonka et al., 2010).

Entrepreneurial decisions are considered a viable option in the career of academic scientists (Murray, 2004). Liguori et al. (2018) recommend an alternative framework for studying entrepreneurial decision-making guided by employing a career-oriented theory: the social cognitive career theory (SCCT; Lent et al., 2002). SCCT seeks to trace the web of connections between individuals and their careers (Bandura, 1989), focusing specifically on cognitive and contextual factors (Lent et al., 2002). According to the conceptual model of Liguori et al. (2018), SCCT predicts entrepreneurial intention as a function of two predictors: entrepreneurial self-efficacy and outcome expectancy. Both entrepreneurial self-efficacy and outcome expectations are expected to mediate personal conditions (e.g., general self-efficacy or gender) and environmental influences and background inputs (e.g., prior professional entrepreneurial experiences or environmental conditions) on entrepreneurial intention. In fact, numerous studies suggest that entrepreneurial self-efficacy belief is an important predictor of entrepreneurial behavior (Huyghe & Knockaert, 2015; McGee & Peterson, 2019; Miao et al., 2017). Prior research also reports that scientists will invest their efforts and time toward

entrepreneurship if they have a positive perception of entrepreneurship (Guerrero & Urbano, 2014; Gulbrandsen & Smeby, 2005) and if they expect to receive reputation or other rewards (e.g., financial and nonfinancial incentives) as a likely consequence of commercializing their research (Lam, 2015).

6.3.2 Institutional theory approach

To date, aspects of intentionality are included in institutional models to account for the influence of university departments, research orientations, and university support mechanisms on the formation of a scientists' entrepreneurial intentions (Feola et al., 2019; Fini & Toschi, 2016; Foo et al., 2016). For example, Huyghe and Knockaert (2015) revealed an effect of institutional rewards, institutional spin-off mission, and the presence of role models, on scientists' spin-off intentions.

Mounting research shows that the entrepreneurship of academics is not only embedded in individuals and sociocultural conditions (e.g., notions of academia or entrepreneurship), but also in complex institutional conditions at the university level that influence the success of scientist's spin-off engagement (Fernández-Nogueira et al., 2018; Hossinger et al., 2020; Zollo et al., 2017). Regulatory, normative, and cultural-cognitive institutions can directly and indirectly influence the perceptions individuals may have about the desirability and feasibility of entrepreneurship (Feola et al., 2019; Miranda, Chamorro Mera, & Rubio, 2017). In other words, institutions can both constrain and enable entrepreneurship (Welter & Smallbone, 2011). Building on North's (1990) institutional theory in the context of academic entrepreneurship, Kirby et al. (2011) examined institutional conditions as formal (e.g., links with industry, support for technology transfer, support measures for spin-offs) and informal factors (e.g., adequate cultural values, appropriate reward system, entrepreneurial role models) for their effectiveness in commercializing research.

A variety of formal frameworks for entrepreneurial projects in the contexts of universities have been presented (Díaz-García et al., 2015; Fini et al., 2017; Kirby et al., 2011). Entrepreneurship in higher education is supported by structures and strategies that can help shape the motivations and guide the activities of university members and students. These conditions are reflected in a variety of ways, including in existing infrastructure, in training and continuing education programs in the area of entrepreneurship education, in existing contacts and networks with industry (Fernández-Pérez et al., 2014; Hayter et al., 2018), in engagement of knowledge transfer offices, and in material resources made available at universities for spin-off projects (Fernandez-Alles et al., 2018; Guerrero & Urbano, 2012).

The behavioral expectations and routines of informal dimensions in organizations form an important framework for spin-off intentions and activities (Fini et al., 2017; Kirby et al., 2011). The extent of recognition, symbolic or material forms of reward for spin-offs (such as prizes) provides information about the quality of informal frameworks and also helps promote start-up orientations at universities (Huyghe & Knockaert, 2015). The greater the appreciation for individuals who participate in spin-off projects, the stronger evidence for the anchoring of spin-off activity in the normative framework of a university (Kirby et al., 2011). Shared attitudes toward entrepreneurial activity contribute to a culture of entrepreneurship in higher education organizations, which, like entrepreneurial role models or social support in the research environment, can influence a researchers' start-up inclinations and activities (Bergmann et al., 2018; Bijedić et al., 2017).

6.4 Need for further research

Despite considerable investigation into the drivers of academic entrepreneurship, relatively less research attention has focused on: (A) the link between the frameworks that drive gender gaps in academic entrepreneurship at UAS; (B) whether job satisfaction or dissatisfaction is an important determinant for selecting academic entrepreneurship as career choice; and (C) whether intention-based research would benefit from an action-based perspective to examine the effects of motivational drivers on entrepreneurial intentions. Below I discuss each of these potential research areas in turn.

(A) The SNSF-funded project on which this thesis is based is first concerned with understanding the causes of a conspicuous gender gap in the entrepreneurial activities of scientists at Swiss UASs. As previous research has revealed, women-led businesses in UASs remains limited (Morandi, et al., 2019-a). The authors found only about one-third of the identified businesses are led by women. They further reported significant gender differences in the magnitude of start-up potential in Swiss UASs as well as prior start-up experience among the female academic staff for spin-off activities across all disciplines. It is notable that the share of female founders is low internationally, especially in academic spin-offs; a pattern also reflected in technology-based start-ups in Switzerland. The European-startup-monitor (2019/2020) revealed that, on average, only 8% of founded teams in Europe (including Switzerland) are led by only women, while 67% are led by "male-only" teams. In Switzerland, data from 2018 shows that 19.6% of highly innovative start-ups are led by women (European-startup-monitor 2018, Steigertahl et al., 2018). According to the Swiss Venture Capital Report (2019), only 9.1% of all high-potential startups that attracted venture capital in Switzerland were led by a woman, revealing a massive gender gap in high-performing young companies

(SECO & Startupticker.ch, 2020). The literature shows that female academics are not only less likely to participate in knowledge transfer activities when compared to men (Fuentes-Fuentes et al., 2012), but they are also much less likely to commercialize or entrepreneurially exploit their research results (Abreu & Grinevich, 2017; Best et al., 2016; Micozzi et al., 2016). A review of current academic entrepreneurship research sheds light on how individual entrepreneurial decisions are tied to organizational structures that strongly influence the formulation of entrepreneurial goals and their implementation (Feola et al., 2019). Studies investigating the gender gap in the field of academic entrepreneurship largely agree on the importance of individual, institutional and structural factors (Ahl & Nelson, 2010; Bergmann et al., 2018). In general, official statistics also show low occurrence of spin-off activities at UAS in recent years (SwiTT-Report, 2019), which points to further dysfunctional structural patterns related to the existence of formal and informal institutional support, especially for women. Taken together, a mounting body of knowledge, including this thesis, suggests the need for research on the existence, nature and orientation of informal and formal framework conditions encouraging spin-off activities of women at Swiss UAS.

(B) There is a continuing knowledge gap concerning the interplay between job satisfaction and career goals in terms of entrepreneurial activities among academics. Although academic entrepreneurship literature has focused primarily on organizational factors influencing entrepreneurial careers (Feola et al., 2019; Kirby et al., 2011), there is scant empirical research exploring outcome expectations and job satisfaction in entrepreneurial career decisions. Job satisfaction, defined as an expression of the fit between job expectations and current employment conditions, influences organizational commitment and managerial decision making (Singh & Onahrng, 2019). At a certain stage of an academic career, studies suggest that scientists choose to either remain in research, move into industry or the service sector, or becoming entrepreneurs (Murray 2004). Previous research outside of the university context point to the role of low organizational commitment, fueled by low job satisfaction, as making entrepreneurial behavior appear more attractive outside of organizations (Guerra & Patuelli, 2016; van Dick et al., 2004). However, in the university context, high job satisfaction and associated higher organizational commitment may lead to a re-evaluation of entrepreneurial outcomes, ultimately making spin-off behavior more attractive. In the context of entrepreneurial universities, spin-off activities are increasingly seen as organizational goals (Etzkowitz, 2014). Job satisfaction has been shown to have a positive effect on taking responsibility for implementing the strategies and goals of the organization (Neessen et al., 2019). In light of

recent research, Singh and Onahring (2019) pointed to the need for future research to investigate the interrelation between job satisfaction and entrepreneurial engagement.

(C) A knowledge gap exists regarding the cognitive and motivational processes involved in the formation of entrepreneurial intention preceding the launch of a new business. A growing number of scholars have recognized the need to shift the focus of inquiry from intention-based research to action-based research by deploying a process and implementation approach (Fayolle et al., 2014; Frese, 2009; van Gelderen et al., 2018). Entrepreneurial intentions have repeatedly been shown to be an important predictor of entrepreneurial behavior in previous research. This work has often used the concept of intention as a surrogate for action. Criticism of intention-based research in entrepreneurship research originates from two sources. First, past research revealed only a weak correlation between entrepreneurial trainings and intention, which was statistically insignificant when controlling for strength of pre-education entrepreneurial intention (Bae et al., 2014). Further, research suggests that entrepreneurial intention seems unlikely to grow when individuals with high interest participate in entrepreneurship courses (Noel, 2002). These findings suggest that intentions may not grow linearly. Second, using longitudinal data, scholars have recently found that intention are not always a comprehensive predictor of subsequent behavior, explaining only 30% of the variance in entrepreneurial behavior (Kautonen et al., 2015). Critics of intention-based models argued for a broader consideration of the entire entrepreneurial process (Frese, 2009). Entrepreneurial scholars, including Adam and Fayolle (2016) and van Gelderen et al. (2018), applied the mindset theory of action phases (MAP) and the related Rubicon model of action phases (Gollwitzer, 1990) to evaluate 'goal intention' and 'implementation intention' (Gollwitzer & Brandstätter, 1997). The intention construct used in the TPB refers to the construct of goal intention (i.e., a mental representation of the desired outcome), representing the first (motivational) phase in the spin-off process prior to initial entrepreneurial actions being taken. Thus, entrepreneurship scholars may have overlooked whether potential entrepreneurs have enacting initial actions toward entrepreneurship and thus have transitioned from the motivational phase associated with a deliberative mindset to an actional phase representing an implementational mindset.

With this previous research in mind, a number of research questions arise regarding: (1) whether intention increases linearly during the entrepreneurial process or whether it peaks in the context of a Rubicon crossing; (2) whether entrepreneurial engagement moderates the relationship between TPB predictors and entrepreneurial intention; and (3) whether the relationship between established endogenous and exogenous factors (e.g., entrepreneurial

rewards) with entrepreneurial intention differs in the motivational phase versus the actional phase of the startup process.

6.4.1 Focus of this thesis and research questions

The primary foundation of this thesis is the theoretical concept of the entrepreneurial university (Clark, 1998; Etzkowitz, 2017; Etzkowitz & Leydesdorff, 1998) and current perspectives in organizational and intention-based entrepreneurship research (Fini & Toschi, 2016; Kirby et al., 2011; Tornikoski & Maalaoui, 2019). In light of the research gaps described previously, different aspects of the scientists' transition to academic entrepreneurship are investigated. Official data and previous research indicate a striking gender gap in the entrepreneurial exploitation of R&D results. Consequently, this thesis first aims to investigate the level of support for female entrepreneurship in UAS. Knowledge of the different organizational determinants that facilitate or hinder female entrepreneurship is especially crucial, as it may represent preconditions for fostering academic entrepreneurship at UAS. Second, this thesis seeks to empirically test the theoretical interrelation between job satisfaction and entrepreneurial intention presented by Singh and Onahring (2019). It would be beneficial to know the extent to which job satisfaction and job dissatisfaction influences entrepreneurial decisions in academic entrepreneurship, and better understand what outcome expectations are associated with academic entrepreneurship for Swiss researchers at UASs. Third, as potential entrepreneurs transition different stages of an entrepreneurial journey, this work aims to shed light on TPB predictions in pre- and post-action stages. Unfortunately, little is known about the motivational mechanisms operating at different stages, as previous research has not accounting for factors related to whether individuals are contemplating or engaged in entrepreneurship.

Against the background of a growing body of intention-based research in entrepreneurship, a number of research questions arise regarding: (1) whether intention increases linearly during the entrepreneurial process or whether intention growth peaks in the context of entrepreneurial engagement; (2) whether the motivational mechanisms described in the TPB are similar before and after engaging in entrepreneurship; and (3) whether the effects of organizational measures on entrepreneurial intention differ in the motivation versus the action phase of the entrepreneurial process. Clarifying the meaning of individuals' entrepreneurial engagement in the context of TPB would allow future research to draw more informed conclusions about cognitive mechanisms and the effect of organizational conditions on entrepreneurship.

The following questions were addressed:

(A) Are there differences in support for spin-off activities at Swiss universities of applied sciences for men and women?

- Do female researchers perceive informal and formal conditions of spin-off activities at their university as less supportive than their male counterparts?
- Are support measures for spin-off activities at the UAS less known to female researchers compared to their male colleagues?

(B) What role does job satisfaction play in the interaction between outcome expectation and Entrepreneurial /Spin-off Intention among academics?

- Do outcome expectations positively influence entrepreneurial intention and spin-off intention among academics?
- Does job dissatisfaction moderate the linkage between outcome expectations and entrepreneurial intention?
- Does job satisfaction influence the relationship between outcome expectations and spin-off intention among academics?

(C) How does whether individuals are in a motivational state or a (pre)actional state affect the prediction of entrepreneurial intentions in TPB?

- Do individuals more advanced in their startup process have higher levels of entrepreneurial intention? Or in other words, does entrepreneurial engagement (and thus the sum of actions already taken) positively predict entrepreneurial intention?
- Is there a threshold relationship between entrepreneurial intention growth and entrepreneurial engagement, so that entrepreneurial engagement has a greater influence on entrepreneurial intention before the threshold as compared to after the threshold?
- Does entrepreneurial engagement moderate the relationship between TPB-antecedents and entrepreneurial intentions (the criterion), such that when entrepreneurial engagement is low the relationship is weaker and when entrepreneurial engagement is high the relationship is stronger?
- Does entrepreneurial engagement moderate the relationship between entrepreneurial rewards and attitudes and between rewards and social norms?

A cross-cantonal survey on organizational support for entrepreneurship examined the extent of academic entrepreneurship at the seven publicly funded Swiss UAS (as of 2019).

7. Methods

7.1 The survey

At the beginning of 2019, an online survey of the academic staff at the seven public universities of applied sciences in Switzerland was conducted (as of 2019)¹. For this purpose, 8,905 employees of the academic staff from various departments of the universities (excluding the universities of teacher education, as well as the Kalaidos University of Applied Sciences) were identified from their homepages and invited to participate in the survey by e-mail.

7.1.1 Study instruments

Informed by prior academic entrepreneurship research (Goethner et al., 2012; Liñán & Chen, 2009; Obschonka et al., 2015), a questionnaire consisting of mostly Likert-scale type questions was constructed. The items were developed on the basis of the results of previous document analyses and expert interviews, as well as from existing validated (also psychological) scales from entrepreneurship research, which were adapted to the context of academic entrepreneurship at the UAS. The questionnaire included an introduction, questions on sociodemographics, university affiliation, personnel category, and expression of appreciation, as well as four other core sections. The first section included questions about the work situation (e.g., amount of work, job satisfaction, work climate, professional and personal obligations). In the second section, questions inquired about the conditions found at the respective universities with regard to research and development (i.e., on the financing of the activity at the university, the perceived university mission with regard to the orientation of the exploitation of research results). The third section addressed experiences in dealing with knowledge transfer activities, personal attitudes towards entrepreneurship (Ajzen, 2001), including one's own general entrepreneurial intention (referred as EI, Liñán & Chen, 2009), but also perceived behavioral control (Ajzen, 2006; Liñán & Chen, 2009) and asked details about previous spin-offs and start-up activities related to one's research results. Informed by prior research (Obschonka et al., 2015) all variables were studied consistent with Fishbein and Ajzen (2010), as predictors of entrepreneurial intention refer to the specific target behavior in their wording.

¹ University of Applied Sciences Western Switzerland (HES-SO), Bern University of Applied Sciences (BFH), University of Applied Sciences Northwestern Switzerland (FHNW), Lucerne University of Applied Sciences (HSLU), University of Applied Sciences and Arts of Southern Switzerland (SUPSI), Zurich University of Applied Sciences (ZFH), University of Applied Sciences Eastern Switzerland (FHO)

Three items assessed scientists' intentions to engage in entrepreneurial activity (Krueger et al., 2000; Liñán & Chen, 2009) as well as scientists' intentions to engage in spin-off activities (referred as SPIN, Goethner et al., 2012; Obschonka et al. 2015, Moog et al., 2015).

In the fourth section, filter questions sought to reveal information regarding the respondent's own company (year of foundation, type, area and legal form of foundation, turnover, number of employees). In the fifth section, questions were asked about outcome expectations towards entrepreneurship, but also about the informal framework conditions (including the existence of entrepreneurial role models, attitudes of colleagues and superiors on the subject of spin-offs). Additional questions about concrete support offers for spin-offs with regard to financing, time off, further training and coaching opportunities and use of the university's internal infrastructure were posed. Chapter eight contains more details on the source of constructs and items used in the manuscripts. Please also find the full questionnaire in the attachment section of this thesis.

7.1.2 Data collection

The survey instrument was first tested and optimized in two pretests on independent samples. A pretest version of the questionnaire was reviewed and checked for comprehensibility by people from the study groups after its creation. To avoid further fundamental linguistic and technical errors in the implementation of the online version, the version of the questionnaire (English, French, German) developed by experts specializing in scientific translations using parallel back-translation procedure (Brislin, 1986). This first version of the questionnaire was already tested in November 2018 during a three-week pilot test at selected departments of the Swiss Federal Institute of Technology in Zurich. During the second step of questionnaire creation, the scales in the respective translation language could be checked for item and scale characteristics (internal consistency, validity including the factorial structure) using *sjplot* version 2.8.7 (Lüdtke, 2021) and *psych* version 2.0.12 (Revelle & Revelle, 2015) packages in R version 4.0.3 (R. C. Team, 2013), and translation errors could be corrected. All additional information (cover letter, contact and privacy policy) as well as the survey itself were provided in English, French and German; the invitation and reminder letters were additionally provided in Italian for academics of the University of Applied Sciences and Arts of Southern Switzerland.

For the main survey, e-mail addresses of scientists were collected from the websites of the respective UAS. In this way, 8,905 of the 17,251 scientists who were (partly) employed at the seven universities of applied sciences under public law in 2019 (BFS, 2020) could be recorded. Due to the project focus on which this work is based, only scientific staff in the categories Lectures with leadership responsibility, Lectures without leadership responsibility and research assistants from UAS were investigated.

The main questionnaire was created using the Questback survey tool (Unipark, 2013). Within the individually personalized invitation emails as well as in the introduction to the questionnaire, all participants were informed regarding the length of the survey and provided background of the questions on topics related to the exploitation of research results and commercial knowledge transfer. The security of data storage and the preservation of anonymity in the analysis of the questionnaire were promised in order to reduce the tendency of respondents to give socially desirable answers. Respondents were informed that participation in the study was voluntary and that responses would be stored anonymously. The survey process and data management thus followed the recommended standards of the SNSF for collecting and securing data.

7.1.3 Analysis methods

Data preparation was performed using the statistical program R (R. C. Team, 2013). In addition to the usual descriptive analysis procedures for checking response tendencies and describing the sample, student T test and Mann-Whitney U tests were used to compare mean values using the basic function of R. Furthermore, scales with more than two items were evaluated using factor and reliability (using Cronbach's alpha for internal consistency) analyses using the sjplot package in R and confirmatory factor analyses within the lavaan version 0.6-7 package (Rosseel et al., 2018).

Correlation analyses and multiple regression analyses were performed to test for relationships between variables by using the LM and GLM function implemented in R. Missing values were imputed, where possible, using the Bayesian bootstrap predictive mean matching method (van Buuren & Groothuis-Oudshoorn, 2010). Based on these analyses, it was possible to examine statements about the presence, accessibility, and salience of informal and formal frameworks for spin-offs at UAS from the perspective of the respective subgroups (cf. manuscript A below).

In order to subsequently investigate the effect of specific framework conditions, such as the perceived entrepreneurial mission of the university, the attitude of superiors and colleagues towards spin-offs (i.e., social norm), or one's own job satisfaction and its interaction with

personal entrepreneurial prerequisites (e.g., outcome expectations, perceived behavioral control or entrepreneurial experience) with regard to future entrepreneurial intentions, structural equation models and including multigroup structural equation models computed using the R package lavaan. For the presentation of the preceding analyses mainly stargazer version 5.2.2 (Hlavac, 2015) and the apaTables packages version 2.0.8 were used (Stanley, 2018).

With the R package SHINY (version 1.5.0) (Chang et al., 2015), the collected data were deposited early (summer 2019) on a secure server as an interactive overview map with anonymized data to inform the participants about the results of the survey and to increase the transparency of the data (Blaese et al., 2019).

7.2 Primary descriptive results of the survey

Three thousand two hundred and fifty-three people (36.5%) followed the e-mail link to the survey; of these, 2851 people could be identified who had accepted the privacy statement and answered at least one item of the questionnaire. The response rate can be classified as medium to high after three contacts (reminder email) without offering any material incentives. In order to increase the validity of the results, the next step was to exclude from the survey both individuals with no responses and responses from administrative and technical staff. The survey thus yielded a corrected response rate of 27.4% (n = 2442). On average, respondents were 44 years old (SD = 10.9, range: 19-69) and predominantly male (64.7%, n=1582). More than half of the researchers reached were faculty with leadership responsibilities (25.6%, n = 608) or faculty without leadership responsibilities (25.6%, n = 609). Next, 39.4% (n = 935) of the responses came from academic assistants and research assistants (1.6%, n = 935). Since it was in the nature of the SNSF research project to depict as accurate a picture as possible of the funding conditions for academic enterprises at universities, the option for participants to produce missing values was also allowed for all items. How missing values were handled can be found in the manuscripts.

8. Summary of manuscripts

Manuscript A

Title: Conditions for Spin-Off Creation at Swiss Universities of Applied Sciences: A gender sensitive approach.

Citation: Schneider, N., Blaese, R. & Liebig, B. (under review). Conditions for Spin-Off Creation at Swiss Universities of Applied Sciences: A gender sensitive approach. *International Journal of Gender and Entrepreneurship*.

8.1.1 Introduction

Cross-sectional data indicates that female academics are less likely to be entrepreneurial in spin-off creation when compared to their male counterparts (Abreu & Grinevich, 2017; Rosa & Dawson, 2006). The 2018 European Start-up Monitor evaluated start-ups of highly innovative technologies and reported low proportions of women-led firms (ranging from 5.1% in Portugal to 23.9% in Poland). In Switzerland, although 19.6% of highly innovative start-ups are led by women, a value that exceeds the European average of 15.6%, it still greatly outnumbered by male-led companies (Steigertahl et al., 2018).

A growing body of literature suggests that several structural and institutional factors may influence female academic entrepreneurship, such as a lack of role models to promote spin-off activities at universities and the lack of women in research and science policy holding leadership positions in institutions and industry (Murray & Graham, 2007). Both within and outside universities, men are often dominant founders and thus may serve as gatekeepers for entrepreneurial activities and decisions related to innovation and investment (Muntean & Ozkazanc-Pan, 2015). As a result, female researchers have been found to be less able to commercialize knowledge outside the university (Lawton-Smith et al., 2017). However, other studies have reported contrasting results. For example, work conducted in Germany and Korea found little evidence for a causal link between entrepreneurial success and the gender of the owner (Abel-Koch, 2014; Lee & Marvel, 2014).

Studies of entrepreneurial action often refer to the interaction of individual drivers with the social environment at the organizational level, including structural conditions and cultural dimensions, such as incentive and reward regimes or promotion and support structures (Feola et al., 2019). Informed by the institutional theory of North (1990), Kirby et al. (2011) introduced a set of formal and informal factors to analyze entrepreneurial attitudes in the context of universities. It has been posited that the university context, facilitated by formal

and informal conditions, creates a specific framework for understanding entrepreneurial intentions and activities (Kirby et al., 2011).

Little research has investigated Swiss Universities of Applied Sciences, asking whether female and male academics perceive the conditions of their entrepreneurial environment to be similar, and what specific organizational conditions exist for women's spin-offs in STEM (Science, Technology, Engineering, and Mathematics) and HSS (Humanities and Social Sciences). Without this understanding, it is difficult to elucidate the role of Swiss UAS as a potential cause of the gender gap in spin-off creation.

Building on the theoretical concept of the entrepreneurial university (Clark, 1998; Etzkowitz, 2017) and current perspectives in organizational and entrepreneurship research (Fini & Toschi, 2016; Kirby et al., 2011), this research evaluates gender differences in the perception of formal and informal frameworks for spin-off activities. This study examines whether women are more likely to encounter barriers related to entrepreneurial activities due to the interplay of specific formal and informal conditions associated with entrepreneurship (Orser et al., 2012) and less likely to be encouraged to pursue an entrepreneurial career. By addressing these questions, it is possible to better understand the current state of entrepreneurial support for female scientists compared to their male colleagues in the Swiss context of UASs. This manuscript develops statistical models to test whether gender differences in the informal and formal promotion of spin-offs persist when controlling for disciplines, professional prerequisites, and positions.

The following hypotheses are investigated:

H1. Female researchers perceive the informal conditions of spin-off activities at their university as less supportive than their male counterparts.

H2. Female researchers perceive the formal conditions of spin-off activities at their university as less supportive than their male counterparts.

H3. The formal conditions for spin-off activities at the UAS are more unknown to female researchers than to their male colleagues.

8.1.2 Methods

This research is based on cross-sectional data collected using an online survey of 1551 researchers from Switzerland's seven public universities of applied sciences. Prior to the analysis all respondents who did not provide any information on the majority of variables listed below as well as those participants with missing information on gender were removed. The mean age of respondents was 36.7 years (SD = 13.1, range: 22-69) and women accounted for

33.3% (n = 517) of participants. In terms of their work, 29.6% (n = 459) reported being a "professor/lecturer with leadership responsibilities," and 54.3% (n = 842) of respondents held positions in STEM fields (n_{STEM} = 842, n_{Women} = 172, n_{Men} = 670, including mathematics, computer science, natural sciences, and engineering, while the others were in the humanities and social sciences (HSS, n_{HSS} = 709, n_{Women} = 364, n_{Men} = 345).

8.1.2.1 Measures

For this study, we measured informal and formal conditions in addition to several control variables (e.g., the level of employment, nationality, age, occupational category) informed by previous research (see Hossinger *et al.*, 2020).

According to Kirby *et al.* (2011), Fini *et al.* (2017), and Fernández-Nogueira *et al.* (2018) we created a set of six criteria to assess informal conditions and seven items to evaluate formal conditions. Participants were given a survey based on five-point Likert scale ranging from 1 (Absolutely disagree) to 5 (Absolutely agree) when answering "To what extent do you agree with each of the following statements with respect to your university?": (1) The university increases people's awareness of its spin-off projects; (2) The university is an important contact partner for existing spin-off activities; (3) Spin-offs are a possible career option at the university; (4) Superiors actively support spin-off projects; (5) Colleagues actively support spin-off projects; (6) Successful founders are well known and respected at the university. Next, reliability and validity were determined and the items were aggregated as part of passive imputation procedure. The internal consistency, as measured by Cronbach's alpha ($\alpha = .85$), was very strong (Cortina, 1993).

Regarding formal framework conditions, participants were initially asked: "How do you assess spin-off promotion at your university?": (1) For the use of research infrastructure; (2) For team-building for co-founders; (3) For the search for suitable co-founders; (4) For mentoring and consultancy services for spin-off projects; (5) During financing in the business creation phase (e.g., "financing of prototypes"); (6) During financing in the "growth phase" (e.g., when looking for investors); and, (7) For unpaid leave of absence for personal spin-off projects. The items were answered on a five-point Likert scale and later in a passive imputation procedure aggregated. Participants were also allowed to answer "Unknown" to skip single items. The reliability measured by Cronbach's alpha ($\alpha = .91$) was strong (Cortina, 1993).

8.1.2.2 Statistical Analyses

After testing for reliability and construct and discriminant validity (Fornell & Larcker, 1981; Hair et al., 2017; Henseler et al., 2015), we computed common method variance (Podsakoff et al., 2012) of the measurement items using five imputed datasets from Lavaan.survey (Oberski, 2014) in R (R. C. Team, 2013). We performed a descriptive analysis, including a comparison of means. Using the set of items above, we assessed both the general level of entrepreneurial support in terms of informal and formal conditions and uncovered gender differences in perceptions of entrepreneurial conditions at UAS.

To correct for potential bias from missing data, we used a multiple imputation procedure (van Buuren & Groothuis-Oudshoorn, 2010) and predictive mean matching (pmm), which makes full use of the available information contained in the data (Sinharay et al., 2001). All estimates presented below were pooled from 50 complete data sets with the MICE package version 3.4.3 (Multiple Imputation by Chained Equations; van Buuren and Groothuis-Oudshoorn, 2010). Further statistical analyses and passive imputation of the informal and formal aggregated dependent variables i.e., calculated from the imputed components after imputation (Seaman et al., 2012) were performed on these datasets and results were combined using Rubin's rule (van Buuren & Groothuis-Oudshoorn, 2010).

To test hypotheses (H1 and H2), ordinary least squares regressions were used while controlling for the above listed characteristics. To test H3, the single items of the formal conditions were recoded as new dummy variables; participants who declared items as "Unknown" were coded as "0" and those who provided a rating of the Likert scale were coded as "1". Next, formal conditions were aggregated into the new dependent variable (known formal condition). Those "Unknown" responses have been treated as separate variables during the imputation procedure. A logistic regression model was built using these newly created dependent variables to test the gender impact on the awareness of formal conditions (GLM function in R).

8.1.3 Results

8.1.3.1 Descriptive analysis of informal and formal conditions

Significant differences existed regarding the perception of formal and informal conditions in higher education. First, female researchers reported significantly lower perceived informal entrepreneurial support for spin-off projects. A significant gender difference in the means (M) of the aggregated scales (six items) measuring informal conditions was found in the data ($M_{Men} = 2.75$, $SD = 1.01$; $M_{Women} = 2.41$, $SD = 1.07$, $t_{[161.28]} = 3.05$, $p <$

.01), such that men rated informal conditions slightly better than women (Figure 1). Overall, more than 30% of the respondents in the STEM disciplines and more than 40% of the respondents within the HSS assessed the level of informal conditions for spin-off activities as weak. The single items that reflect different aspects of informal conditions are examined in more detail in the original study to reveal gender differences within the STEM ($n_{STEM} = 842$) and HSS ($n_{HSS} = 709$) disciplines.

With regard to formal conditions, respondents answered whether specific measures are in place or that they are not aware of the existence of these measures. Overall, all respondents were uncertain about the formal conditions at universities of applied sciences. For example, 35-71% of researchers in STEM disciplines ($n = 842$) and 54-79% of researchers in HSS disciplines ($n = 709$) categorized formal conditions as "Unknown" and thus did not determine the level of conditions at their UAS. More details about the various aspects of formal conditions are qualitatively explored in the original study.

8.1.3.2 Statistical testing of gender differences in informal and formal conditions

Ordinary least squares (OLS) regression and logistic regression models were parameterized to assess the significance of gender differences in perceptions of formal and informal conditions (H1-3). Regarding the control variables (in baseline model M1 and M3), the results indicate that researchers from STEM disciplines considered informal conditions ($b_{STEM} = .268, p < .001$) and not formal conditions ($\beta_{STEM} = .112, p = .5$) as better developed. Only the fixed-term employment contract ($\beta_{Contract} = .271, p < .01$) showed a significant positive effect on the formal conditions (M3), whereas the other control variables in the models (M1 and M3) demonstrated non-significant effects on the informal and formal conditions.

Regarding the direct effects of gender on formal and informal conditions (Models 2 and 4), the OLS regression model (M2) revealed a significant negative gender effect on the informal conditions ($\beta_{Female} = -.195, p < .01$), but no significant gender effect on the formal conditions ($\beta_{Female} = -.013, p = .52$). Thus, the results are in support our hypothesis (H1) that female researchers evaluate informal conditions as weaker than their male counterparts, while little evidence exists for hypothesis (H2).

For testing hypothesis (H3), we conducted logistic regression models (M5 and M6) to examine the extent to which gender category membership influenced whether formal conditions were considered as "unknown" by participants. The dependent variables, known formal conditions, were formed from the mean of the aggregated items using passive

imputation as described above (with dichotomous expression; 0 = unknown, 1 = known). After controlling for discipline, age, professional status, nationality, and performance in R&D, M6 revealed a significant negative effect of female researchers ($b_{\text{Female}} = -.440, p < .001$) on formal conditions. This suggests that formal conditions are more often perceived as "unknown" by female researchers than by their male counterparts, thus supporting hypothesis (H3). Additional results are presented in the appendix.

8.1.4 Discussion

This study explored whether female scientists perceive formal and informal conditions, including support for entrepreneurial activities, to be weaker when compared to their male counterparts. Previous research has addressed the lack of entrepreneurial intentions and spin-off activities among female academics (Austin & Nauta, 2016; de la Cruz Sánchez-Escobedo et al., 2011; Strobl et al., 2012). Consequently, there is widespread agreement among entrepreneurship scholars that individual, institutional, and structural factors play an important role in creating the gender gap in academic entrepreneurship (Abreu & Grinevich, 2017; Best et al., 2016; Foo et al., 2016).

Results of the empirical analyses provide strong evidence that informal and formal conditions for spin-off activities exist in the context of universities of applied sciences, however, these opportunities are perceived to be rather limited to women. Regression analysis reveals that gender negatively predicts informal conditions over and above several control variables. By contrast, when we tested our second hypothesis, we found no effect of gender on perceptions of formal conditions. However, results also revealed that female researchers were less informed about formal frameworks and therefore about concrete entrepreneurial support measures.

Despite recent studies indicating a strong interest in entrepreneurship among researchers in UAS (Morandi, et al., 2019-a), the results suggest an unfavorable environment for "informal" entrepreneurial activities. Furthermore, female researchers are still less active in entrepreneurship at Swiss universities of applied sciences in comparison to their male colleagues. This is also reflected in our sample, which includes only 59 female founders out of a total of 320 founders at universities of applied sciences. The current lower participation of women in spin-offs represent an opportunity for economic potential, as well as concurrently promoting previously unexploited career paths for female academics. Despite the wide range of policies supporting technical and social innovation in Switzerland (Dasilva & Gabrielsson, 2019) and growing initiatives to raise awareness of social and cultural entrepreneurship

(Bornstein et al., 2014), formal support services for UAS staff appear to remain barely visible to academics.

This study points to opportunities for improvement of certain support measures, as only limited concrete measures for spin-off activities of researchers are perceived as existing at the non-STEM disciplines at UAS. These results are comparable to other European universities, according to which commercial technology transfer is more prevalent in STEM disciplines (Kalar & Antoncic, 2015). The result was similar for informal conditions, which related to the presence of role models, entrepreneurial career opportunities, and spin-off support from superiors.

8.1.5 Limitations

The results of this study may only be applicable to the UAS context, thus future studies should seek to put UAS within a more international perspective. We have accounted for nonresponse and used multiple imputation to account for missing variable information. These methods rely on the assumption that the data are missing at random and therefore recoverable by observed variables, which is an untestable assumption. Further limitations are discussed in the original paper.

Manuscript B

Title: Should I Stay, or Should I Go? Job Satisfaction as a Moderating Factor between Outcome Expectations and Entrepreneurial Intention among Academics.

Citation: Blaese, R., Schneider, N. & Liebig, B. (accepted for publication). Should I Stay, or Should I Go? Job Satisfaction as a Moderating Factor between Outcome Expectations and Entrepreneurial Intention among Academics. *International Entrepreneurship and Management Journal*.

8.2.1 Introduction

Previous research suggests a strong relationship between the likelihood of engaging in entrepreneurial activities and job satisfaction; the latter defined as the expression of fit between job expectations and current employment conditions (Singh & Onahring, 2019). Highly qualified scientists traditionally choose between the following career options: (a) remaining in research, (b) moving into industry or the service sector, or (c) becoming a full-time or part-time entrepreneur (Murray, 2004). By using outcome expectations and an agent perspective, social cognitive career theory (SCCT) (Lent et al., 1994, 2002) is a valuable construct to illuminate

contributions to entrepreneurial motivation (Kassean et al., 2015; Liguori et al., 2018; Segal et al., 2002). Prior research shows that the idea of low commitment makes entrepreneurial behavior outside organizations more attractive when employment conditions are perceived as unsatisfactory (Guerra & Patuelli, 2016; van Dick et al., 2004). As a so-called push factor, job dissatisfaction accelerates the transfer from dependent employment to self-employment. For example, Guerra and Patuelli (2016) reported that pecuniary and non-pecuniary job satisfaction significantly affect the transition to self-employment and job change in Switzerland.

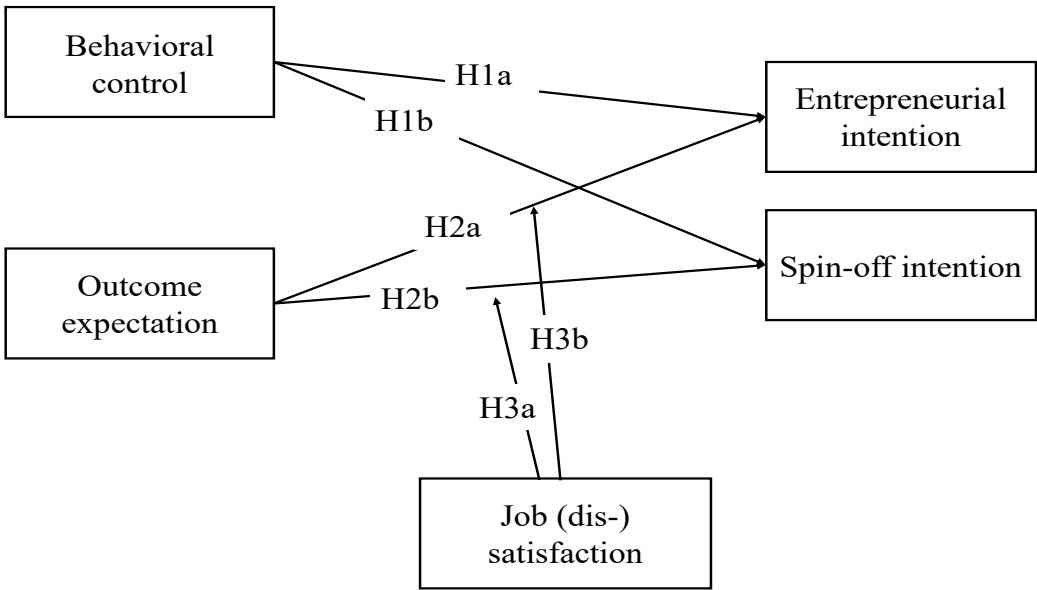
Previous research operationalizes entrepreneurial careers as escapes from poor work environments, yet our understanding of how job satisfaction within and related to university environments can trigger entrepreneurial action is still limited. Innovative spin-offs associated with commercial knowledge transfer in universities are typically viewed from a scientist's perspective as a continuation of their academic career rather than a career exit from academia (Lam, 2015; Shane, 2004). By contrast, there is also evidence that high job satisfaction has a positive effect on taking responsibility for implementing the strategies and goals of the organization (Neessen et al., 2019; Tang et al., 2019). In the context of the entrepreneurial university, spin-off activities are considered organizational goals - and thus hypothesized to contribute to the expression of individual organizational commitment. Nevertheless, there are few systematic studies in the entrepreneurship literature that examine the interplay between job satisfaction and entrepreneurial career goals in terms of spin-off activities among academic researchers. Some studies have evaluated academic entrepreneurship in terms of spin-off intentions to commercialize research (Brettel et al., 2013; Goethner et al., 2012; Obschonka et al., 2015). Other studies have taken a broader perspective and simply examined entrepreneurial intent (Foo et al., 2016; Moog et al., 2015) or framed it as a pathway from wage employment to self-employment outside the organization. Because entrepreneurship in terms of academic knowledge transfer embodies unique outcome expectations (e.g., personal and financial gain or career enrichment), thus in contrast with non-academic forms of entrepreneurship (Lam, 2015; Miller et al., 2018; Shane, 2004), additional research is warranted to evaluate whether job satisfaction acts as a catalyst for entrepreneurial intention in general, spin-off intention, or both. This study attempts to address the aforementioned research gap by examining the relationship between job satisfaction and entrepreneurial intention, and between job satisfaction and spin-off intention. Specifically, we evaluate whether spin-off activities are more attractive to academics when job satisfaction is high, or whether low job satisfaction promotes the rate of entrepreneurship pursuit as an exit strategy from an academic career. Building on social cognitive career theory, which provides a valuable framework for assessing the influence of

organizational variables on (entrepreneurial) career decisions (Kassean et al., 2015; Liguori et al., 2018; Segal et al., 2002), this study sheds empirical light on the entrepreneurial career path of academics. The motivational mechanisms behind entrepreneurial decisions were investigated by surveying Swiss academics from different disciplines at Swiss Universities of Applied Sciences.

The following hypotheses are investigated:

- (H1a) Perceived behavioral control is positively related to entrepreneurial intention.
- (H1b) Perceived behavioral control is positively related to spin-off intention.
- (H2a) Outcome expectations positively influence entrepreneurial intention.
- (H2b) Outcome expectations positively influence spin-off intention.
- (H3a): Job satisfaction has a moderating effect on the relationship between outcome expectations and spin-off intention, such that when job satisfaction is high the relationship is higher and when job satisfaction is low the relationship is lower.
- (H3b): Job dissatisfaction has a moderating effect on the relationship between outcome expectations and entrepreneurial intention, such that when job dissatisfaction is high the relationship is higher and when job dissatisfaction is low the relationship is weaker.

Figure 1 Conceptual research model. Hypothesized predictors of an entrepreneurial intention and spin-off intention and hypothesized moderating effects of entrepreneurial job (dis-) satisfaction on intentions within the SCCT- framework, Behavioral Control refers to perceived behavioral control.



8.2.2 Methods

In Questback, an online survey tool (Unipark, 2013), participants could select from three languages (German, English, and French). After eliminating incomplete responses, the final sample consists of 593 participants. All participants are still employed at the UAS at the beginning of 2019. The mean age of these respondents was 43.1 years (SD = 10.0, range: 25-69), and 63.7% (n = 378) of these participants were male. Fifty percent (n = 289) of the participants belonged to STEM disciplines, including mathematics, computer science, natural sciences, and engineering, whereas the remaining participants belonged to social sciences and business administration. Academics who indicated that they had entrepreneurial experience were included as controls. An overview of the demographic characteristics of the sample are reported in Table 1.

Table 1 Descriptive statistics of the sample (n = 593)

		Frequency	Percentage
Gender	Male	378	63.7
	Female	215	36.3
Discipline	Social Sciences	304	51.3
	Natural Sciences (STEM)	289	49.7
Academic status	Professor with leadership responsibility	180	30.4
	Professor without leadership responsibility	141	23.8
	Research assistant	272	45.9
Temp. work contract		222	37.4
Highest educational qualification	Master (UAS, university)	296	49.9
	Doctorate or post-doctoral degree	297	50.1
		Mean	SD
Age		43.1	10.0
Employment level		80.1	22.9

8.2.2.1 Measures

To test our hypothesis, we relied on prior approaches to estimating academics' (a) general entrepreneurial intention and (b) spin-off intention (Goethner et al., 2012; Liñán & Chen, 2009; Moog et al., 2015). Details of variables used are presented in the original study.

Spin-off intention (SPIN). To measure SPIN, three items were used as a seven-point Likert scale (1 = "very unlikely" to 7 = "very likely"). For example, we posed the question: "You will engage in the establishment of a company based upon an idea, on knowledge or specific competencies or technology developed at the university," based on Obschonka et al. (2015), with scale reliability measured by Cronbach's $\alpha = .85$.

Entrepreneurial intention (EI). Three items were used as a seven-point Likert scale (1 = “very unlikely” to 7 = “very likely”) to measure general EI. For example, the question “You have the firm intention of becoming an entrepreneur one day,” was used based on Liñán and Chen (2009)). Scale reliability, measured by Cronbach's $\alpha = .88$, was above the generally accepted criterion of .70, indicating high reliability (Cortina 1993).

Job-Satisfaction/Job-Dissatisfaction. Informed by Wanous et al. (1997) and Gagné et al. (2015) four items were averaged and used as a seven-point Likert scale (1= “Absolutely incorrect” to 7 = “Absolutely correct”) to estimate job satisfaction of the respondents. An example question was: “Overall, I am very pleased with the types of activities that I do in my job.”. Scale reliability for job-satisfaction was acceptable, measured by Cronbach's $\alpha = .77$.

Perceived behavioral control. Informed by Liñán and Chen (2009), we employed four items to measure outcome expectations as a seven-point Likert scale. The four items were averaged based on scale reliability measured by Cronbach's $\alpha = .82$.

Outcome expectations (OE). Based on Miranda et al. (2017) and Douglas and Shepherd (2000), we employed four items to measure OE as a seven-point Likert scale (1 = “Absolutely disagree” to 7 = “Absolutely agree”), focusing on (1) *Autonomy*, (2) *Profit*, (3) *Self-realization*: and (4) *Quality of life*: The four items were averaged based on scale reliability measured by Cronbach's $\alpha = .82$.

Control variables. Multiple factors are recognized as influencing a scientist's entrepreneurial behavior, such as *Gender* (Abreu & Grinevich, 2017; Miranda, Chamorro Mera, Rubio, et al., 2017), *Nationality* (Peroni et al., 2016), *Age* (Goethner et al., 2012), *academic status* (Ucbasaran et al., 2008) and perceived entrepreneurial mission of the university (Huyghe & Knockaert, 2015).

8.2.2.2 Statistical Analyses

Prior to testing the hypotheses, confirmatory factor analysis was carried out to verify the distinctiveness of our measurements (discriminatory validity) and to estimate the effects of commonly measured variances. The inspection of the AVE values for all factors suggests an acceptable convergent validity (AVE > .50, is considered as acceptable, AVE > .70 as very good). Discriminant validity was evaluated by comparing the constructs' values of the squared root of the AVE (\sqrt{AVE}) with the correlation of the other constructs (Fornell & Larcker, 1981) and by using a more recent technique, the heterotrait-monotrait ratio of the correlation (HTMT) (Henseler et al., 2015) The results provide evidence for convergent and discriminant validity. To test the common method variance (CMV), all study variables were loaded onto one factor

to examine the fit of the CFA model. The one-factor CFA model did not represent the data very well ($\chi^2 [119] = 2563.8, p < .001, CFI = .55, RMSEA = .19$), demonstrating that the study variables were not merely different aspects of an underlying construct (CMV).

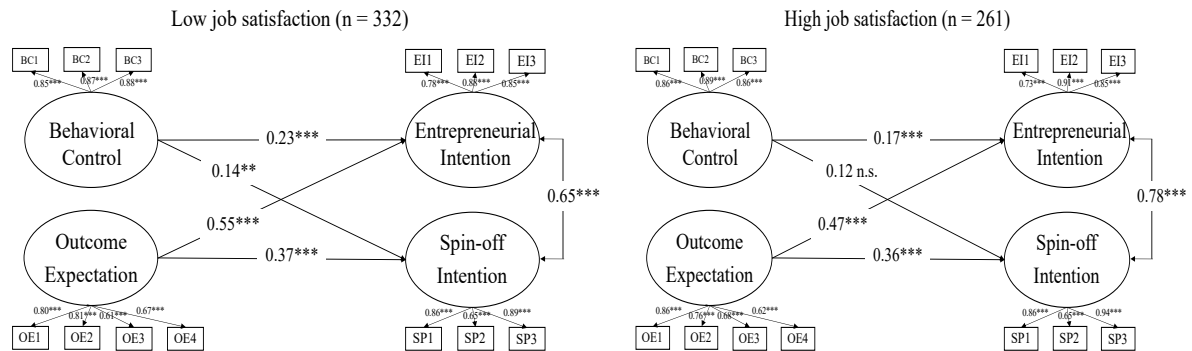
To test the hypotheses, we deployed structural equation modeling using lavaan package version 0.6-5 (Rosseel et al., 2018) in R version 4.0.3 (R. C. Team, 2013). To test the moderating effect of job satisfaction, a SEM multi-group analysis was conducted. By applying a median split of the aggregated items of job satisfaction (Mean = 5.1, SD = 1.12, Median = 5.2), two groups were created (high job satisfaction; $n = 261$ and low job satisfaction; $n = 332$). For this analysis, the items of the outcome expectations scale were aggregated. This procedure has been applied in past entrepreneurship studies (e.g., Obschonka et al. 2012).

8.2.3 Results

H1 and H2 were tested using EI and SPIN as dependent variables in the SEM, respectively; all constructs were measured as latent variables in the model, including the above shown control variables. By using Full Information Maximum Likelihood (FIML) estimation (Enders & Bandalos, 2001), the model fit was acceptable ($X^2 [168] = 407.7, p < .001, RMSEA = .05, CFI = .95, TLI = .94$), indicating that the latent variable measurement was robust (Kline 2005). The model was found to explain 55% of the variance in EI and 44% of the variance in SPIN. Perceived behavioral control had a significant relationship with EI ($\beta = .21, p < .001$) and a significant relationship with SPIN ($\beta = .14, p < .001$), thus providing support for (H1a) and (H1b). Moreover, in accordance with hypotheses (H2a) and (H2b), the results show that outcome expectations directly affect both EI ($\beta = .52, p < .001$) and SPIN ($\beta = .36, p < .001$). Among the control variables, gender, entrepreneurial experience, and university spin-off mission were positively associated with both entrepreneurial intention and spin-off intention. STEM-Discipline showed a positive relationship on SPIN.

In a multi-group-SEM, outcome expectations showed a significant effect of $\beta_{\text{LowSatisfaction}} = .55 (p < .001)$ on EI among academics with low job satisfaction and an effect of $\beta_{\text{HighSatisfaction}} = .47 (p < .001)$ on EI among academics with high job satisfaction, indicating a negative moderating effect of job satisfaction (Figure 2). The effects of outcome expectations on SPIN did not essentially differ within the low job satisfaction group ($\beta_{\text{LowSatisfaction}} = .37, p < .001$) compared to the group with high job satisfaction ($\beta_{\text{HighSatisfaction}} = .36, p < .001$). While evidence in support of hypothesis (H3a) was weak, the moderation analysis indicated a negative moderation effect of job satisfaction on the relationship between outcome expectations and EI in support of hypothesis (H3b).

Figure 2 Multi-group analysis (Moderator: Job Satisfaction), Behavioral Control refers to perceived behavioral control.



Note: Standardized coefficients are given. All effects are controlled for gender, field, nationality, venture already founded, academic status, qualifications and contract of employment. * $p < .05$, ** $p < .01$, *** $p < .001$

Using an exploratory approach, we further tested associations between the single outcome expectations and entrepreneurial and spin-off intentions. For this purpose, the items of the outcome expectations items for autonomy, profit, satisfaction, and quality of life were individually included as independent variables in the model. The resulting model demonstrated a strong fit to the data ($X^2 [157] = 365$, $p < .001$, RMSEA = .05, CFI = .96, TLI = .94). Regarding EI, the empirical model indicated a direct effect of outcome expectation self-realization ($\beta = .31$, $p < .001$) and outcome expectation quality of life ($\beta = .27$, $p < .001$) on EI. Regarding SPIN, besides outcome expectations self-realization ($\beta = .16$, $p < .01$) and outcome expectations quality of life ($\beta = .18$, $p < .001$), whereas the other outcome expectations did not reveal significant relationships with EI or SPIN. The results suggest that both entrepreneurial and spin-off intentions are driven by an expectation of improvement in the quality of life and self-realization. I refer the reader to appendix for more results.

8.2.4 Discussion

Current state of knowledge regarding the motivational factors driving entrepreneurial career decisions among researchers remains limited. This is especially true when it comes to the differences between academic entrepreneurship (i.e., spin-offs) and other forms of entrepreneurial activities among academic researchers (Miller et al., 2018). In general, academic researchers in our sample exhibited high levels of job satisfaction. By drawing on social cognitive career theory, a multigroup analysis revealed no statistically significant moderating effects of job satisfaction on the relationship between outcome expectation and spin-off intention. However, a moderating effect of job dissatisfaction was found between outcome expectation and entrepreneurial intention.

The results of this research shed new light on the importance of accurately operationalizing entrepreneurial action and the need to clearly distinguish entrepreneurial intentions, e.g., for spin-offs, from other forms of entrepreneurial action. Spin-offs are considered a specific case of entrepreneurship, but entrepreneurial intention can also more broadly encompass extramural forms of entrepreneurship and thus forms of entrepreneurship that are not related to knowledge transfer. Our findings add to the literature by showing that entrepreneurial researchers are more likely to engage in entrepreneurial activities than spin-off activities when they have positive outcome expectations toward entrepreneurial actions and are dissatisfied with their current employment. This implies that previous findings in the entrepreneurship literature, which have shown that job dissatisfaction increases the likelihood of transitioning to self-employment (Chang & Edwards, 2015; Guerra & Patuelli, 2016; van Dick et al., 2004; Werner et al., 2014), may also apply to academic researchers.

Recently published research has postulated a relationship between job satisfaction, organizational commitment, and entrepreneurial activities (Singh & Onahring, 2019). Our results show limited support that entrepreneurial researchers with high job satisfaction develop a greater interest in spin-off activities. It is possible that researchers in our Swiss sample, who are largely satisfied with their current position, may seek to maintain the status quo and not pursue additional spin-off activities. It seems questionable, in light of current research on Swiss UAS, that UAS have previously expanded their goals with respect to spin-off activities (Morandi et al., 2019-b; Morandi et al., forthcoming-b). In the current sample, slightly more than one-third of respondents indicated that their universities would significantly or partially support spin-off activities by researchers. Thus, this study supports the findings of previous research that reported that start-up intentions are positively influenced by prior entrepreneurial experience and an explicit university spin-off mission. This suggests that fostering an

entrepreneurial mission within universities contributes significantly to spin-offs and other entrepreneurial activities (e.g., Huyghe and Knockaert 2015; Foo et al. 2016). Consistent with previous entrepreneurship literature (Brettel et al., 2013; Krabel & Mueller, 2009), our results also suggest that participants with higher levels of perceived behavioral control showed a greater likelihood of developing entrepreneurial intentions as well as spin-off intentions when controlling for previous entrepreneurial experiences and other personal control variables.

8.2.5 Limitations

Much like previous investigations, the present analysis of academic entrepreneurship and job satisfaction is subject to some well-known limitations. First, unlimited contracts and good salaries among Swiss science professions at UAS may give additional weight to non-financial outcome expectations compared to professions in other countries. Second, because UAS have uncharacteristically strong ties to industry compared to other countries, this may lead to greater opportunities for activities on the fringes of academic employment (e.g., engaging in consulting). Third, this study distinguished between entrepreneurial intentions and spin-off intentions by assuming that spin-off intentions are a special case of entrepreneurial intentions. Additional research that separates spin-off intentions from other extramural forms of entrepreneurship is warranted and could provide additional insight. Lastly, this study was designed to generate cross-sectional data, longitudinal data could be informative to the impact of possible interactions. A mixed-methods approach could be used to examine the extent to which spin-off careers are seen as alternative career paths and whether they could be developed through training and a greater presence of role models.

Manuscript C

Title: From a Deliberative to an Implementing Mindset: A process- oriented view of the formation of academic entrepreneurial intention.

Citation: Blaese, R. & Liebig, B. (accepted for publication). From a Deliberative to an Implementing Mindset: A process- oriented view of the formation of academic entrepreneurial intention. *Open Psychology Journal*.

8.3.1 Introduction

Entrepreneurial intentions are well recognized as among the top predictors of entrepreneurial behavior (Krueger et al., 2000). Past studies have elucidated the motivating factors that explain entrepreneurial intentions, for example based on the theory of planned behavior (Ajzen, 1991). Both exogenous and endogenous factors influencing entrepreneurial intentions have been discussed in various reviews (e.g., Hossinger et al., 2020; Miranda et al., 2018). Concurrently, scholars are critical of the practice of studying the strength of EI as predictor of behavior (Kautonen et al., 2015; Krueger, 2017; van Gelderen et al., 2018), while others postulate an action approach to investigate entrepreneurship (Rauch & Frese, 2007). Recent research has reported evidence that cognitive processes differ in the motivation and (pre-)action phases of venture creation (Delanoë-Gueguen & Fayolle, 2019).

In response to increasing demand for approaches that reflect the complexity of entrepreneurial action implementation, studies (e.g., Adam & Fayolle, 2016; van Gelderen et al., 2018) applied the mindset theory of action phases (MAP) and the related Rubicon model of action phases (Gollwitzer, 1990) to evaluate 'goal intention' and 'implementation intention' (Gollwitzer & Brandstätter, 1997). The formation of a goal intention (i.e., a mental representation of the desired outcome) is the first step in a (business) creation process, followed by implementation intentions in the pre-actional and actional phases. The transition from the motivational to the (pre)actional phase is referred to as the Rubicon-crossing, following Julius Caesar's historical image.

Entrepreneurship research has recently corroborated the Rubicon model's assumption that the transition from a motivational to a volitional phase (i.e., crossing the Rubicon) is associated with a change in cognitive mindset (Delanoë-Gueguen & Fayolle, 2019). Individuals in the motivational phase have a tendency to focus exclusively on information relevant to achieving their goal, in contrast to individuals in the motivational phase whose focus is on assessing desirability and feasibility (Delanoë-Gueguen & Fayolle, 2019). The intention

construct used in the TPB is related to the construct of goal intention in the motivation phase of the Rubicon model. The effects of attitudes toward the behavior, social norms, and perceived behavioral control are mediated by entrepreneurial intention on subsequent behavior (Ajzen, 1991). Previous entrepreneurship research has rarely considered whether individuals are in the motivation phase or the action phase. Accordingly, research has overlooked whether potential entrepreneurs achieved initial actions to become entrepreneurial and thus moved from the motivational phase associated with a deliberative mindset to an actional phase associated with an implementational mindset. Consequently, a knowledge gap exists regarding the cognitive and motivational processes involved in the formation of entrepreneurial intention within the phase preceding the launch of a new business.

To address this research need, the present study has two objectives. First, it seeks to uncover the effects of entrepreneurial engagement on the formation of entrepreneurial (goal) intention using academic entrepreneurship as an example. Following previous operationalization, we aim to capture entrepreneurial engagement by counting so-called Gestation Actions (i.e., realized measures required to achieve entrepreneurial goals). We then examine the extent to which engagement as a construct in established explanatory models additionally helps reveal variance in entrepreneurial intention (Ajzen, 1991). We further investigate whether intention increases linearly during the entrepreneurial process or whether the growth of EI peaks in the context of a Rubicon crossing. Lastly, we test whether entrepreneurial engagement moderates the relationship between TPB predictors and entrepreneurial intention. By addressing this objective we provide a more complete picture of entrepreneurial intention, thus representing a critical first step in evaluating the influence of entrepreneurial engagement on the cognitive processes of potential entrepreneurs in the context of TPB.

The second objective of this study addresses the lack of understanding about the impact of entrepreneurial engagement on the relationship between framework conditions and entrepreneurial decision-making. Institutions such as universities guide the process of entrepreneurial decision-making among scientists (Foo et al., 2016; Kirby et al., 2011). There remains incomplete knowledge of the effect of entrepreneurial engagement on the relationship between established endogenous and exogenous factors (e.g., entrepreneurial rewards) on entrepreneurial intention. This study analyzes the institutional determinants of entrepreneurial intention by combining motivational aspects of TPB and environmental factors to predict entrepreneurial intention. Based on an institutional perspective (North, 1990), this part of the study begins by using environmental factors to predict entrepreneurial intention, exemplified

by entrepreneurial rewards that promote entrepreneurship among academics (Feola et al., 2019; Huyghe & Knockaert, 2015).

This study poses the following hypotheses:

- H1a) Entrepreneurial engagement positively predicts entrepreneurial intention.
- H1b) A threshold relationship between EI growth and entrepreneurial engagement, so that entrepreneurial engagement has a greater influence on EI before the threshold as compared to after the threshold.
- H1c) Entrepreneurial engagement has a moderating effect on the relationship between TPB-antecedents and entrepreneurial intentions (the criterion), such that when entrepreneurial engagement is low the relationship is weaker and when entrepreneurial engagement is high the relationship is stronger.
- H2a) Attitudes mediate the relationship between entrepreneurial rewards and entrepreneurial intention.
- H2b) Social norms mediate the relationship between entrepreneurial rewards and entrepreneurial intention.
- H2c) Entrepreneurial engagement moderates the relationship between entrepreneurial rewards and attitudes.
- H2d) Entrepreneurial engagement moderates the relationship between entrepreneurial rewards and social norms.

8.3.2 Methods

This study is based on cross-sectional data collected in a nationwide online survey of academics at the seven Swiss universities of applied sciences in 2019. From January to March 2019, 8905 academics were randomly invited by email to take part in an online survey to explore their entrepreneurial behavior and organizational environment. A total of 2442 academics followed the link to the survey tool and accepted the privacy policy on the first page. The sample size included 490 participants for the following analysis. Previously, we removed the respondents from our sample who did not provide any data and those with missing data on gestation actions, and entrepreneurial intention. Descriptive data are reported in Table 2.

Table 2. Descriptive statistics of the sample (n = 490).

		Frequency	Percentage
Gender	Male	360	73.5
	Female	130	26.5
Discipline	Humanities	222	33.3
	Natural and Technical Sciences (STEM)	268	66.7
Occupational status	Lecturer / Professor with leadership responsibility	163	33.3
	Lecturers without leadership responsibility	123	25.1
	Research assistant	204	41.6
Temporary Employment contract		163	33.3
		Mean	SD
Age		44.4	10.7
Employment level		79.5	24.8

8.3.2.1 Measures

To test our study hypothesis, we leveraged previous research to assess *entrepreneurial intention* as a dependent variable (Goethner et al., 2012; Huyghe & Knockaert, 2015; Liñán & Chen, 2009). The responses were measured using a seven-point Likert scale ranging from 1 (Absolutely disagree) to 7 (Strongly agree) to estimate entrepreneurial intention. Scale reliability, which was measured using Cronbach's α , was strong ($\alpha = .86$) (Cortina, 1993).

With respect to the independent variables, *TPB-antecedent Social norm (SN)* was measured using three items (Obschonka et al., 2015) referring to academic colleagues and superiors at the workplace. The items were assessed on a five-point Likert scale from 1 (Absolutely disagree) to 5 (Strongly agree) and averaged ($\alpha = .85$).

Attitudes (ATT) towards academic entrepreneurship refers to the degree to which a person develops a positive or negative assessment towards entrepreneurial behavior. The scale was found to be internally consistent with a scale reliability of Cronbach's $\alpha = .90$.

Four items were used on a seven-point Likert scale to measure *Perceived behavioral control (PBC)*, with responses ranging from 1 (Strongly disagree) to 7 (Strongly agree). The resulting scale reliability was excellent (Cronbach's $\alpha = .90$).

University rewards for commercialization. Based on Huyghe and Knockaert (2015) and Principal Components Analysis we created two instruments to measure “*entrepreneurial rewards*” (Cronbach’s alpha .75) and “*rewards on contract-research and consulting*” (Cronbach’s $\alpha = .73$).

Entrepreneurial engagement (ENG). To reflect the level of engagement of respondents, we followed the approaches used in prior research (Delanoë-Gueguen & Fayolle, 2019), which relied on the count of gestational actions reported by individuals. The distribution of the number of gestation actions is displayed in the *Appendix*. The survey included 14 adjusted gestation actions based on lists compiled by Delanoë-Gueguen and Fayolle (2019) and the US. Panel Study of Entrepreneurial Dynamics (PSED) (Reynolds, 2000).

Control variables. Based on findings from systematic reviews on academic research on entrepreneurship (Hossinger et al., 2020), we selected gender, age, occupational status, and highest educational qualification, employment level, and discipline, as control variables to reduce the possibility of alternative explanations for the following results. We controlled for employment level to ensure that academics were comparable across all of the involved universities. Furthermore, we controlled for discipline, as well as controlling for *rewards on contract-research and consulting*.

8.3.2.2 Statistical Analyses

Prior to hypothesis testing, we proofed reliability, discriminant validity, and Common Method Variance (CMV). First, discriminant validity was evaluated both by comparing the constructs' values of the squared root of AVE (\sqrt{AVE}) with the correlation of the other constructs (Fornell & Larcker, 1981) and by using the heterotrait-monotrait ratio of correlation (HTMT) (Henseler et al., 2015). The results provide evidence for convergent and discriminant validity.

Furthermore, to account for Common Method Variance (CMV), a one-factor confirmatory factor model did not represent the data well ($\chi^2[134] = 2'935, p < .001, CFI = .38, RMSEA = .21$), suggesting that the items were not just different aspects of an underlying construct (Mossholder et al., 1998).

After testing zero-order correlations among all variables, hypothesis testing (H1a) was estimated using SEM performed with Lavaan (Version 0.6-5) (Rosseel et al., 2018) in R. SEM examined the relationship between the latent variables and tested the specific hypotheses. Because the data was non-normal and incomplete, we used the *Robust Maximum Likelihood* (MLR) with standard errors and χ^2 test statistics that are robust to the normality assumption and implement a missing data estimation method (Yuan & Bentler, 2000).

To test (H1b), segmented regression analysis (Toms & Lesperance, 2003) was used for empirical detection of the EI-breakpoint analysis. A segmented regression (*i.e.*, Broken-stick-regression), is a method of regression analysis in which the independent variable, namely

entrepreneurial engagement, is partitioned into intervals and each interval is assigned a separate line segment. Segmented regression was calculated in segmented (Muggeo, 2008) using entrepreneurial engagement as the independent variable, and EI served as the dependent variable.

As described in H1c, Multi-Group SEM analyses were conducted to determine whether the link between TPB variables and EI was moderated by entrepreneurial engagement. Using results from the segmented regression, two groups were obtained (pre-breakpoint vs. post-breakpoint). For additional measurement invariance tests, we used criteria for large samples: p -value of $< .01$ for $\Delta\chi^2$ (scaled difference Chi-square test; (Satorra & Bentler, 2001) and $\Delta CFI > .002$, which indicate a lack of measurement invariance (Meade et al., 2008).

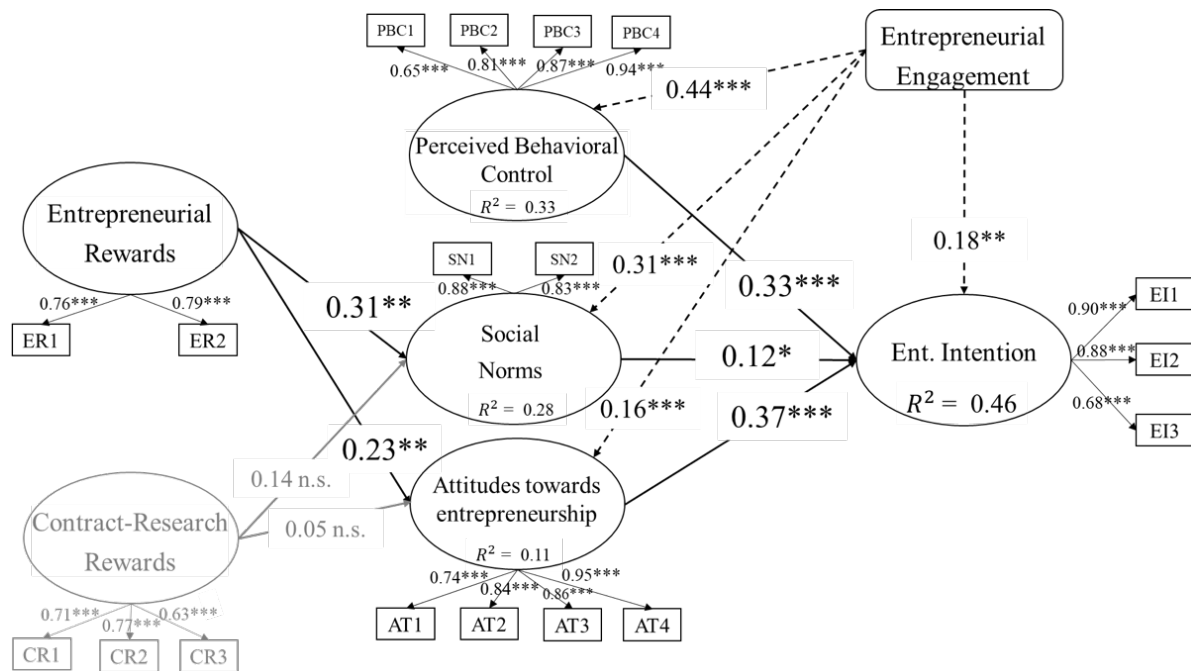
8.3.3 Results

8.3.3.1 The empirical path model for predicting entrepreneurial intention (H1a).

We tested our hypotheses on unique main effects as well as moderating effects of ENG in the prediction of EI (hypotheses 1a-c), thereby employing path analysis.

The model displayed a marginal fit Y-B $\chi^2[253] = 641.21, p < .001$; SRMR = .09; CFI = .89; RMSEA = .06 (90% CI of .056, .067). The examination of the indices of modification (MI) revealed the addition of *entrepreneurial engagement* as an independent variable to further explain variation in PBC (MI = 84.56), SN (MI = 40.07) and ATT (MI = 16.56). The fit of the final re-specified model was strong, Y-B $\chi^2[299] = 522.09, p < .001$; SRMR = .06; CFI = .95; RMSEA = .04 (90% CI of .037, .049), indicating the measurement of the latent variables as robust (Kline, 2005). The model explained 45.8 % of the variance of EI among respondents. The results for the SEM are depicted in Figure 3.

Figure 3 Structural equalization model of the TPB, participants (n = 490).



Note: Standardized coefficients are displayed. All effects are controlled for gender, age, occupational status, nationality, discipline, and employment level.

* $p < .05$, ** $p < .01$, *** $p < .001$

In accordance with prior research, the three TPB-antecedents, ATT ($\beta = .37, p < .001$), SN ($\beta = .12, p < .05$), and PBC ($\beta = .33, p < .001$), were positively associated with EI. ENG exerted a positive influence on EI ($\beta = .18, p < .001$). These results provided evidence in support of hypothesis (H1a) that there was a unique main effect of entrepreneurial engagement when predicting EI.

We also found evidence of a direct impact of ENG on TPB-antecedents. More specifically, the effect of engagement on PBC ($\beta = .44, p < .001$), on ATT ($\beta = .16, p < .001$), and on SN ($\beta = .31, p < .001$). Among the control variables, age, gender, employment level, discipline, and nationality were not significantly related to EI.

8.3.3.2 Segmented regression to estimate the EI growth breakpoint (H1b).

In hypothesis (H1b), we expected EI to increase during the entrepreneurial process, and for hypothesis (H1b), EI growth to have a breakpoint per the context of an action engagement (Rubicon-crossing). First, an OLS regression revealed a positive effect of $b_0 = 0.23$ ($p < .001$) on EI ($R^2 = .12$). To create the scale of EI, values consisting of three items were aggregated. The piecewise regression estimated a breakpoint at 1.05 (St. Err = 0.56), suggesting two different segments of EI-growth. An adjusted OLS regression revealed that the effect of engagement on EI in the first segment (Engagement < Breakpoint, $b_1 = 0.82, p < .001$) differed

compared to the second segment (Engagement > 1 Breakpoint, $b_2 = 0.20, p < .001$). The results supported hypothesis (H1b) that a breakpoint in intention growth was visible at that moment respondents engaged in implementation.

8.3.3.3 Moderating effects of entrepreneurial engagement within TPB (H1c).

In hypothesis (H1c), we postulated a moderating effect of entrepreneurial engagement on the relationship between TPB antecedents and entrepreneurial intentions (the criterion).

The results of the multi-group model show that in both groups, different magnitudes of EI variance were explained by the model (27.9% and 44.2%). Aligned with our expectations, the TPB antecedents positively explained EI (PBC: $\beta = .19, p < .05$; ATT: $\beta = .36, p < .001$; SN: $\beta = .17, p < .05$) within the pre-breakpoint group. In the post-breakpoint group, intention was significantly explained by ATT ($\beta = .41, p < .001$) and PBC ($\beta = .39, p < .001$), but not by SN ($\beta = -.01, p = .92$). The results indicate that in the post-breakpoint group, the TPB antecedents PBC and ATT gain influence on the EI.

After accounting for measurement invariance, we tested whether the group differences between the paths of TPB-variables and EI were statistically significant. To address the hypothesis (H1c), we tested the unconstrained model using three models in which one of the three paths of TPB variables to intentions was always set equal across both groups. We found evidence of a moderation effect in the case of the ATT-EI path and the PBC-EI path (as indicated by the significant $\Delta SBS - \chi^2$); thus, the hypothesis (H1c) was partially supported.

8.3.3.4 University entrepreneurial rewards dimension of motivation (H2a-d).

The SEM depicted in Figure 3 supported a positive effect of spin-off rewards on SN ($\beta = .31, p < .01$) and ATT ($\beta = .23, p < .01$). The mediation hypotheses (H2a and H2b) were supported by a significant indirect effect via ATT and SN on intention ($\beta_{ATT} = .10; p < .001; CI_{95} = .07, .17$), and via SN on intention ($\beta_{SN} = .07; p < .001; CI_{95} = .04, .13$) ($R^2_{TotalMed} = .27$). SN and ATT mediated the relationship between university spin-off rewards and EI ($\beta_{Total} = .32; p < .001, \beta_{Direct} = .15; p < .01$). I refer the reader to the appendix for more results.

8.3.4 Discussion

For three decades, scholars have focused their attention largely on entrepreneurial intention rather than entrepreneurial performance when examining the role of personal and environmental drivers and barriers of entrepreneurship (Fayolle et al., 2014; Hossinger et al., 2020). To help address this knowledge gap, our study elucidated the deeper cognitive mechanisms that go beyond the predictors of the theory of planned behavior by adopting an action perspective. Building on the TPB and MAP models, we theorized a positive effect of entrepreneurial engagement, which extended beyond the antecedents of TPB (e.g., attitudes, perceived behavioral control, and social norms) to explain EI. Furthermore, we investigated whether EI increased during the entrepreneurial process or whether the growth for EI peaked as predicted by a Rubicon crossing. Due to a changing cognitive mindset when moving into implementation, we investigated whether entrepreneurial engagement moderates the relationship between TPB predictors and entrepreneurial intention.

Interaction of engagement and entrepreneurial intention. Consistent with Mwangi and Rotich (2019), the results of our empirical analyses demonstrated that entrepreneurial engagement positively impacts entrepreneurial intention beyond the TPB antecedents. Furthermore, a segmented regression revealed that EI growth significantly changed after implementing the first gestation action, suggesting the existence of an entrepreneurial Rubicon-like demarcation during the pre-start-up phase. Although our analysis did indicate that EI growth during the motivation phase was higher than EI growth after initiating gestation action. According to the research of Delanoë-Gueguen and Fayolle (2019), we theorized that the motivational mechanisms described by TPB vary after the transition to implementation. SEM-multi-group analysis revealed supporting evidence (with exception of SN) for our hypothesis that ENG moderates the relationship between TPB antecedents and EI (the criterion); such that pre-Rubicon the relationship is weaker and post-Rubicon the relationship is stronger. The effect of PBC and ATT gained importance for predicting EI among participants in the post-Rubicon group, which can be interpreted as a reaction to cognitive dissonance after decision-making (*i.e.*, post-decision dissonance effect; cf. Festinger, 1957). Consequently, individuals are selective about new information and are more likely to focus on information that supports their previous decisions. The moderation effect shown in our data is also aligned with research from social psychology, suggesting that participants in an implemental mindset exhibit a higher level of self-efficacy (Taylor & Gollwitzer, 1995) and demonstrate more risk-taking behavior (Keller & Gollwitzer, 2016) in order to achieve the entrepreneurial goals.

University entrepreneurial rewards-exogenous dimension of motivation. In the second part of our study, we leveraged institutional theory (North, 1990) to evaluate the influence of environmental factors, namely entrepreneurial rewards on the TPB antecedents, in shaping patterns in EI. The results indicate that entrepreneurial rewards indirectly affect EI. We further investigated whether the effects of university entrepreneurial rewards on TPB antecedents vary after the transition to an action phase. While our data supported evidence of a positive indirect effect of entrepreneurial university rewards mediated via social norms and attitudes on the EI, we found no further moderating effect pre-/post-Rubicon for the relationships between entrepreneurial rewards and social norms, as well as between rewards and attitudes. Our results of part two are consistent with Link and Siegel (2005), who posited that social prestige and financial rewards are important incentives to foster academic entrepreneurship during the entire venture creation process.

8.3.5 Limitations

We recognize a number of limitations to our study. First, cross-sectional approaches are subject to criticism because there are no controls for individual-level effects. Our results should be verified with longitudinal data to further investigate an entrepreneurial Rubicon and estimate the non-linear threshold effect we postulate exists. Second, the current study sought to measure the status of entrepreneurial progress as the sum of gestation actions. The measurement of entrepreneurial engagement should be validated using different samples and entrepreneurial contexts. Third, more exogenous factors, such as formal factors per Kirby et al. (2011), should be considered in future investigations to provide additional insight into the drivers of entrepreneurial rewards.

9. General conclusion

Spin-off activities are recognized as a key dimension of the so-called "third mission" of universities (Etzkowitz, 2003). Increasingly, universities are seeking to develop strategies and tools that promote entrepreneurial careers among their academic staff and now appreciate spin-off activities as a form of research commercialization and integrate them into their organizational goals (Etzkowitz, 2014). Researchers aim to explore the nature of academic entrepreneurship, which emerges from the interplay of individual, socio-cognitive, and environmental characteristics (Antonioli et al., 2016; D'este & Perkmann, 2011; Lam & Campos, 2015). In this thesis, I addressed the question of how academic entrepreneurship can be studied and promoted in the context of Universities of Applied Sciences. The results of this research extend our understanding of the entrepreneurial ecosystem in the context of Swiss UAS. Manuscript (A) highlighted structural gender differences in venture-creation support addressing academics. Manuscript (B) focused on motivational aspects and examined the role of job (dis)satisfaction as a moderator between outcome expectations and entrepreneurial decision-making. Manuscript (C) addressed the way entrepreneurship is studied, using intention-based models as a surrogate for behavior, without considering the extent to which motivational mechanisms depend on whether individuals initiate their entrepreneurial ideas.

9.1 Studies' contributions to the field

In Manuscript A, we conducted both descriptive and regression analyses to identify deficits in entrepreneurship support for female scientists at the seven Swiss UASs under public law. Gender differences in the perception of formal and informal frameworks for spin-off activities were evaluated from the perspective of existing organizational and entrepreneurship research (Fini & Toschi, 2016; Kirby et al., 2011). The extent to which work conditions are supportive by providing formal and informal measures for scientist's spin-offs, especially for female researchers, has not yet been sufficiently investigated in the Swiss context. Such research is critical because the institutional environment has been identified as a primary driver of academics' spin-off intention. At the same time, spin-off activities are vanishingly rare at Swiss UASs.

The results suggest that there are structural differences in the support for start-ups at the expense of female researchers at UAS. This helps explain the low number of (spin-off) start-up activities led by women. The results confirm that informal and formal forms of support for start-ups of scientific staff are only accessible to a limited extent to female staff, predominantly scientists. Access to informal support and incentives for entrepreneurial activities is rated lower by women compared to their male counterparts. Female researchers were shown to be less

aware of formal programs to support entrepreneurial activities. Therefore, we suspected that there are structural reasons why academic entrepreneurship is not a career option for female scientists.

The main value of manuscript A is its identification of critical gaps in the promotion of academic entrepreneurship in UAS that primarily affect women. The results add to our current understanding of the departmental and gender-specific perception of entrepreneurial frameworks and provide new insight into their contextual dependency. Policymaker and university managers should pay more attention to the issue of female entrepreneurship in the context of academia, for example by supporting collaborations between TTOs and gender equality officers to realize specific measures addressing female scientists. Moving forward, additional research that evaluates structural causes of barriers and drivers of female academic entrepreneurship is needed. Such knowledge will help inform recommendations for policymaker to overcome the gender-gap in entrepreneurship support.

In Manuscript B, quantitative analyses (multigroup SEM) elucidated the complex associations between outcome expectations and entrepreneurial decision making in the context of academia. These results helped address existing knowledge gaps by generating a better understanding of motivation and subjective perceptions of the environment in which an academic researcher considers their potential career as an entrepreneur. Informed by the prediction of SCCT, the results of this study expand our knowledge of the relationship between job satisfaction and entrepreneurial career decisions among researchers by making an important distinction between entrepreneurial intention and spin-off intention. Academic spin-offs (based on intellectual property or knowledge and skills) are considered a specific form of academic entrepreneurship. They are an essential part of commercial knowledge transfer from universities to society (Etzkowitz, 2003; Fini et al., 2018; Meek & Wood, 2016) and were considered a significant extension of an academic career in the study. Recently published research has postulated a relationship between job satisfaction, organizational commitment, and entrepreneurial activities (Singh & Onahring, 2019). This analysis revealed no evidence to confirm a positive moderating effect of job-satisfaction on the relationship between outcome expectations and spin-off intention. We argued that spin-off activities do not yet have a high priority at all survey UAS, and that success in spin-off activities may not yet strengthen academic careers. In the current study, only one-third (36%) of respondents stated that their universities would significantly or partially support spin-offs activities of researchers. Future research could aim to test whether the university's level of spinoff mission moderates whether job satisfaction moderates the relationship between outcome outcomes and spinoff intentions

(i.e., three-way interaction). We would then expect job satisfaction to moderate the relationship between outcome expectations and spin-off intention in the case where academics perceive a strong university mission to promote spin-off activity. The results of the study also demonstrate that job dissatisfaction can foster the re-evaluation of outcome expectations affecting entrepreneurial but not spin-off career goals. Thus, Manuscript B contributes to the literature by showing that entrepreneurial researchers are more likely to engage in entrepreneurial activities compared to spin-off activities when they have positive outcome expectations toward entrepreneurial actions and are dissatisfied with their current employment. This implies that previous findings in the entrepreneurship literature, which have shown that job dissatisfaction increases the likelihood of transitioning to self-employment (Chang & Edwards, 2015; Guerra & Patuelli, 2016; van Dick et al., 2004), may also apply to researchers in academia. Further it was found that pecuniary satisfaction is not the primary motivator for a scientist to become an entrepreneur. Instead, non-pecuniary satisfaction, such as personal fulfillment of one's ideas combined with job dissatisfaction, proved to be a more compelling motivator. In summary, this study highlights the importance of individual outcome expectations and perceived behavioral control; both of which deserve more attention from practitioners and technology transfer officers. The main value of this study was to support the role of job satisfaction as a key determinant of entrepreneurship activities in academia.

Manuscript C represents the first step towards evaluating the influence of entrepreneurial engagement (i.e., the action taken by potential entrepreneurs) on the cognitive processes of academic scientists within the framework of the theory of planned behavior. This approach aligns with previous scholars rethinking of the theoretical and conceptual use of intention in entrepreneurship research (Fayolle et al., 2014; Krueger, 2017). Manuscript C leverages the Mindset Theory of action phases to study the influence of motivational factors on entrepreneurial intention. The study assumes the TPB construct of intention to be equivalent to the MAP construct of goal intention in the motivational stages. However prior intention-based entrepreneurship research has not considered whether entrepreneurial intention varies between individuals who are still in a motivational stage versus those engaged in realizing entrepreneurial actions (Feola et al., 2019; Goethner et al., 2012). Due to a changing cognitive mindset when transitioning to implementation, we investigated whether entrepreneurial engagement affects entrepreneurial intention and if engagement moderates the relationship between TPB predictors and entrepreneurial intention as goal-intention. The results of our analyses demonstrated that entrepreneurial engagement positively impacts intention beyond the TPB antecedents. However, model results revealed that intention growth showed a marked

change after implementing the first gestation action, suggesting the existence of an entrepreneurial Rubicon-like demarcation during the pre-spin-off phase. Furthermore, we found supporting evidence (with exception of SN) for our hypothesis that ENG moderates the relationship between TPB antecedents and EI (the criterion); such that the relationship is weaker in pre-Rubicon vs. post-Rubicon. For three decades, scholars have predominantly focused on entrepreneurial intention rather than entrepreneurial performance when examining the role of personal and environmental drivers and barriers of entrepreneurship. In agreement with Krueger (2017), this research re-fuels the discussion concerning the importance of EI in entrepreneurship research. Manuscript C highlights the essential role of action-based approaches to study entrepreneurship, adding knowledge on entrepreneurial intention and highlighting future research directions that controls for entrepreneurial engagement while studying entrepreneurial intention. We urge that such this new research follows current trends in entrepreneurship to apply action-related approaches (Adam & Fayolle, 2016; Esfandiar et al., 2019) when studying drivers and barriers of entrepreneurship. However, to provide guidance to policymakers and researchers, additional research is needed to unravel the cognitive mechanisms behind entrepreneurial implementation.

9.2 Implications for future research

Across all research results from the SNSF project we found significant deficits in the support of academic entrepreneurship at Swiss universities of applied sciences. Furthermore, this thesis aimed to address knowledge gaps in research, by combining psychological and economical approaches. Accordingly, I offer the following recommendations for future research in different areas of academic entrepreneurship research.

Various studies conducted within the framework of this project have shown that there is a great interest in entrepreneurship from the perspective of UAS academics. However, there remains a lack of basic prerequisites and support services that would be necessary to anchor the topic of spin-off knowledge transfer at the Swiss UAS. One of the main conclusions of this thesis, therefore, is that research and new strategies are needed to establish a more robust promotion of academic entrepreneurship at Swiss UASs. In order to establish political will to advance academic entrepreneurship, the importance of spin-off ventures for regional and social development in Switzerland should first be examined, following the study on ETHZ spin-offs (Hofer et al., 2020). There is sparse reliable data on how many spin-offs are actually created at Swiss UAS and what economic value they offer to society and for the UAS (profit, job creation and importance of knowledge transfer). Further research beyond the findings of this research should seek to identify barriers that inhibit conditions for consistent spin-off promotion

addressing students and faculties. Are there limiting structural conditions or funding bottlenecks, such as restrictions in contract research or intellectual property licensing at UASs, that may reduce spin-off support because spin-off revenues for UASs with additional revenues from patents and licenses are primarily not attractive in the short term? The role of funding traditions of UAS departments should be better aligned with aspirations for enhanced spin-off activities in academia. Further research is needed to address the factors influencing strategies for academic entrepreneurship at universities and UASs.

At the university level, future research should also examine the role of existing TTOs at UAS on academic entrepreneurship, which can then be compared to international studies to provide policy recommendations on how to strengthen the role of TTO on academic entrepreneurship. Previous research has attested to a strong influence of TTO on the success of engaging in academic entrepreneurship (Chapple et al., 2005); yet this influence does not appear to exist at UAS. From a purely practical perspective, technology transfer offices would also benefit from developing communication networks to facilitate best practice sharing and learning. Future research could test for the benefits of such a process. As noted in manuscript (B) and supported by other studies of the SNSF project (Morandi et al., forthcoming-b), researchers perceive the mission of universities as not yet strongly promoting spin-off activities, but to support teaching, researching and also conduct contract research as a form of knowledge transfer. Future studies should examine, in the context of UAS, how other forms of knowledge commercialization (e.g., contract research, scientific consulting, patent development) influence the entrepreneurial behavior of scientists. And future research should investigate how faculty, TTOs and industry collaborations can work together to foster (female) academic entrepreneurship.

Academic entrepreneurship from a gender perspective is also an integral part of this thesis. Informal and formal support elements for UAS spin-off activities were perceived as less available by women in Manuscript (A) (controlled for age, discipline, and position). Future research is urgently needed to examine both structural causes and opportunities for female-centered venture support. This information is critical for developing support models for increasing women's involvement in academic ventures. This is especially the case because international studies could little correlation between business success and founder gender (Abel-Koch, 2014; Lee & Marvel, 2014). However past research has constantly highlighted the role of formal and informal environments in promoting academic entrepreneurship (Feola et al., 2019; Miranda, Chamorro Mera, & Rubio, 2017).

In light of the results of this thesis, it may be beneficial to examine actual entrepreneurial behavior as a dependent variable based on longitudinal data. Future studies could consider formal and informal support for academic entrepreneurship in the context of a changing mindset (dependent of whether individuals are in a motivational vs. actional phases) and related needs, for example, using the Mindset Theory of Action. An example of such an approach is presented by Esfandiar et al. (2019).

Furthermore, in addition to individual incentives and prerequisites, new research should investigate how entrepreneurial teams can be fostered. Little is known of the psychological mechanism and success of entrepreneurial teams in academic entrepreneurship when compared to solely entrepreneurial ventures. The study of "spin-off teams" is still in its infancy. However, European data (including Switzerland) emphasized that high-potential technology companies are predominantly founded in teams (European-startup-monitor 2019/2020).

Additional recommendations for future entrepreneurship research can be derived from this work. Although the topic of action-oriented research in this context is not new (cf. Frese et al., 2009) and models and research approaches based on implementation intention already exist (Esfandiar et al., 2019), future research should seek to corroborate the findings reported in manuscript (C) using longitudinal data. In addition, investigation into the cognitive and affective mechanisms involved in entrepreneurial decisions and their implementation is needed. Informed by prior research of Fayolle and Liñán (2014) research is required to identify cognitive mechanisms in decision making, the role and importance of mental prototypes, cognitive scripts, mental schemas, and maps in the formation of entrepreneurial intentions and the process leading from intention to behavior. However, cognitive mechanisms should be further explored by distinguishing different stages of entrepreneurial decision making in the early stages and in advanced stages of the entrepreneurial process. With regard to the application of the Rubicon model in entrepreneurship, there is still too little research on how implementation intentions in the field of entrepreneurship arise and can be supported, for example, by the policy and actions of universities. The Mindset theory of action phases and the Rubicon model create many opportunities for future entrepreneurship researchers to elucidate the drivers and barriers of (academic) entrepreneurship in terms of changing needs and cognitive mechanisms.

This research could also consider affective components in the motivation phase of decision making. Blaese and Goethner (forthcoming) have highlighted the role of negative emotions and the importance of fear of missing out as drivers of entrepreneurial decisions. Yet, the role of emotions in entrepreneurial decision-making and implementations remains

understudied. This research is immediately needed to better understand and support the complex process of entrepreneurial decision making and implementation.

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Conditions for Spin-Off Creation at Swiss Universities of Applied Sciences
A gender sensitive approach

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Abstract

Purpose

The promotion of research-based entrepreneurship is considered a crucial task for universities and policymakers in many Western countries. Research has shown that the university environment plays a decisive role in the spin-off activities of researchers. Although the number of science-based spin-offs has increased in recent years, women are still an exception when it comes to developing spin-off ventures. In turn, there is a lack of knowledge regarding the university environment that supports entrepreneurship from a gender perspective.

Design/methodology/approach

Based on the theoretical framework of the “Entrepreneurial University”, this contribution examines formal and informal conditions for academic entrepreneurship using the example of Swiss universities of applied sciences (UAS). Based on a cross-sectional data set of 1,551 researchers from various disciplines who were surveyed in 2019, linear and logistic regression models were used to test gender-specific differences in the perception of organizational conditions concerning the entrepreneurial exploitation of research.

Findings

The results demonstrated significant differences in the perception of formal and informal conditions in higher education. First, they show gender differences in the perception of informal entrepreneurial support in universities; in particular, female researchers received less informal support for spin-off projects. For example, women hardly viewed commercial use of R&D knowledge as a career option and considered the existence of entrepreneurial role models at universities to be low. Second, further analyses highlighted that also formal support offerings were less known among female researchers.

Originality

Our study highlights organizational barriers for female researchers regarding the development of spin-off creation at UAS, including the different formal and informal conditions for female academics in comparison to their male counterparts

Keywords: gender, spin-off, academic entrepreneurship, organizational framework

Introduction

In knowledge-based economies, such as Switzerland's, research and development (R&D) are considered decisive factors of productivity that, in turn, promote researchers to explore the entrepreneurial potential of their research by creating spin-offs (e.g., Fini *et al.*, 2017). As an important context for technical and social innovation, many universities inspire researchers to engage in entrepreneurial activities as part of their institutional mission (Etzkowitz, 2017; Meek and Wood, 2016). Even if institutional entrepreneurialism has not yet been de facto implemented at all universities, it remains a normative and political demand. Research on academic entrepreneurship has sought to answer the question of how to design and implement spin-off activities. Spin-offs are defined as companies resulting from the commercialization of intellectual property and knowledge developed in universities (Djokovic and Souitaris, 2008).

Emerging research demonstrates that female academics are less likely to become entrepreneurially active in spin-off creation than their male counterparts (Abreu and Grinevich, 2017; Rosa and Dawson, 2006; Miranda *et al.*, 2017b). The European Start-up Monitor 2018 surveyed start-ups of highly innovative technologies and found a low percentage of female-driven companies (ranging from 5.1 in Portugal to 23.9 in Poland). In Switzerland, 19.6% of highly innovative start-ups are founded by woman; above the European average of 15.6 % but still relatively low (Steigertahl *et al.*, 2018). At Swiss universities of applied sciences (UAS), "chemistry and life sciences" constitute an interdisciplinary field where qualifications in chemistry, pharmacy, biology and medical technology are in demand. Swiss UAS are characterized by a noticeable gap between the representation of women in the lower versus higher hierarchical levels of scientific personnel (Dubach *et al.* 2017). Among researchers about only 24% were female in 2015, this is strikingly low in comparison with the number of female professors in many EU countries.

Previous studies have found little association between entrepreneurial success and the gender of the owner (Abel-Koch, 2014; Lee and Marvel, 2014), therefore it is possible that lower participation rate of women in spin-off activities represents an opportunity for economic potential. Literature addressing the gender gap in academic entrepreneurship points to the university environment as a primary driver of the lower spin-off intentions of female academics (Abreu and Grinevich, 2017; Best *et al.*, 2016; Eriksson, 2014). To date, research has focused on the motivational processes and socio-organizational predictors of academic entrepreneurship within the academic environment (see for an overview, Miranda *et al.*, 2018; Hossinger *et al.*, 2020; Schmitz *et al.*, 2017). Despite this, little attention has focused on whether female and male academics perceive their entrepreneurial environment in a similar manner, nor has it explored whether their entrepreneurial environment is similar, nor explored the specific organizational conditions for spin-off creation of women in STEM (science, technology, engineering, and mathematics) and HSS (humanities and social sciences). This leads to a lack of knowledge concerning the role of universities in driving the gender gap in spin-off creation.

The objectives of the present study are twofold. Drawing from the theoretical concept of the entrepreneurial university (Clark, 1998; Thorp and Goldstein, 2010) and current perspectives in

organizational and entrepreneurship research (Fini and Toschi, 2016; Kirby *et al.*, 2011; Miranda *et al.*, 2017a), gender-specific differences in the perception of formal and informal framework conditions for spin-off activities will be evaluated for Swiss universities of applied sciences (UAS). Next, the perceptions of female researchers from disciplines with high affinity for spin-off creation, including STEM-fields, will be compared to other disciplines from the Arts and Humanities. We explore the current state of entrepreneurial promotion for scientists in this university context. We then use linear regression and logistic regression models to examine gender differences in the informal and formal support of spin-offs at UAS.

This study's findings highlight gender-specific perceptions of organizational conditions for spin-off creation within UAS and thus inform entrepreneurship scholars and political decision-makers how to reduce the gender disparity. This research points to significant gaps in the promotion of academic entrepreneurship in UAS, which primarily impacts women. The remainder of the paper discusses the theoretical framework and hypotheses, methodology, and results and implications.

Theory and hypotheses

In examining entrepreneurial activities within higher education, research has focused on both individual characteristics of academic entrepreneurs as well as on socio-organizational conditions (Goethner *et al.*, 2009; Krabel and Mueller, 2009). For example, work-related skills (e.g., social networks and contacts, see Goethner *et al.*, 2012) and non-work-related competences (e.g., entrepreneurial experiences) (Wright *et al.*, 2004; Hoye and Pries, 2009) are found to be crucial in predicting entrepreneurial activities among academics. In addition, personal characteristics (Shane, 2004), such as entrepreneurial passion (Obschonka *et al.*, 2019) and specific motives such as financial gains and social reputation (Lam, 2015), personal attitudes towards the commercialization of knowledge, (Henrekson and Rosenberg, 2001) and specific demographic characteristics (Bijedić *et al.*, 2017) are considered to be personal drivers of entrepreneurial activities.

Current understandings state that entrepreneurial decision-making is bounded to organizational structures, which influence the development of entrepreneurial goals and their implementation (see Ahl and Nelson, 2010; Bergmann *et al.*, 2018; Kirby *et al.*, 2011; Miranda *et al.*, 2017a). That means, when predicting entrepreneurial action, scholars frequently refer to the interaction of individual drivers with the social environment at the organizational level, including structural conditions and cultural dimensions, such as incentive and reward systems or promotion and support structures (Feola *et al.*, 2019). The structural conditions also include shared attitudes that guide the behavior of institutional members (Bercovitz and Feldman, 2008; Goethner *et al.*, 2012).

Hossinger *et al.* (2020) summarized three central factors for promoting entrepreneurial intentions of researchers at the meso-level: university characteristics; research orientation of the department; and university support mechanisms. They emphasize that entrepreneurial intention is significantly influenced by the characteristics and research orientation of universities. For example, universities that focus on applied research and possess traditions of cooperation with industry tend to encourage more entrepreneurial activity (Arvanitis *et al.*, 2008; Fischer *et al.*, 2018). While researchers in the fields of science, engineering and physics, participate in all types of entrepreneurial activities, researchers in the social sciences (e.g., education

and economics) rather veer into informal commercial activities such as consultancy and contract research (Prodan and Drnovsek, 2010; Abreu and Grinevich, 2017).

Regarding the entrepreneurial environment, a growing number of scholars recognize the value of a supportive environment in promoting academic entrepreneurship (for examples see Bergmann *et al.*, 2018; Feola *et al.*, 2019; Huyghe and Knockaert, 2015). Based on North (1990), Kirby *et al.* (2011) introduced a set of formal and informal factors to analyze entrepreneurial framework conditions in the context of universities. These factors can either facilitate or hinder a researcher's entrepreneurial thinking and action. While North (1990) defined formal institutions as laws, regulations, and guidelines, his concept of the 'informal institution' also includes ideas, beliefs, attitudes, and social values. According to entrepreneurship literature (Brush *et al.*, 2009; de la Cruz Sánchez-Escobedo, María *et al.*, 2011), North's theoretical framework facilitates the understanding of 'hidden constraints' concerning entrepreneurial activity with their contextual dependence. Starting from here it can be assumed that the university context - facilitated by both formal and informal conditions - creates a specific framework for entrepreneurial intentions and activities (Kirby *et al.*, 2011).

Gender gap in spin-off creation

Several studies have addressed the lack of entrepreneurial intention and spin-off activities amongst female academics (see Austin and Nauta, 2016; de la Cruz Sánchez-Escobedo, María *et al.*, 2011; Strobl *et al.*, 2012). There is broad agreement among entrepreneurship scholars that individual, institutional, and structural factors play an important role in driving the gender gap in academic entrepreneurship (see Foo *et al.*, 2016; Abreu and Grinevich, 2017). Individual factors that contribute to the gender gap in entrepreneurial intentions and activities include: parental entrepreneurial activities (Laspita *et al.*, 2012), job-related experiences and skills, and the intersection of gender and ethnic origin (Krabel and Mueller, 2009). Psychological studies also attributed lower self-efficacy expectations (Wilson *et al.*, 2007) and different motivations (Espiritu-Olmos and Sastre-Castillo, 2015) as reasons for the lower entrepreneurial intentions of women. For example, women frequently report choosing to engage in entrepreneurial activities in order to provide time for family and professional tasks, while men consider the implementation of a new product or innovation idea driving their entrepreneurial interest (Piacentini, 2013). Howe *et al.* (2014) also identified greater risk aversion, less affinity for the commercialization of knowledge, and a lack of familiarity with technology transfer issues as barriers for start-up activities among female academics. Additionally, family responsibilities can especially effect women's founding activities. Past studies reported that founders most often launch their businesses between the ages of 30 and 40, while the average age of successful founder is about 45 (Azoulay *et al.*, 2018, Hirschfeld *et al.*, 2020).

Moreover, research literature shows several structural and institutional factors affecting female academic entrepreneurship, such as a lack of role models to foster spin-off activities at universities and the lack of women in research and science policy holding which hold leading positions in institutions and industry (Murray and Graham, 2007).

Both inside and outside universities, men are often dominant founders and end up serving as the gatekeepers of entrepreneurial activities and decisions related to innovation and investment (see. Muntean, Clark, Susan and Ozkazanc-Pan, 2015). Consequently, female researchers are less well placed to commercialize knowledge outside the university (Lawton-Smith *et al.*, 2017), and quite often can rely on smaller networks and fewer industry contacts, investors, and partners (Best *et al.*, 2016; Micozzi *et al.*, 2016). On a cultural level the association of entrepreneurship with male gender stereotypes (Ahl and Nelson, 2010; Gupta *et al.*, 2008; Gupta *et al.*, 2009) also affects the probability of women to become entrepreneurs (Henry *et al.*, 2013). And also outside of the university context less positive attitudes towards female entrepreneurship due to perceived difficulties associated with feasibility (Dabic *et al.*, 2012; Strobl *et al.*, 2012), can contribute to a lack of entrepreneurial women in academia.

Different market- and exploitation-oriented traditions, as well as priorities, within the different scientific fields are important in forming the framework conditions for academic entrepreneurship (Krabel and Mueller, 2009; Landry *et al.*, 2006; Stuart and Ding, 2006). While the level of entrepreneurial activity differs generally between disciplines and scientific fields, studies point out that also the barriers to spin-off activities differ in these contexts. Some evidence is given that in disciplines which show strong entrepreneurial activities, the proportion of females is lower (Abreu and Grinevich, 2017; Rosa and Dawson, 2006). Since women are particularly underrepresented in disciplines with higher entrepreneurial potential – such as it is the case for STEM-fields - they are less likely to become founders (Rosa and Dawson, 2006). Studies indicate that more individuals with leadership positions, extensive networks, and entrepreneurial experience are engaged in spin-off activities at universities and that an overwhelmingly large proportion of these individuals are male (Stephan and El-Ganainy, 2007). As Abreu and Grinevich (2017) noted, female academics are both less represented in "spin-off relevant" positions within universities and predominantly active in fields such as health, social sciences, humanities, and education, which are fields that tend to lack entrepreneurial experience and hold ambivalent views regarding the commercialization of research.

Against this background of explanations and findings on gender-specific differences in entrepreneurial activities among researchers, we argue that the horizontal and vertical gender segregation in academic entrepreneurship is perpetuated by the fact that women are not as present in the disciplines with high entrepreneurial potential (Abreu and Grinevich, 2017; Rosa and Dawson, 2006) and therefore less likely to participate in academic entrepreneurship. Further, we assume that formal and informal conditions of entrepreneurship are perceived differently by men and women. We suppose that due to the interaction of specific formal and informal conditions associated with entrepreneurship, women are more likely to encounter barriers related to entrepreneurial activities (Orser *et al.*, 2012) and are less likely to be encouraged to pursue an entrepreneurial career. We assume gender significant differences in the perception of formal and informal conditions for spin-off activities.

H1. Female researchers perceive the informal conditions of spin-off activities at their university as less supportive than their male counterparts.

H2. Female researchers perceive the formal conditions of spin-off activities at their university as less supportive than their male counterparts.

H3. The formal conditions for spin-off activities at their university are more unknown to female researchers than to their male colleagues.

Method

Data Collection

This research was based on cross-sectional data collected in an online survey of researchers at the seven public UAS in Switzerland. Since the 1990s, Swiss UAS have created an entrepreneurial profile of knowledge transfer, for example by promoting consulting services, contract research and entrepreneurship (SBFI, 2020). The official performance mandate of UAS includes education, research and development (R&D), continuing education, and service/consulting (Lepori and Müller, 2016). Compared to other universities, the research mission of UAS focuses on "application-oriented research" which has been described in the literature as a driver of academic entrepreneurship. Furthermore, UAS maintains close collaborations with industry (KFH, 2014) that further promotes the exploitation of commercial knowledge.

The main objective of the survey was to assess the framework conditions for entrepreneurial activities at universities from a gender perspective. In January 2019, more than 8,000 researchers from various disciplines were randomly invited to participate in the survey by e-mail. Using Questback, an online survey tool (Unipark, 2013), participants could choose between three languages (German, English, and French). Previously, the questionnaire and the procedure were tested and optimized using an independent sample.

The study sample size contained 1,551 participants. Previously, we removed the respondents from our sample who did not provide any data and those with missing data on gender, as gender is a key aspect of this study. The average age of respondents was 36.7 years (SD=13.1, range: 22-69) and females accounted for 33.3% (n=517) of the participants. Roughly one-third (30.4%; n=472) were other than Swiss citizens, 41.5% (n=643) hold a Master's degree, and 42.7% (n=663) stated a PhD as their highest educational qualification. Regarding their work, 29.6% (n=459) reported "professor /lecturer with leadership responsibilities," and 54.3% (n=842) of respondents held positions within STEM departments, including mathematics, life science, computer science, science, and technology, while the others belong to the humanities and social sciences (HSS). For employment status, 35.7% (n=554) of the participants held temporary employment. Fifty three percent (n=171) of the responding participants with entrepreneurial experience are being in STEM department. The participants in our sample are not equally distributed among all seven UAS (Bern University of Applied Sciences n=300, University of Applied Sciences Northwestern

Switzerland n=253, University of Applied Sciences Eastern Switzerland n=195, University of Applied Sciences Western Switzerland n=220, Lucerne University of Applied Sciences n=241, University of Applied Sciences Southern Switzerland n=72, Universities of Zurich n=270).

Measures

Informed by previous research and best practices on entrepreneurial support measurement by Fernández-Nogueira et al. (2018), the following items on formal and informal conditions are created. *Informal framework conditions.* Using details from prior research (Kirby et al., 2011; Fini et al., 2017; Fernández-Nogueira et al., 2018) we created a set of six criteria for assessing informal framework conditions. Participants were asked: “To what extent do you agree with each of the following statement with respect to your university?”: (1) The university increases people’s awareness of its spin-off projects; (2) The university is an important contact partner for existing spin-off activities; (3) Spin-offs are a possible career option at the university; (4) Superiors actively support spin-off projects; (5) Colleagues actively support spin-off projects; (6) Successful founders are well known and respected at the university. The items were presented on a five-point Likert scale ranging from 1 (Absolutely disagree) to 5 (Absolutely agree). After the reliability and validity were determined and the items were aggregated as part of passive imputation procedure. The internal consistency, as measured by Cronbach's alpha ($\alpha = 0.85$), was very strong.

Formal framework conditions. Employing the same studies as above (Kirby et al., 2011; Fini et al., 2017; Fernández-Nogueira et al., 2018), seven items were developed to address formal framework conditions. Participants were initially asked: “How do you assess spin-off promotion at your university?”: (1) For the use of research infrastructure; (2) For team-building for co-founders; (3) for the search for suitable co-founders; (4) For mentoring and consultancy services for spin-off projects; (5) During financing in the business creation phase (e.g., “financing of prototypes”); (6) During financing in the “growth phase” (e.g., when looking for investors); and, (7) For unpaid leave of absence for personal spin-off projects. The items were answered on a five-point Likert scale and later in a passive imputation procedure aggregated. Participants were also allowed to answer "Unknown" to skip single items. The reliability measured by Cronbach’s alpha ($\alpha = 0.91$) was excellent.

Control variables: Based on prior academic entrepreneurship research (see Hossinger et al., 2020; Goethner et al., 2012; Huyghe and Knockaert, 2015), we controlled for the level of employment, nationality, temporary employment, age, occupational category, entrepreneurial experience, level of employment in the are of R&D in percent (0-100), and discipline. For the STEM disciplines the departments of technology, life science, natural sciences, and architecture (incl. facility management), health sciences, agricultural sciences, and forestry were included ($n_{STEM} = 842$, $n_{Women} = 172$, $n_{Men} = 670$). HSS disciplines included economics, design, arts and music, social work, applied psychology, and applied linguistics ($n_{HSS} = 709$, $n_{Women} = 364$, $n_{Men} = 345$)

Discriminant validity and common method variance

Items on formal conditions and informal conditions stated to be "Unknown" were treated as missing values for the following validity and reliability analysis. An Exploratory Factor Analysis (EFA) was performed to extract and evaluate the initial construct validity and reliability, and the metrics (Table I). The analysis conducted by EFA included the examination of item commonalities, their factor loading and Cronbach's alpha. The item commonalities exceeded the threshold of 0.50 (Hair *et al.*, 1992), and the two factors explained 63.8% of the total item variance. The factor loads of the items and the names of the extracted factors are listed in Table I. The measurement items loaded to their respective factors as expected, indicating initial convergent and discriminant validity as factor loadings exceeded 0.50 and cross-loadings were below 0.30.

By using five imputed datasets conducted in {Lavaan.survey} (Oberski, 2014) in R (R Development Core Team, 2013), Confirmatory Factor Analysis (CFA) was performed to assess the convergent and discriminatory validity of the measurement items. The model fit can be assessed using several techniques, Chi-square statistics (χ^2), mean square approximation error (RMSEA), and Comparative Fit Index (CFI). Values below 0.05 for RMSEA were interpreted as very good, while values below 0.08 were interpreted as acceptable. CFI values above 0.90 and 0.95 are considered acceptable and excellent, respectively (Kline, 2005). The Chi-square value for the measurement model was significant indicating a poor fit, but Chi-square is affected by sample size, we calculated alternative fit indices. The CFI and RMSEA demonstrated a good fit of the measurement model (CFI = 0.96, RMSEA = 0.03) and confirmed a sufficient convergent and discriminatory validity, as the items were significantly loaded on their respective factors and all factor loads were above 0.60. The convergent validity can be assumed by obtaining the extracted mean variance (AVE) with a threshold value of 0.50 (Hair *et al.*, 2017). Reviewing the AVE values for all factors suggests an acceptable validity (AVE > 0.50).

Discriminant validity was first assessed by comparing the values of the AVE square root of the conceptual constructs ($\sqrt{\text{AVE}}$) with the correlation of the other conceptual constructs (Fornell and Larcker, 1981). If the value of $\sqrt{\text{AVE}}$ was higher than the coefficient of correlation between the factors, this was interpreted as an indication of discriminant validity. All factors assessed met the criterion and showed discriminant validity. Second, we assessed discriminant validity by using the heterotrait-monotrait ratio of correlation (HTMT) (Henseler *et al.*, 2015). If the HTMT was below 0.90, a discriminant validity between the two constructs was assumed. The results showed that the HTMT values between the respective constructs were below 0.90 (HTMT = 0.62 for the connection between formal and informal frameworks). The results provide evidence of convergent and discriminatory validity.

Construct	Item	Factor Loadings
Informal Framework	Info 1	0.71
	Info 2	0.74
	Info 3	0.71
	Info 4	0.74
	Info 5	0.72
	Info 6	0.68
Formal Framework	Formal 1	0.69
	Formal 2	0.84
	Formal 3	0.85
	Formal 4	0.75
	Formal 5	0.82
	Formal 6	0.84
	Formal 7	0.62

Table I Analysis of reliability and converged validity

Common Method Variance (CMV) occurs when a method bias affects all measures equally (Podsakoff *et al.*, 2012) and can occur when participants systematically distort their responses to surveys (e.g., according to social desirability). To investigate the potential for CMV, all study variables were loaded on a factor to investigate the CFA model fit. If the one-factor CFA model fits the data, the CMV is considered largely responsible for the relationship between the variables (e.g. Mossholder *et al.*, 1998). Within these data, a one-factor CFA model did not represent the data well ($X^2 [54] = 689$, $p < 0.001$, CFI = 0.73, RMSEA = 0.09), suggesting that the items were not just different aspects of an underlying construct (CMV).

Analytical strategy

Before testing our hypothesis, we conducted a descriptive analysis, including a mean value comparison. Using the individual items mentioned above, we assessed both the general level of entrepreneurial support regarding informal and formal frameworks and to uncover gender differences in the perception of entrepreneurial conditions at UASs.

A total of 18% and 30% data on formal and informal frameworks in our sample were missing information on one or more variables. To assess whether the data were missing completely at random (MCAR), Little's Chi-square test (Little, 1988) was used. This statistic tests the null hypothesis that the data were MCAR, and the result for this sample was found to be statistically significant, suggesting a violation of the MCAR assumption. Because the presence of missing values on some variables (e.g., Info 1, Info 2) clearly depends on the values on other variables in the analyses (e.g., gender, discipline), the use of a missing data handling method that makes the weaker assumption of missing at random (MAR) (e.g., model- or imputation-based procedures) is warranted. To correct for potential bias from missing data, we used a multiple imputation procedure (van Buuren and Groothuis-Oudshoorn, 2010) and predictive mean matching (pmm), which makes

full use of the available information contained in the data. (e.g., Sinharay et al., 2001). All estimates presented below were pooled from 50 complete data sets with the {MICE} package version 3.4.3 (Multiple Imputation by Chained Equations; van Buuren and Groothuis-Oudshoorn, 2010). Further statistical analyses, and passive imputation of the informal and formal aggregated dependent variables i.e., calculated from the imputed components after imputation (Seaman *et al.*, 2012) were performed on these datasets and results were combined using Rubin's rule (van Buuren and Groothuis-Oudshoorn, 2010).

To test the hypotheses (H1 and H2), ordinary least squares (OLS) regressions were used while controlling for individual characteristics. To test H3, the single items of the formal conditions were recoded as new dummy variables; participants who have declared items as "Unknown" were coded as "0" and those who provided a rating of the Likert scale were coded as "1". Next, formal conditions were aggregated into the new dependent variable (known formal condition). Those "Unknown" responses have been treated as separate variables during imputation procedure. Using these newly created dependent variables to test the gender impact on the awareness of formal conditions, a logistic regression model was estimated by using the GLM function in R.

Results

Descriptive analysis of gender differences in the assessment of the organizational environment

First, to answer our hypothesis we conducted a descriptive analysis of gender differences with regard to the assessment of the formal and informal conditions. Therefore, the items of the two scales described above (for formal and informal settings) were descriptively analyzed.

Informal framework conditions for spin-off activities

Regarding the conditions of the informal environment, the next section examines gender differences in the perception of these conditions from the respondents' perspective. The mean values of the items are presented in Figure 1. A significant gender-specific difference in the mean values (M) of the aggregated scales (six items) for measuring informal conditions was observed in our data ($M_{Men}=2.75$, $SD=1.01$, $M_{Women}=2.41$, $SD=1.07$, $t[161.28]=3.05$, $p < 0.01$).

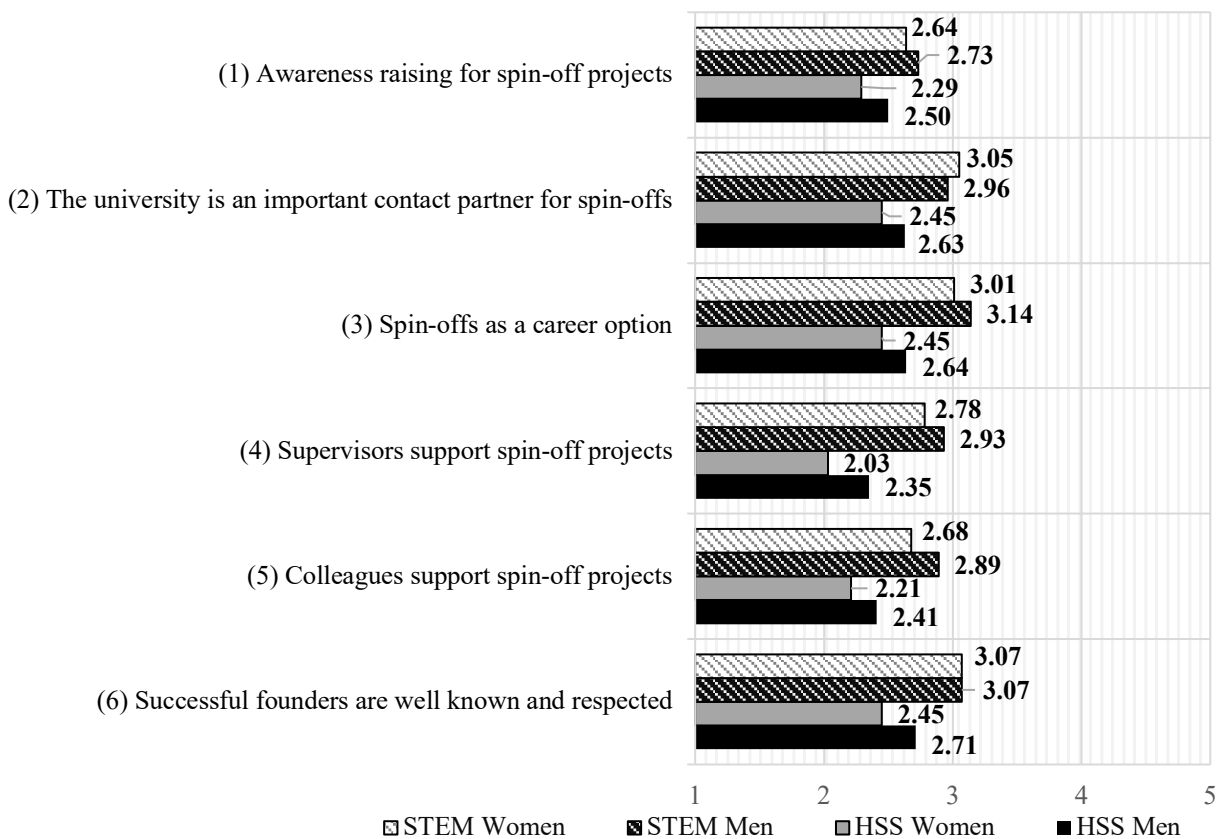


Figure 1 Mean values: Evaluation of the informal framework conditions for spin-off activities at the seven universities of applied sciences on the basis of a five-point Likert scale (1-absolutely disagree to 5-absolutely agree). STEM disciplines: $n_{STEM} = 842$, $n_{Women} = 172$, $n_{Men} = 670$; HSS disciplines: $n_{HSS} = 709$, $n_{Women} = 364$, $n_{Men} = 345$

The single items, which reflect various aspects of informal conditions in detail, are examined below in order to examine gender differences within the disciplines STEM ($n_{STEM}=842$) and HSS ($n_{HSS}=709$) more precisely. Overall, more than 30% of the respondents in the STEM disciplines and more than 40% of the respondents within the HSS assessed the level of informal conditions for spin-off activities as unknown or weak (see Figure 2). For example, only 23% ($n=132$) of men and 17% ($n=23$) of women in STEM disciplines and only 17% ($n=56$) of men and 14% ($n=35$) of women in HSS disciplines found their university to actively *raise awareness for entrepreneurial projects (No.1)*. Furthermore, 29% ($n=160$) of male respondents and 25% ($n=34$) of the female respondents in STEM, but only 18% ($n=61$) of the male respondents and 13% ($n=33$) of female respondents in HSS considered their UAS to be an *important contact partner for entrepreneurial projects (No.2)*. These results are shown in Figure 2 below.

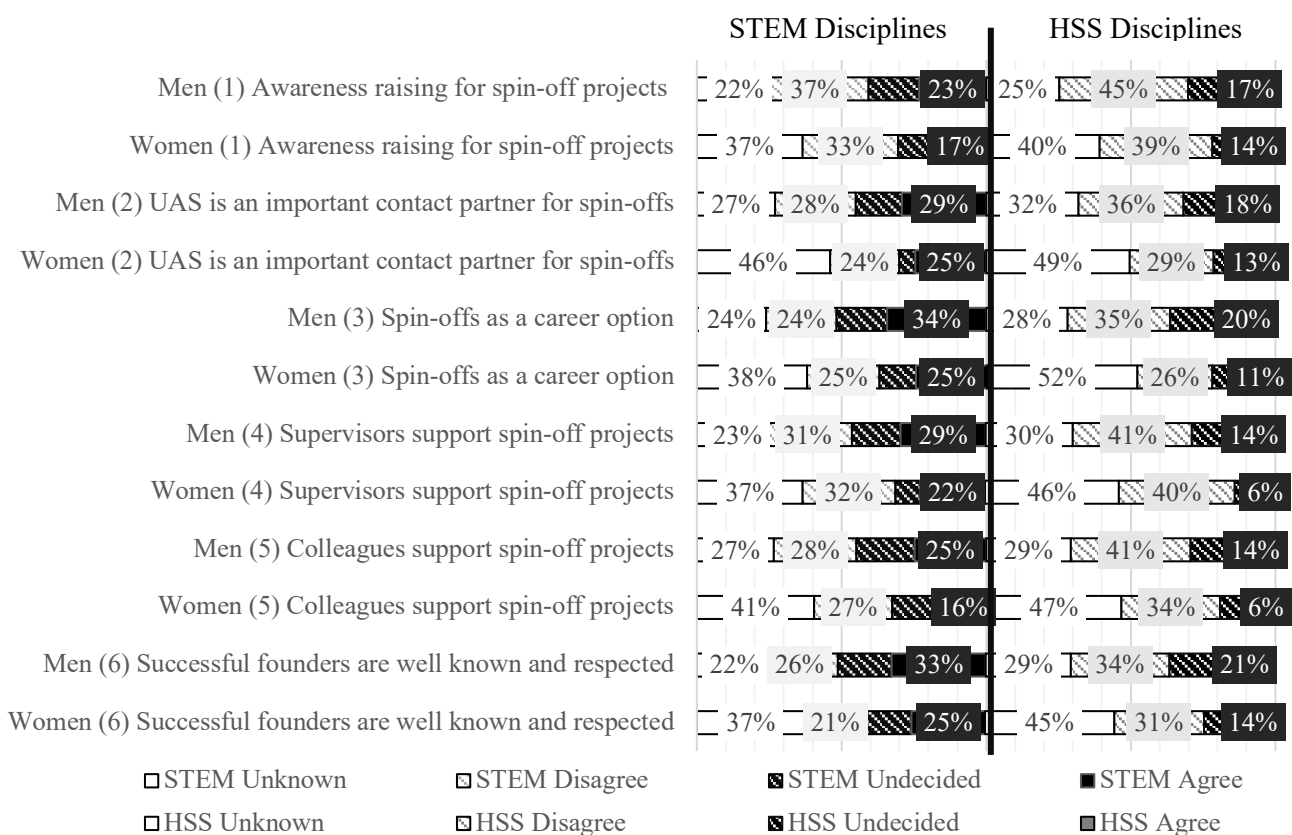


Figure 2 Evaluation of the informal framework conditions for entrepreneurial projects at the seven universities of applied sciences on the basis of a five-point Likert scale (1-absolutely disagree to 5-absolutely agree). STEM disciplines: $n_{STEM}=842$, $n_{Women}=172$, $n_{Men}=670$; HSS disciplines: $n_{HSS}=709$, $n_{Women}=345$, $n_{Men}=364$. The printed data refer to the original data without imputation. Due to missing values n_{total} on the item level can vary: $n_{(No.1)}=1,259$, $n_{(No.2)}=1,249$, $n_{(No.3)}=1,248$, $n_{(No.4)}=1,248$, $n_{(No.4)}=1,306$, $n_{(No.5)}=1,309$, $n_{(No.6)}=1,251$.

A similar result was found for item *No.3, spin-off creation as a career option*. Thirty-four percent ($n=193$) of male researchers and 25% ($n=34$) of female researchers in the STEM disciplines and 20% ($n=62$) of male researchers, but only 11% ($n=28$) of female researchers in the HSS disciplines stated that spin-off activities are considered to be a career opportunity in the context of UAS.

Also, the support for *spin-off projects by colleagues and superiors (No.4 and No.5)* was perceived as rather weak. Twenty-nine percent (n=172) of male researchers and 22% (n=34) of female researchers in STEM disciplines, and only 14% (n=47) of male researcher and 6% (n=18) of female researcher in HSS disciplines reported that supervisors actively support spin-off projects (*No. 4*). However, only 25% (n=44) of male and 16% (n=19) of female researchers in the STEM disciplines and 14% (n=44) of male and 6% (n=18) of female researchers in the HSS disciplines stated that they received support from colleagues in spin-off projects (*No.5*).

However, descriptive analyses suggested that informal conditions for spin-offs at UAS was rated weak by all participants. Gender differences were only given, such that men rated informal conditions slightly better than women.

Formal framework conditions for spin-off-activities

Regarding the formal conditions, respondents replied whether concrete measures were available or that they were unaware of these conditions. Overall, all respondents were more uncertain about the formal conditions at UASs. For example, between 35% and 71% of the researchers in the STEM disciplines (n=842) and between 54% and 79% of the researchers in the HSS disciplines (n=709) considered the formal conditions to be "Unknown" and thus did not determine the degree of conditions at their UAS.

Thirty-two percent (n=151) of male and 26% (n=29) of female researchers in the STEM disciplines and 15% (n=42) of male and 12% (n= 26) of female researchers in the HSS disciplines stated that they were free to *use the university's research infrastructure for spin-off projects (No. 1)*. However, 35% (n= 162) of men and 58% (n= 65) of women in the STEM disciplines and 54% (n=145) of men and 71% (n= 158) of women in the HSS disciplines responded with "Unknown".

The support offered by the university through team-building measures (*No.2*) or the search for co-founders (*No.3*), was perceived as generally "unknown" by half of the respondents in the STEM disciplines areas and by more than half of the respondents in the HSS disciplines (see Figure 3 STEM and Figure 4 for HSS). Only 14% (n= 64) of men and 12% (n= 12) of women in STEM disciplines and 10% (n=26) of men and 4% (n=9) of women in HSS disciplines considered the opportunities for *team building at the UAS (No.2)* to be well developed. Forty-six percent (n=217) of men and 69% (n=77) women in the STEM field and 57% (n=154) of men and 78% of (n= 174) women answered this question with "Unknown". Only 14% (n=64) of the male researchers and 12 % (n=14) of the female researchers of the STEM disciplines and 11% (n=29) of male and 6% (n=14) of female researchers in the HSS disciplines indicated that they could *receive support at their university to find suitable co-founders (No.3)*.

Figure 3 - STEM disciplines (n_{STEM} =842; n_{Women}=172; n_{Men}=670)

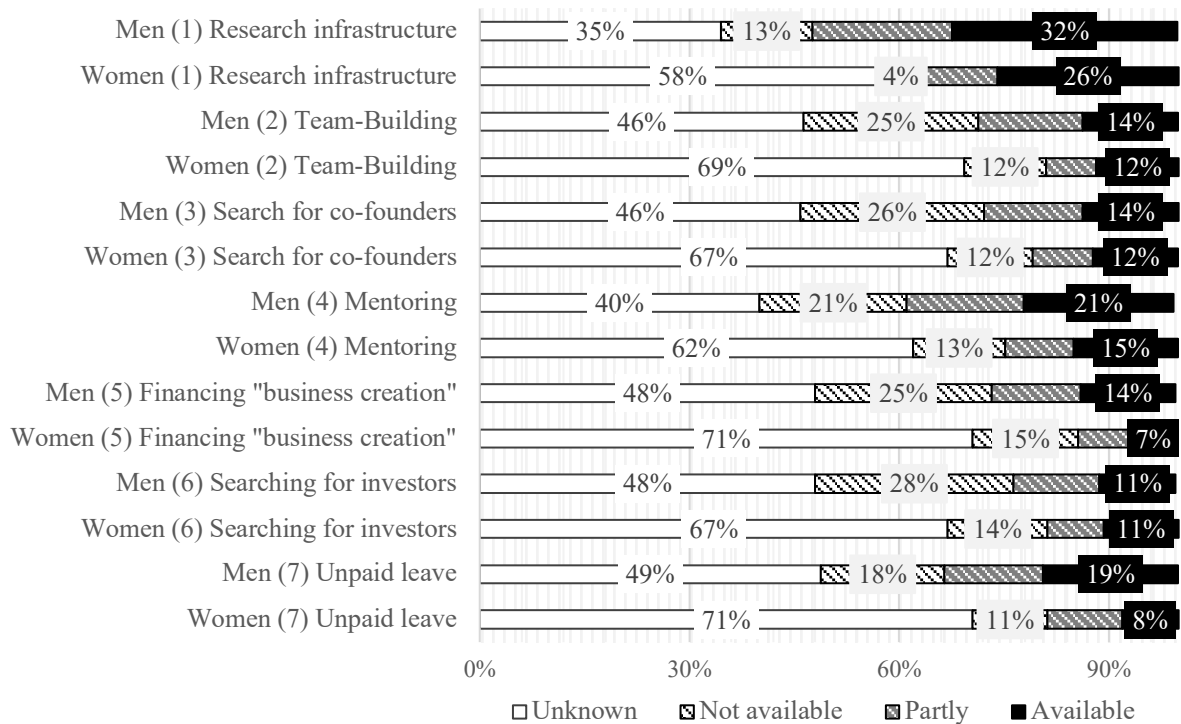


Figure 3 STEM-disciplines: Formal framework conditions at seven universities of applied sciences examined on the basis of the five-point Likert scale and "Unknown". STEM disciplines: n_{STEM}= 842; n_{Women}=172; n_{Men}=670. Due to missing values n_{total} on the item level can vary; n_(No.1)=581, n_(No.2)=579, n_(No.3)=583, n_(No.4)=586, n_(No.5)=583, n_(No.6)=576, n_(No.7)=581.

For component measure No.4, *mentoring offers are considered to be available*, 21% (n=102) of men and 15% (n=17) of women researchers in STEM disciplines and 18% (n= 47) of men and 9% (n=21) of women in HSS disciplines indicated that *mentoring offers are available*. In contrast, 51% (n=136) of men and 69% (n=153) of women in HSS disciplines rated this item as "Unknown". Also, internal offers to *locate suitable financing opportunities in the "start-up phase"* (No. 5) and to *attract suitable investors* (No. 6) were "Unknown" to more than half of the respondents in the STEM and HSS disciplines at seven UAS (see Figure 3 and 4).

For measure No.5, *targeted support in finding suitable financing offers* (e.g., enabling a prototype in the start-up phase), was perceived as "available" by 14% (n=64) of the male researchers and 11% (n=8) of the female researchers in STEM disciplines and only 8% (n=22) of the men and 4% (n=8) among women in the HSS disciplines. Only 11 % (n=51) of the male researchers and 11 % (n=12) of the female researchers in the STEM disciplines and 7 % (n=20) of the male researchers and 4 % (n=8) of the female researchers in the HSS disciplines have *sufficient internal support for spin-off activities in the "growth phase" such as searching for investors* (No.6). To take *unpaid leave for entrepreneurial projects* (No.7) was seen as likely on the scale by 19% (n= 91) of men and 8% (n=9) of women in STEM disciplines and only 10% (n=27) of

men and 4% (n=9) of women in HSS disciplines. We then considered whether these gender differences were statistically significant in the next section.

Figure 4 -. HSS disciplines (n= 709, n_{Women}=364, n_{Men}=345)

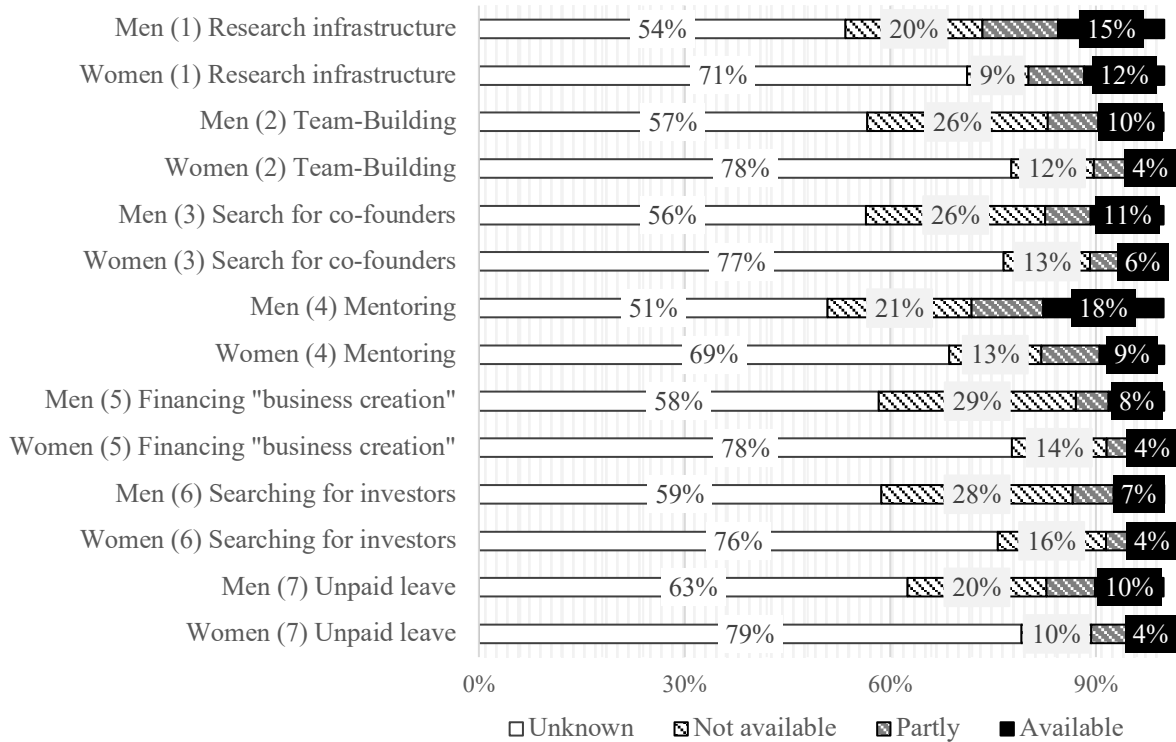


Figure 4 HSS-disciplines: Informal framework conditions at seven universities of applied sciences examined on the basis of the five-point Likert scale and "unknown". HSS disciplines: n_{HSS} = 709, n_{Women}=345, n_{Men}=364. Due to missing values n_{total} on the item level can vary; n_(No.1)=493, n_(No.2)=496, n_(No.3)= 493, n_(No.4)=490, n_(No.5)=496, n_(No.6)=493, n_(No.7)= 492.

Gender-specific effects of formal and informal framework conditions

Ordinary Least Squares (OLS) regression and logistic regression models, were performed to evaluate gender differences in the perception of formal and informal conditions (hypotheses 1-3). First, we verified that the data meet the linearity and homoscedasticity assumptions for OLS regressions and verified multicollinearity problems by calculating variance inflation factors (VIFs). The highest VIF was 1.3, which is significantly below the critical value of 10 (Hair *et al.*, 2006) and indicates that multicollinearity is not an issue in our study.

The OLS regression models are reported in *Table II*. It should be noted that M1 and M3 were baseline models, consisting only of control variables. While the results indicated that researchers from the STEM disciplines consider the informal conditions ($\beta_{STEM}=0.268, p < 0.001$) but not the formal conditions ($\beta_{STEM}=0.112, p = 0.5$) to be better developed. Only temporary employment contract ($\beta_{Contract}= 0.271, p < 0.01$) showed a significant positive effect on formal conditions (M3), while the other control variables in the models (M1 and M3) demonstrated no significant influence on informal and formal conditions.

Models 2 and 4 capture the direct effects of gender on formal and informal conditions. While OLS-regression model (M2) revealed a significant negative gender effect on informal conditions ($\beta_{\text{Female}} = -0.195, p < 0.01$), no significant gender effect on formal conditions ($\beta_{\text{Female}} = -0.013, p = 0.52$) was evident. The results, therefore, support our hypothesis (H1) that female researchers rated the informal conditions significantly weaker than their male colleagues, while hypothesis (H2) was not supported.

	<i>Dependent variable:</i>					
	Informal conditions		Formal conditions		Known formal conditions	
	<i>OLS</i>		<i>OLS</i>		<i>GLM:</i> <i>link = logit</i>	
	(M1)	(M2)	(M3)	(M4)	(M5)	(M6)
Female researcher		-0.195** (0.059)		-0.013 (0.079)		-0.440*** (0.133)
STEM discipline	0.268*** (0.053)	0.263*** (0.055)	0.112 (0.065)	0.108 (0.070)	0.521*** (0.115)	0.396*** (0.121)
Age	0.000 (0.002)	0.000 (0.002)	-0.003 (0.003)	-0.003 (0.003)	0.005 (0.004)	0.005 (0.005)
Swiss nationality	0.045 (0.057)	0.034 (0.057)	0.084 (0.068)	0.084 (0.068)	-0.104 (0.125)	-0.129 (0.126)
Professor/Lecturer	-0.042 (0.070)	-0.047 (0.070)	-0.106 (0.083)	-0.106 (0.083)	-0.251 (0.160)	-0.263 (0.160)
Research assistant	0.116 (0.078)	0.150 (0.078)	-0.096 (0.109)	-0.094 (0.110)	-0.294 (0.171)	-0.223 (0.174)
Degree of employment in percent (0-100)	-0.003 (0.002)	-0.003 (0.002)	-0.002 (0.002)	-0.002 (0.002)	0.007 (0.004)	0.006 (0.004)
Temporary employment	0.040 (0.064)	0.041 (0.065)	0.271** (0.088)	0.271** (0.088)	0.090 (0.141)	0.086 (0.142)
Performance R&D in percent (0-100)	0.002 (0.001)	0.001 (0.001)	0.001 (0.002)	0.001 (0.001)	-0.002 (0.003)	-0.002 (0.003)
Entrepreneur	0.096 (0.064)	0.123 (0.065)	-0.148 (0.078)	-0.150 (0.077)	0.592*** (0.144)	0.534*** (0.146)
Constant	2.683*** (0.206)	2.808*** (0.210)	3.248*** (0.261)	3.256*** (0.263)	0.581 (0.416)	-0.321 (0.420)
Observations	1,551	1,551	1,551	1,551	1,551	1,551
R ²	0.063	0.072	0.045	0.046		
Adjusted R ²	0.058	0.066	0.040	0.040		
ΔR^2		0.008		0.000		

Table II Linear (M1-M4) and logistic regression (M5-M6) model coefficients (standard errors in parentheses).
Note. * p<0.05**, p<0.01, *** p<0.001

Next we conducted additional logistic regression models (M5 and M6) to investigate the extent that the belonging to a gender category influenced whether formal conditions were evaluated by the participants or considered "Unknown". The dependent variables, known formal condition, were formed from the mean of the aggregated items, by using passive imputation as described above (with dichotomous expression; 0=unknown, 1=known).

The model (M5), showed a significant positive effect of discipline ($b_{STEM}=0.521, p < 0.001$) and entrepreneurial experience ($b_{Entrepreneur}=0.502, p < 0.001$) on the dependent variable known formal conditions. While controlling for discipline, age, occupational status, nationality, and performance in R&D, M6 revealed a significant negative effect of female researcher ($b_{Female}=-0.440, p < 0.001$) on formal conditions. Therefore, the formal conditions are more often considered to be “Unknown” to female researchers than to their male colleagues, which supports the hypotheses H3.

Discussion

This study is an initial evaluation into the impact of framework conditions on academic entrepreneurship at UAS in Switzerland starting from a gender-perspective. In particular, the analysis intended to identify gender-differences in formal and informal framework conditions to the disadvantage of spin-off activities of female researchers. Building on the institutional theory of North (1990) in the context of academic entrepreneurship, our study examined framework conditions of UASs using a unique sample of Swiss scientists. Therefore, the perceptions of organizational conditions for entrepreneurial activities were analyzed by surveying the seven public Swiss UASs ($n=1,551$). This study is an initial evaluation into the impact of framework conditions on academic entrepreneurship at UAS in Switzerland starting from a gender-perspective. In particular, the analysis intended to identify gender-differences in formal and informal framework conditions to the disadvantage of spin-off activities of female researchers. Building on the institutional theory of North (1990) in the context of academic entrepreneurship, our study examined framework conditions of UASs using a unique sample of Swiss scientists. Therefore, the perceptions of organizational conditions for entrepreneurial activities were analyzed by surveying the seven public Swiss UASs ($n=1,551$). Briefly, the results of our empirical analyses highlight informal and formal conditions for spin-off activities in the context of UAS still exist but only to a limited extent. Regression analysis reveals gender to negatively predict informal conditions beyond various control variables. In contrast, when testing our second hypothesis, we did not find gender to predict awareness of formal framework conditions.

However, our results also demonstrate that female researchers were less informed about formal framework conditions and concrete entrepreneurial support measures. Our descriptive analysis also highlights that among the UAS only limited concrete support for spin-off activities for researchers exist, and that these support measures are largely unknown to our participants. The result was similar for informal conditions, which referred to the existence of role models, entrepreneurial career options, and spin-off promotion by superiors. In our sample, the informal conditions that promote entrepreneurial activity in UAS were rated by the respondents as low.

Female researchers remain less active in entrepreneurship than their male counterparts at Swiss UAS today. This is also reflected in our sample, where only 59 female founders out of a total of 320 founders at UAS can be found. Our data highlight that formal and informal conditions for entrepreneurial activities were assessed as unfavorable. Despite the wide range of measures to support technical and social innovation in

Switzerland (Dasilva and Gabrielsson, 2019) and growing initiatives to raise awareness of social and cultural entrepreneurship (see Bornstein et al., 2014), formal support services for employees at UAS seem barely visible for academics. While recent studies indicate a strong interest in entrepreneurship among researchers at UAS (Morandi et al., 2019a), our results shed light on the unfavorable “informal” situation and concrete support for entrepreneurial activities.

Our data indicate gender-specific differences in the assessment of organizational conditions at UAS and partly confirm our hypotheses. Although no gender difference in the perception of formal conditions was identified, our analyses revealed that female researchers rate informal conditions for entrepreneurial activity as less accessible compared to their male counterparts. The descriptive results on the perception of informal relationships demonstrates that women receive less support from superiors and colleagues regarding spin-off projects and that they generally consider spin-off projects less regularly as a possible career option. Against the background of recent research indicating the important role of informal conditions for academic entrepreneurship (Huyghe and Knockaert, 2015; Bercovitz and Feldman, 2008), our results reveal strong institutional barriers to female spin-off activities. Therefore, our findings indicate that the concept of entrepreneurship remains strongly gendered (Gupta et al., 2018), making it not only problematic for women accessing support from colleagues and supervisors but also preventing the development of entrepreneurial career intentions of female scientists due to the lack of early sensitization and entrepreneurial role models in the work environment. This is supported by past research highlighting the motivating role of same-gender role models for women in entrepreneurship (Bechthold and Rosendahl Huber, 2018)

The results provide growing evidence of gender differences in the perception of organizational conditions in specific disciplines (STEM vs. HSS). Despite numerous support offers for start-up activities of students at Swiss UAS (Morandi et al., 2019b) and the first targeted support offers for (prospective) female founders (Liebig and Schneider, 2019), female scientists seem unaware of those opportunities in all areas central to entrepreneurial activities - training, financing, mentoring, and coaching. Reasons for the invisibility of start-up promotion among women may be the hitherto unrecognized potential of female entrepreneurship in start-up and gender equality promotion at Swiss universities of applied sciences (Liebig & Schneider, 2019). Since joint efforts to link start-up promotion with the universities gender equality agenda still lack, (potential) female entrepreneurs keep falling through the cracks.

Contrary to past research (Huysentruyt, 2014), the findings illustrate that even in disciplines that lack an affinity for spin-off activities and support a high proportion of women, it appears that entrepreneurship is more likely to be expressed by men. Consequently, the under-representation of female academic founders cannot be exclusively attributed to their under-representation within fields, and cannot be explained by varying levels of entrepreneurship in universities (Rosa and Dawson, 2006). Our study supports the findings of Abreu and Grinevich (2017) that shows the gender gap in academic entrepreneurship exists across the entire spectrum of academic disciplines. This is explained by the lower number of women in higher education and the lack of entrepreneurial experience among women. However, there appears a lack of organizational support for scientists to leverage R&D results, which previous research has shown to be fundamental to spin-

off projects (e.g., Kirby et al., 2011; Miranda et al., 2017a; Feola et al., 2019). Universities play a central role regarding the observed differences in high entrepreneurial intentions and low spin-off activities among scientists at UAS (Morandi et al., 2019a). This, in turn, can perpetuate and transform gender inequalities in entrepreneurship. From a gender perspective, practitioners and university managers should develop ways to promote entrepreneurial activities and ensure that they are readily accessible to women.

Female entrepreneurship in the context of academia could be promoted, for example by supporting collaborations between TTOs and gender equality officers to realize specific measures addressing female scientists. Moreover, research institutions should aim to achieve a more inclusive entrepreneurial setting in the local work environments and institute cultures. Moving forward, additional research that evaluates structural causes of barriers and drivers of female academic entrepreneurship is needed. Such knowledge will help inform further recommendations for policymaker to overcome the gender-gap in entrepreneurship support.

The results of this study should be considered in light of the following limitations. First, the results of this study are only applicable to the UAS context. We recommend that future studies should also compare universities with UAS from an international perspective. Research exploring the gender gap in academic entrepreneurship should consider additional disciplines not examined here, which will allow for comparisons to fields outside of STEM. To investigate gender-specific differences in the context of spin-off formation, future studies should also be based on different university contexts that include disciplines characterized by non-entrepreneurial traditions (e.g., humanities), and incorporate additional explanatory variables of entrepreneurship, such as risk propensity. Second, self-selection bias is a common limitation of this type of study. Academics who already have an interest in the topic of the study are more likely to be persuaded to participate in such a survey. Fourth, we have accounted for nonresponse and used multiple imputation to account for missing variable information. These methods rely on the assumption that the data are missing at random (i.e., recoverable by observed variables), which is an untestable assumption. Third, the study was exploratory and cross-sectional, which makes it difficult to establish causal relationships between the variables and gender. It would be valuable to analyze the influence that control variables such as age, entrepreneurial experience, and job category may have on the proposed model.

The present results illustrate the contextual nature of gender-specific perceptions at universities, which can be differentially expressed across universities. Our results promote a more comprehensive understanding of the departmental and gender-specific perception of entrepreneurial frameworks and provide new insight into their contextual dependency. Taken together, additional research is needed to uncover the barriers and drivers of female academic entrepreneurship.

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SHOULD I STAY, OR SHOULD I GO?

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Should I Stay, or Should I Go?

Job Satisfaction as a Moderating Factor between Outcome Expectations and Entrepreneurial
Intention among Academics

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SHOULD I STAY, OR SHOULD I GO?

Abstract: Both psychological and entrepreneurship research emphasize the pivotal role of job satisfaction in the process of entrepreneurial career decisions. In fact, a co-relationship between entrepreneurial intention, job satisfaction, and organizational commitment was demonstrated recently. Prior research operationalized entrepreneurial careers as an escape from poor work environments; thus, there is a lack of understanding regarding how job-satisfaction and outcome expectations can motivate and trigger academic entrepreneurship within and related to the environment of universities (e.g., spin-off activities). In this study, drawing on Social Cognitive Career Theory delineated by Lent and colleagues and the concept of entrepreneurial intention, we addressed the role of job satisfaction as a moderating factor between outcome expectations and entrepreneurial intention. Furthermore, we examined to what extent (a) entrepreneurial intention and (b) spin-off intention are determined by certain outcome expectations and perceived behavioral control. This paper purports to study academic researchers in specialized and non-technical fields and builds on a survey of 593 academic researchers at Swiss Universities of Applied Science (UAS). Supporting our hypothesis, we showed that outcome expectations are a significant predictor for entrepreneurial intentions, in general, and spin-off intentions, in particular. Finally, a multi-group analysis corroborated that job dissatisfaction partly operates as a motivational factor in entrepreneurial transition and interactions with entrepreneurial outcome expectations. In conclusion, the concept of job satisfaction and the theoretical approach of Social Cognitive Career Theory seems to be relevant to study and to encourage academic entrepreneurship as career decisions of the academic researchers.

Keywords: university spin-offs, entrepreneurial intention, academic entrepreneurship, perceived utility, job satisfaction, social cognitive career theory

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Introduction

Academic entrepreneurship is widely recognized for its contribution to economic, regional, and innovation development (Audretsch 2014; Block et al. 2017; Fini et al. 2018; Guerrero et al. 2015; Shane 2004; Stuetzer et al. 2018). As a specific form of entrepreneurship¹, academic entrepreneurship refers to the “commercial application of academic research” (Abreu and Grinevich 2017, p. 764). According to the right of universities to claim the ownership of intellectual property stemming from research (e.g., caused by the US Bayh-Dole Act of 1980), the notion of the ‘entrepreneurial university’ emerged in the late 1990s (Etzkowitz and Leydesdorff 1998). The entrepreneurial university is comprised of services and tasks that go beyond research, teaching, and redefines the organizational outlook of departments as well as the interaction between research, education and innovation.

Spin-off activities are recognized as a central element of the so-called ‘third mission’ of universities (Etzkowitz 2003). Universities seek to develop policies and instruments that encourage entrepreneurial careers of their academic researchers and support spin-offs to commercialize research as a specific form of academic entrepreneurship. Within the entrepreneurial literature, there is ample evidence that universities are key actors in shaping and influencing favorable entrepreneurial ecosystems, for example by creating an entrepreneurial culture, inaugurating technology transfer offices and providing infrastructure and incentives for entrepreneurial activities (Etzkowitz 2003, 2014, 2017; Huyghe and Knockaert 2015; Kirby et al. 2011; Meek and Wood 2016; Miller et al. 2018). Although the literature on academic entrepreneurship has focused primarily on exogenous factors such as socio-organizational conditions affecting entrepreneurial decision-making (Feola et al. 2017; Huyghe and Knockaert 2015; Kirby et al. 2011; Miranda et al. 2017), empirical research identifying endogenous, motivational factors such as job-satisfaction for entrepreneurial careers of academics are remain limited.

Academic researchers traditionally select among the following career options: (a) remaining in research positions, (b) moving to industry or services, or (c) become a full or part-time entrepreneur (Murray 2004). Crucial to the entrepreneurial process is the deliberate initiation of entrepreneurial activities that lead to, in the case of academic entrepreneurship, the creation of spin-off companies. It is generally acknowledged that entrepreneurship represents an intended career decision based on motivational factors such as desirable outcome expectations and perceived behavioral control - the individual’s perception of whether an entrepreneurial action would be feasible (Douglas and Shepherd

¹ The Global Entrepreneurship Monitor defines entrepreneurship as “*any attempt at new business or new venture creation, such as self-employment, a new business organization, or the expansion of an existing business, by an individual, a team of individuals, or an established business*” (Bosma et al. 2012, p. 9)

SHOULD I STAY, OR SHOULD I GO?

2002; Tran and Korfflesch 2016; Shane 2004). By using outcome expectations and an agent perspective, Social Cognitive Career Theory (SCCT) (Lent et al. 2002, 1994) is a valuable construct previously used in research to shed light on the contributors of entrepreneurial motivation (Kassean et al. 2015; Liguori et al. 2018; Segal et al. 2002; Tran and Korfflesch 2016).

The concept of entrepreneurial intention is widely used to investigate the earlier stages of academic entrepreneurship (Goethner et al. 2012; Hossinger et al. 2020; Miranda et al. 2018; Obschonka et al. 2015). Entrepreneurial decision-making is understood as a form of career choice, made in a unique organizational context, based on individual, socio-cognitive, and environmental characteristics (D'este and Perkmann 2011; Lam and Campos 2015; Lam 2015; Rizzo 2015). Limited studies have explored the motivating factors driving academics to engage in entrepreneurship (e.g., Abreu and Grinevich 2013; Guerrero and Urbano 2014). What research has been conducted suggests a strong interconnection between propensity to participate in entrepreneurship activities and job satisfaction – the expression of the fit between job expectations and current employment conditions, organizational commitment and entrepreneurial decision-making (Singh and Onahrng 2019).

Previous research demonstrates that through a low level of commitment, entrepreneurial behavior becomes more attractive if employment conditions are perceived as dissatisfying (Guerra and Patuelli 2016; van Dick et al. 2004; Werner et al. 2014). As a so-called push-factor, job-dissatisfaction accelerates the transmission from wage employment to self-employment. For example, Guerra and Patuelli (2016) reported that pecuniary and nonpecuniary job satisfaction significantly affects transition to self-employment and job changes in Switzerland. This study also showed that the transition probability was positively affected by the level of education, suggesting a higher likelihood of well-educated individuals leaving unsatisfying employment.

Academic spin-offs, which are linked to the commercial knowledge transfer of universities, are usually considered from a scientist's perspective as the continuation of their academic career, rather than a career exit (Shane 2004; Lam 2015). Therefore, in contrast to the research discussed above, evidence also exists that high job satisfaction has a positive effect on taking ownership of the translation of the organization's values and goals (Neessen et al. 2019, Tang et. al. 2019). In the context of the entrepreneurial university, spin-off activities are emphasized as organizational goals - and thus are hypothesized to be an expression of the individual's organizational commitment. Despite this, entrepreneurship literature is still limited with respect to systematic research investigating the interaction between job satisfaction and entrepreneurial career goals in terms of spin-off activities among academic researchers. Since entrepreneurship in terms of knowledge transfer embodies unique outcome expectations (e.g., personal and financial gain or career enrichment), which contrasts with extramural

SHOULD I STAY, OR SHOULD I GO?

forms of entrepreneurship (Lam 2015; Hossinger et al. 2020; Shane 2004), additional research is warranted to evaluate whether job satisfaction acts as a moderator of entrepreneurial intention, spin-off intention, or both.

By focusing on spin-off outcomes, academic entrepreneurship research thus far has largely overlooked the fact that there are various forms of entrepreneurial activities among academics, and not all are necessarily geared towards knowledge transfer. This issue is also reflected in existing research with some studies evaluating academic entrepreneurship in the form of spin-off intention to commercialize research (Brettel et al. 2013; Goethner et al. 2009, 2012; Huyghe and Knockaert 2015; Obschonka et al. 2012; Obschonka et al. 2015). Other studies have taken a broader perspective and simply examined entrepreneurial intention (Foo et al. 2016; Moog et al. 2015), or framed it as a way to move from wage employment to self-employment outside the organization. Taken together, we argue that the multitude ways that entrepreneurship has been operationalizing among academics makes it difficult to compare study results and generate generalizations in the field.

There is little research examining the role of socio-environmental conditions, such as job satisfaction and job dissatisfaction, as a motivational driver of different forms of entrepreneurial modes among academics (Singh and Onahrng 2019). In this study, we seek to address this knowledge gap by evaluating the relationship between job satisfaction and entrepreneurial intention as well as between job satisfaction and spin-off intention. Specifically, we investigate whether spin-off activities are more attractive to academics when job satisfaction is high, or if low job satisfaction drives rates of pursuing entrepreneurship in terms of an academic career exit strategy. Building on Social Cognitive Career Theory, which is a valuable framework for assessing the influence of organizational variables on (entrepreneurial) career decisions (Kassean et al. 2015; Liguori et al. 2018; Segal et al. 2002; Tran and Korflesch 2016), this study sheds empirical light on entrepreneurial career-path of academics by combining the above research questions. The motivational mechanisms behind entrepreneurial decisions were investigated according to a survey of Swiss academics from various disciplines at the Swiss Universities of Applied Science (UAS). With a sample of 593 participants, we test the proposed research questions using structural equation modeling.

This study contributes original data to the emerging research on academic entrepreneurship. First, it addresses the motivational role of job (dis-)satisfaction in the entrepreneurial process for academics. Second, it highlights the role of outcome expectations and perceived behavioral control in modulating the entrepreneurial career decisions of academics, thus offering more in-depth insight into the interplay between job satisfaction and the scientists' outcome expectations and commitment to entrepreneurship. Third, it develops an empirical application of SCCT in academic entrepreneurship research by

SHOULD I STAY, OR SHOULD I GO?

demonstrating empirical differences between academic entrepreneurship and entrepreneurial academics in terms of outcome expectations. Overall, this study contributes to a greater understanding the dynamics driving academics to participate in entrepreneurial activities.

Theoretical framework

Motivational drivers of entrepreneurship in academia

Entrepreneurial motivations are considered to be the initial inspiration for an individual to launch a new business (Shane et al. 2003). Prior research explicitly addressed motivational factors for spin-off activities (Antonioli et al. 2016; Guerrero and Urbano 2014; Lam 2015; Houweling and Wolff 2019; Morales-Gualdrón et al. 2009; Shane et al. 2003) and posit that socio-organizational factors have a significant influence on the motivation of academics to become entrepreneurial (Feola et al. 2017; Miranda et al. 2017; Morales-Gualdrón et al. 2009). For example, in their empirical study of Spanish academic entrepreneurs, Morales-Gualdrón et al. (2009), identified the following factors to be major drivers of entrepreneurial motivation: personal, entrepreneurial potential (i.e., entrepreneurial opportunity), scientific knowledge, and availability of resources, incubator organization and social environment (i.e., social norms and attitudes). In an in-depth interview-based study, Guerrero and Urbano (2014) used nascent academic entrepreneurs to analyze individual motivations. Their findings showed that academic entrepreneurs define various outcomes, including technology diffusion, technology development, financial gain, public service, and peer motivation.

Lam (2015) offers a conceptual framework for the motivation of researchers to participate in spin-off activities, which included of three types of motivation: ‘Gold’ (as for financial rewards); ‘Ribbon’ (as a reward for reputation/career); and ‘Puzzle’ (as intrinsic satisfaction). Lam (2015) also stresses that the majority of academic entrepreneurs participating in spin-off creations are motivated by intrinsic and reputation-related factors rather than pecuniary expectations. The synthesis of the literature mentioned above would suggest that the outcome expectations associated with spin-off activities are mainly related to improving current employment opportunities in academia.

Individual personality traits such as self-efficacy (Chang and Edwards 2015; Huyghe and Knockaert 2015; Zhao et al. 2005), attitudes (Goethner et al. 2012; Miranda et al. 2017), entrepreneurial passion (Obschonka et al. 2015) and job dissatisfaction have been repeatedly identified in the literature as key drivers of entrepreneurship (Brockhaus 1982; Chang and Edwards 2015; Guerra and Patuelli 2016; Jeong and Choi 2017; Singh and Onahring 2019). In their review, Singh and Onahring, p. 2 (2019) defined job satisfaction as “the difference between the quantum of rewards received by employees and the amount they believe they should receive”. Based on previous research, the authors postulated a

SHOULD I STAY, OR SHOULD I GO?

research model that assumed a positive relationship between job satisfaction, organizational commitment and entrepreneurial intention. Although job dissatisfaction can act as a push factor for entrepreneurial intentions (Brockhaus 1982; Guerra and Patuelli 2016), job satisfaction can alternatively strengthen individual's proactivity, intrapreneurship (Neessen et al. 2019) and organizational commitment (Tang et al. 2019), such as the implementation of an entrepreneurial mission.

The Social Cognitive Career Theory (SCCT)

When studying entrepreneurial career decisions, scholars have widely acknowledged entrepreneurial intention to be the first step in a long entrepreneurial process and to be the 'best' predictor of entrepreneurial behavior (Bird 1988; Krueger et al. 2000). Entrepreneurial intention reflects a mental process that accompanies the planning and implementation of entrepreneurial actions (Boy and Vozikis 1994; Tran and Korflesch 2016). To date, researchers have applied several theoretical models to study the formation of entrepreneurship intention. These include the Model of Entrepreneurial Events (SEE) (Shapiro and Sokol 1982), the Theory of Planned Behavior (TPB) (Ajzen 1991, 2011; Tornikoski and Maalaoui 2019), the Social Cognitive Career Theory (SCCT) that analyzes career choices (Lent et al. 1994, 2002). SCCT considers environmental (see Liguori et al. 2018; Tran and Korflesch 2016) and motivational influences, such as outcome expectations and feasibility beliefs in form of self-efficacy to predict career decisions. In comparison to other theoretical approaches, the SCCT is considered to have a number of advantages. For example, SCCT defines precise intention predictors that are not as abstract as represented by other intentional models (e.g., perceived desirability in SEE versus outcome expectations in SCCT) (Tran and Korflesch 2016). SCCT postulates that career goals are determined by the assessment of cognitive-individual factors (e.g., self-efficacy, 'I will be able to do this') and associated outcome expectations ('If I do this, then what will be the outcome?') (Lent et al. 1994, p. 83). By evaluating past behavior, individuals gain an understanding of social environmental factors, their cognitive capabilities (e.g., domain-specific self-efficacy) to shape future career goals. Scholar frequently employed SCCT as a theoretical framework to help explain career choices (Lent et al. 2008) based on individual cognitive factors (Lent et al., 2002) originating from Bandura's general socio-cognitive theory (1986). SCCT has been empirically applied in a variety of contexts (Chang and Edwards 2015; Lent et al. 2002; Lent et al. 2008; Rogers and Creed 2011), leading Liguori et al. (2018) to recommend it as a valid theoretical framework for investigating entrepreneurial career goals.

Development of hypotheses

In line with SCCT, the present contribution focuses on entrepreneurial and spin-off intention as a career choice, by assuming outcome expectations and self-efficacy beliefs to influence entrepreneurial decision making. Both self-efficacy and perceived behavioral control refers to the individual's perception of whether or not an action would be difficult to perform (Ajzen 2002). In their literature review, Tran and Korflesch (2016) argue that the construct of self-efficacy in SCCT was conceptually similar to the constructs of perceived behavioral control in TPB (Ajzen 1991) and perceived feasibility in SEE, "as they are all about perception of capability to start a social venture" (Tran and Korflesch 2016, p. 23). According to Bandura, self-efficacy refers to the individual's "judgment of their capabilities to organize and execute courses of actions required to attain designated types of performance" (Bandura 1986, p. 391) and thus to one's own perceived abilities. In the framework of SCCT, self-efficacy beliefs are posited to predict career goals, and influences outcome expectations, as people expect outcomes that are more desirable in activities where they consider themselves effective (Bandura 1986). Ajzen (2002) considered Bandura's (1986) concept of self-efficacy (dealing with ease or difficulties in task performance) as part of a superordinate construct of perceived behavioral control. In the field of academic entrepreneurship, studies show that both perceived behavioral control and self-efficacy are strong predictors of entrepreneurial intentions (Boy and Vozikis 1994; Goethner et al. 2012; Guerrero et al. 2008; Huyghe and Knockaert 2015; Obschonka et al. 2015; Obschonka et al. 2012).

Informed by prior research, we believe that perceived behavioral control will be positively associated with entrepreneurial intention. The following hypotheses are made according to SCCT and the larger body of literature:

- (H1a) Among academics, perceived behavioral control is positively related to entrepreneurial intention.
- (H1b) Among academics, perceived behavioral control is positively related to spin-off intention.

Outcome expectations are personal beliefs about possible and imaginary consequences of specific behaviors, which are considered to be fulfilled as a result of a specific action (Lent et al. 1994). SCCT, therefore, assumes that individuals are more willing to act if they believe that the associated outcome expectations are more achievable (Liguori et al. 2018). Based on SCCT and the expectation theory of Vroom (1964), outcome expectations are a key factor to predict career goals. Expectation theory states that individuals are motivated to participate in an activity if they believe that the goal is worth the effort and that there is a way to realize the goal. In terms of entrepreneurship, outcome expectations result from a global assessment of expected efforts and the resulting benefits (Douglas and Shepherd 2000). According to literature, one will favour an entrepreneurial career if the expected profits from

SHOULD I STAY, OR SHOULD I GO?

entrepreneurship are higher than the sum of the expected future benefits from employment (Goethner et al. 2012, p. 630). As outlined above, the literature considers various motivations that may encourage academics to become entrepreneurial (Morales-Gualdrón et al. 2009; Lam 2015; Guerrero and Urbano 2014). In their review of literature, Hossinger et al. (2020) suggested that academics choose entrepreneurial activities in order to pursue an intrinsic source of rewards, such as independence, sense of achievement, inner satisfaction and self-realization or external rewards, and academic benefits from the creation of spin-off companies. Academics may consider spin-off activities as an opportunity to obtain academic reputation (Lam 2015) or to gather resources, such as access to financial funding or new infrastructure to support research (Hossinger et al. 2020).

We expect that outcome expectations, in terms of pecuniary gains, satisfaction, autonomy, and quality of life, are predictors of both entrepreneurial intentions and spin-off activities. Previous research on entrepreneurship has shown that certain expectations (e.g., pecuniary and non-pecuniary satisfaction) predicted entrepreneurial decisions (Guerrero and Urbano 2014; Miranda et al. 2017). For example, expected reputation and financial gains indirectly influenced spin-off intentions of academic researcher (Goethner et al. 2012; Miranda et al. 2017; Lam 2015). Thus, we pose the following hypotheses:

(H2a) Among academics, outcome expectations positively influence entrepreneurial intention.

(H2b) Among academics, outcome expectations positively influence spin-off intention.

Job satisfaction as a two-way moderator

In 2019, Singh and Onahring (2019) reviewed various theoretical frameworks depicted the interrelationships between job satisfaction, organizational commitment, and entrepreneurial intention. For example, Vroom (1964) defined job satisfaction as an affective orientation of the individual towards his current employment conditions. Based on Singh and Onahring's (2019) assumption, job satisfaction is an indicator and measure of the fulfillment of work-related expectations and personal needs. The literature notes that job satisfaction could be affected by various organizational conditions, such as perceived autonomy, job content, job flexibility, social benefits, career prospects, and interpersonal relationships (Agho et al. 1993; Shvets 2018). Although employees who are satisfied with the conditions tend to be more committed towards their organizational norms (Tang et al. 2019), research has demonstrated that job dissatisfaction positively affects career decisions that include increased entrepreneurial activities (Chang and Edwards 2015; Guerra and Patuelli 2016; van Dick et al. 2004; Werner et al. 2014). It has been argued that, under certain circumstances, the transition to entrepreneurship is a kind of exit strategy from current employment (Brockhaus 1982). For example, those employees who are dissatisfied with their employment conditions would expect improvements

SHOULD I STAY, OR SHOULD I GO?

from a change to self-employment, accompanied by greater economic benefits than those remaining in their current employment (Guerra and Patuelli 2016). In general, job satisfaction is an indicator and a driver for the evolution of new outcome expectations and career goals, as it creates a subjective framework for both interpretation and behavior.

SCCT states that career goals are affected by personal, environmental, and situational factors (Tran and Korfflesch 2016), including both objective and subjective environmental conditions such as job satisfaction. Subjective environmental conditions influence the individuals' interpretation regarding opportunities, resources, barriers, and pecuniary benefits (Lent et al. 1994). According to prior research, satisfied employees display higher levels of organizational commitment, higher productivity, and more punctual as well as efficient behavior (Lumley et al. 2011; Tang et al. 2019). A higher level of organizational commitment is related to the desire to pursue a career within the organization (Feinstein and Vondrasek 2001; Meyer et al. 2002). We argue that entrepreneurial academics with a high level of job satisfaction show a greater propensity to commercialize their research by developing spin-offs that align with the aims of Entrepreneurial Universities (Etzkowitz 2017). Based on a psychological contract (Rousseau 1995), employees try to implement the organization's goals in a meaningful way and align their behavior accordingly. For example, Huyghe and Knockaert (2015) demonstrated that the entrepreneurial mission of the university has a positive effect on spin-off intentions. Obschonka et al. (2012) showed that academics who feel attached to their university are more likely to follow institutional norms in terms of entrepreneurial goals. As entrepreneurial universities create a specific environment to encourage spin-off activities and practices that promote the commercialization of R&D (Etzkowitz 2017; Kirby et al. 2011), entrepreneurial academics will feel committed to them in order to gain reputation within their organization (Lam and Campos 2015). Thus, researchers with high job satisfaction will automatically weigh their entrepreneurial outcome expectations more positively than academics with low job satisfaction to pursue an entrepreneurial career within and promoted by the ecosystem of entrepreneurial universities. This study assumes in particular that a high level of job satisfaction has a moderating effect on the relationship between outcome expectations and spin-off intention of academics. Accordingly, the following hypothesis can be developed:

(H3a): Among academics, job satisfaction has a moderating effect on the relationship between outcome expectations and spin-off intention, such that when job satisfaction is high the relationship is stronger and when job satisfaction is low the relationship is lower.

SHOULD I STAY, OR SHOULD I GO?

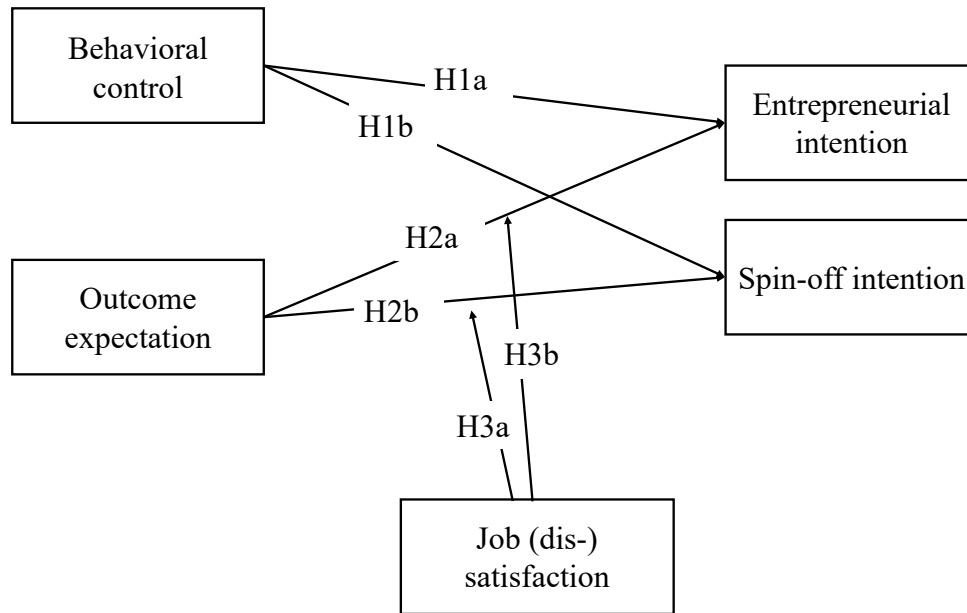


Figure 1 Conceptual research model. Hypothesized predictors of an entrepreneurial intention and spin-off intention and hypothesized moderating effects of entrepreneurial job (dis-)satisfaction on intentions within the SCCT- framework

In contrast to the effects of job satisfaction (see Figure 1), scholars widely acknowledged that high job dissatisfaction – i.e., the experience of frustration over unfulfilled expectations, increases the rate of individuals leaving their job (van Dick et al. 2004; Werner et al. 2014; Werner and Moog 2007) and decreases their degree of organizational commitment (Singh and Onahring 2019). The study of job dissatisfaction is now core to entrepreneurship research, as the creation of businesses such as start-ups is perceived as a way to escape poor working conditions and thus as an alternative to the current employment (Brockhaus 1982; Lee et al. 2011; Singh and Onahring 2019). As associated with the construct of outcome expectations, individuals compare costs and benefits when choosing (an entrepreneurial) goals (Lent et al. 2002). Therefore, job dissatisfaction as an indicator that describes the individual's perception of the perceived disadvantages of remaining in the current job, is triggered by a low level of autonomy, financial resources or pay, lack of career options, poor opportunities for advancement within the organization, and excessive workload. Morales-Gualdron et al. (2009) noted that there are numerous motivators at the organizational level for academic researchers to leave their university positions to start a new business; these factors include dissatisfaction regarding current workloads, high bureaucracy, and low-risk orientation of the parent organization. Guerrero and Urbano (2014) observed that ‘motivating peers’ either came from outside the university or were perceived as rebels within the university, suggesting that universities have either so far not sufficiently supported

SHOULD I STAY, OR SHOULD I GO?

academic entrepreneurship or that these individuals do not feel committed to their organizations and thus encouraged to commercialize their research.

Given empirical evidence for a positive relationship between dissatisfaction with current employment and individuals' intention to pursue an entrepreneurial career (Werner et al. 2014; Guerra and Patuelli 2016), we argue that job dissatisfaction moderates the relationship between outcome expectations and entrepreneurial intention. Accordingly, we expect that entrepreneurial academics who are encouraged by the desire to leave university due to job dissatisfaction will pursue entrepreneurial activities that are unrelated to their current employment. In particular, career opportunities for young scientists at universities are limited, as there are few places in top academic positions and university employments are often limited in time. Thus, the following hypothesis can be formulated based on earlier findings:

(H3b): Among academics, job dissatisfaction has a moderating effect on the relationship between outcome expectations and entrepreneurial intention, such that when job dissatisfaction is high the relationship is stronger and when job dissatisfaction is low the relationship is weaker.

Research methodology

Data collection and sample

This contribution is based on cross-sectional data collected in a nationwide, online survey of academics at the seven public Swiss Universities of Applied Sciences. Since 1995, the UAS expanded its activities in research and development supported by the legal performance contract (Bundesgesetz über die Fachhochschulen 1995). Intensive cooperation with non-institutional players in the context of practice- or business-oriented education and practice-oriented research remains central to the mission of UAS. In recent years, thus, the promotion of science-based start-ups has become an integral part of the service spectrum of universities in Switzerland. Accordingly, many universities and UASs have introduced measures to promote the commercialization of research. The pecuniary benefits of spin-offs, license rewards, and contract research have become an important source of income for Swiss universities. In addition, a large proportion of members of UASs have completed their academic education (doctorate, habilitation) at universities; we thus assume that our results are transferable to other research institutions and universities.

In Questback, an online survey tool (Unipark 2013), participants could select from three languages (German, English, and French). Before conducting our study, we tested and optimized the questionnaire and procedures on an independent sample of academics from a large Swiss university. In January 2019, more than 8,900 academics from various disciplines were randomly invited via e-mail to participate in the survey. After eliminating incomplete responses, the final sample consists of 593 participants. All participants are still employed with the UAS in early 2019. The mean age of these respondents was 43.1 years (SD = 10.0, range: 25–69), 63.7 % (n=378) of these participants were male. Fifty percent (n= 289) of the participants belonged to STEM disciplines, including mathematics, computer science, natural science, and technology, while the others belonged to the social sciences and business administration. Academics who stated that they gained entrepreneurial experience were included as controls. An overview of the demographic characteristics of the sample is provided in *Table 1*. In January 2019, when the survey was conducted, all participants were working under contract at the university. The sample corresponds to the demographic distribution in terms of age, nationality, gender, and education of scientists at the Swiss UASs (Bundesamt für Statistik 2019).

SHOULD I STAY, OR SHOULD I GO?

		Frequency	Percentage
Gender	Male	378	63.7
	Female	215	36.3
Age	Mean (SD)	43.1 (10.0)	
	Median [Min, Max]	42.0 [25.0, 69.0]	
Discipline	Social Sciences	304	51.3
	Natural Sciences (STEM)	289	49.7
Academic status	Professor with leadership responsibility	180	30.4
	Professor without leadership responsibility	141	23.8
	Research assistant	272	45.9
Employment level	Mean (SD)	80.1 (22.9)	
Temp. work contract		222	37.4
Highest educational qualification	Master (UAS, university)	296	49.9
	Doctorate or post-doctoral degree	297	50.1

Table 1 Descriptive statistics of the sample ($n = 593$)

Measures

Dependent Variables

To test our hypothesis, this contribution relies on prior research in terms of capturing academics' (a) general entrepreneurial intention and (b) spin-off intention (Goethner et al. 2012; Huyghe and Knockaert 2015; Moog et al. 2015; Obschonka et al. 2012). Similar with previous entrepreneurial research studies, principal component analysis was used to investigate patterns by summarizing dominant gradients of variation in six response variables (described below). The first two principal components accounted for 80% of cumulative variance, showing a probable two factorial structure. Participants in the survey were offered a precise definition of spin-off activities in order to avoid possible confusion and inaccuracies in the measurement of spin-off intention. Spin-offs are based either on the intellectual property resulting from research or on skills and knowledge developed at a university. Intellectual property or skills are essential for the creation of the company (i.e., academic entrepreneurship).

Spin-off intention (SPIN). To measure SPIN, three items were used as a seven-point Likert scale (1 = "very unlikely" to 7 = "very likely"). It was asked e.g. "You will engage in the establishment of a company based upon an idea, on knowledge or specific competencies or technology developed at the university," based on Obschonka et al. (2015), with scale reliability measured by Cronbach's $\alpha = 0.85$.

SHOULD I STAY, OR SHOULD I GO?

Entrepreneurial intention (EI). Three items were used as a seven-point Likert scale (1 = “very unlikely” to 7 = “very likely”) to measure general EI, e.g., “You have the firm intention of becoming an entrepreneur one day,” based on Liñán and Chen (2009). Scale reliability, measured by Cronbach's $\alpha = 0.88$, was above the generally accepted criterion of 0.70, indicating high reliability (Cortina 1993).

Independent Variables

Job satisfaction. Four items were averaged and used as a seven-point Likert scale (1 = “Absolutely incorrect” to 7 = “Absolutely correct”) to estimate job satisfaction of the respondents. E.g., “Overall, I am very pleased with the types of activities that I do in my job,” “Overall, I am very satisfied with my salary,” and “Overall, I am very pleased with my career opportunities,” adapted from Wanous et al. (1997) and Gagné et al. (2015). Scale reliability was acceptable, measured by Cronbach's $\alpha = 0.77$.

Outcome expectations (OE). Based on Miranda et al. (2018), we employed four items to measure OE as a seven-point Likert scale (1 = “Absolutely disagree” to 7 = “Absolutely agree”): (1) *Autonomy*: “Being an entrepreneur would entail a very high degree of Autonomy,” (2) *Profit*: “The financial return that I would get by becoming an entrepreneur would be high,” (3) *Self-realization*: “The personal satisfaction from being an entrepreneur would be very high,” and (4) *Quality of life*: “The quality of life that I would get from being an entrepreneur would be very high.” The four items were averaged based on scale reliability measured by Cronbach's $\alpha = 0.82$.

Perceived behavioral control (PBC). Three items were used as a seven-point Likert scale to measure PBC. The three items were (1) “I can control the creation process of a new company,” (2) “I know how to develop an entrepreneurial project,” and (3) “I know the necessary practical details to start a company” with scale reliability of Cronbach's $\alpha = 0.89$ (Seven-point Likert scale; 1 = “Absolutely incorrect” to 7 = “Absolutely correct”)

Control variables

Multiple factors are recognized as influencing a scientist's EI, including the following. *Gender* [women = 0, men = 1] was controlled for, as men are usually more entrepreneurially active (Zhao et al. 2005; Miranda et al. 2017; Abreu and Grinevich 2017). Additionally, Goel et al. (2015) demonstrated a lower EI among female academics. *Nationality* [foreign = 0, Swiss citizen = 1] was controlled for, as individuals with foreign citizenship demonstrate higher entrepreneurial interests (Peroni et al. 2016). *Age* was controlled, as older academics may have gained more social capital (Goethner et al. 2012). Since there is a considerable body of research showing that social capital (in the sense of social networks) is associated with pecuniary resources and market knowledge, and thus a greater propensity to spin-off creation (Fernández-Pérez et al. 2014), *academic status* (professor [no = 0, yes = 1] (Huyghe and

SHOULD I STAY, OR SHOULD I GO?

Knockaert 2015; Goethner et al. 2012; Ucbasaran et al. 2008), *highest job qualification* (master's degree [no = 0, yes = 1], doctoral degree [no = 0, yes = 1] (Goethner et al. 2012; Huyghe and Knockaert 2015), postdoctoral qualification [no=0, yes=1]), and *discipline* (social science and humanities =0, STEM =1) were accounted for (Abreu and Grinevich 2014; Mosey and Wright 2007; Krabel and Mueller 2009). Additionally, the *level of employment* (in percent) and *temporary work contract* [no = 0, yes = 1] was controlled as a dummy variable, since limited work contract negatively predict job satisfaction (Waijjer et al. 2017). Following Huyghe and Knockaert (2015), we controlled for the *spin-off mission* of the universities, measured as a seven-point Likert-Scale. Bercovitz and Feldman (2008) emphasized that the individual behavior of academics is strongly affected by the social norms of the departments.

Data analysis

To test the hypotheses, the technique of structural equation modeling (SEM) using lavaan R package v. 0.6-5 (Rosseel 2012) in R (R Core Team 2013) was employed. This procedure uses fit indices to examine whether, and how well, the hypothesis-based model fits the data. Based on previous recommendations in social sciences (Kline 2005), this study focused on the overall fit indices (Chi-Square Statistics, Root mean square of approximation RMSEA) and the incremental fit indices (Tucker Lewis Index = TLI, Comparative Fit Index = CFI). A non-significant X^2 indicates a good fit, but using X^2 alone as a fit statistic is problematic because it is influenced by the sample size and the extent of the correlations in the model. Generally, a CFI and a TLI of greater value than 0.90 indicate a reasonably good fit. In terms of the RMSEA, values ≤ 0.05 indicate a close approximation, and values between 0.05 and 0.08 indicate a reasonable approximation error (Kline 2005).

Convergent, discriminant validity and common method variance

Before testing the hypotheses, confirmatory factor analysis was carried out to verify the distinctiveness of our measurements (discriminatory validity) and to estimate the effects of commonly measured variances. The criterion of Fornell and Larcker (1981) has commonly been used to assess the degree of shared variance between latent variables of the model, and it was used to test convergent validity. On the basis of a confirmatory factor analysis ($X^2[94.0] = 219.7$ $p < 0.001$, RMSEA= 0.05, CFI = 0.97, TLI = 0.97), convergent validity can be investigated by calculating the Average Variance Extracted (AVE) using a cut-off point of 0.50 (Hair et al. 2017). The inspection of the AVE values (*Table 2*) for all factors suggests an acceptable convergent validity (AVE > 0.50, is considered as acceptable, AVE > 0.70 as very good).

Discriminant validity was evaluated in two ways. First, it was evaluated by comparing the constructs' values of the squared root of the AVE ($\sqrt{\text{AVE}}$) with the correlation of the other constructs

SHOULD I STAY, OR SHOULD I GO?

(Fornell and Larcker 1981) (*see Table 2*). A value of $\sqrt{\text{AVE}}$ that is higher than the coefficient of the correlation between factors provides evidence of discriminant validity. As shown in *Table 2*, all factors met the criterion and demonstrated discriminant validity. Second, discriminant validity was evaluated by using a more recent technique, the heterotrait-monotrait ratio of the correlation (HTMT) (Henseler et al. 2015). HTMT is the average of the heterotrait-heteromethod correlation relative to the average of the monotrait-heteromethod correlation. If HTMT is below 0.90, a discriminatory validity between two reflective constructs can be assumed. Results show that the HTMT values between the respective constructs appeared to be below 0.90 (highest value of HTMT = 0.82 for the link between entrepreneurial and SPIN, lowest HTMT = 0.04 for perceived behavioral control and satisfaction). The results provide evidence for convergent and discriminant validity.

Variable	<i>M</i>	<i>SD</i>	(1)	(2)	(3)	(4)	(5)
(1) Ent. Intention (EI)	2.39	1.46	0.84				
(2) Spin. Intention (SPIN)	2.58	1.57	0.70**	0.90			
(3) Perceived behavioral control	3.34	1.41	0.43**	0.35**	0.83		
(4) Job-Satisfaction	4.72	1.15	-0.09*	-0.02	-0.02	0.74	
(5) Outcome Expectation	3.65	1.24	0.55**	0.43**	0.37**	-0.07	0.73

Table 2 *M* and *SD* are used to represent mean and standard deviation, respectively. The values shown in bold are the square root of AVE. * indicates $p < 0.05$. ** indicates $p < 0.01$.

Common method variance (CMV) arises if a method bias influences all measures equally (Podsakoff et al. 2012) and can occur when respondents systematically distort their responses to surveys, e.g., according to social desirability. To examine the potential of CMV, all study variables were loaded onto one factor to examine the fit of the CFA model. If the one-factor CFA model fits the data, the common method variance is considered largely responsible for the relationship among the variables (Mossholder et al., 1998). The one-factor CFA model did not represent the data very well ($\chi^2(119) = 2563.8, p < 0.001, CFI = 0.55, RMSEA = 0.19$), demonstrating that the study variables were not just different aspects of an underlying construct (CMV).

Results

Table 3 presents the zero-order correlations with Bonferroni Correction between all variables used to investigate the prediction model for explanation of EI and SPIN. In line with the theoretical expectations, EI and SPIN are correlated with perceived behavioral control ($r_{\text{Ent/PBC}} = 0.43, p < 0.001$ and

SHOULD I STAY, OR SHOULD I GO?

$r_{Spin/BC} = 0.35, p < 0.001$) (Table 3). EI and SPIN intention are positively correlated with outcome expectations ($r_{Ent/OE} = 0.55, p < 0.001$ and $r_{Spin/OE} = 0.43, p < 0.001$). No statistically significant correlation emerged between job satisfaction and the SPIN (H3a). Whereas, as expected in hypothesis (H3b), a negative correlation between the EI and satisfaction was observed ($r_{EI/Sat} = -0.9, p < 0.05$). A high correlation between SPIN and EI ($r_{Spin/EI} = 0.70, p < 0.001$) is apparent in the data.

Testing the Path Model

The hypothetical model (H1) and (H2) was tested with perceived behavioral control and outcome expectations as predictors of EI and SPIN (all constructs were measured as latent variables in the model), including the control variables. Due to missing data (less than 3%), the full information maximum likelihood (FIML) estimation was used (Enders and Bandalos 2001). The model fit was acceptable ($\chi^2 [168] = 407.7, p < 0.001$, RMSEA = 0.05, CFI = 0.95, TLI = 0.94), indicating that the measurement of the latent variables was sound.

The model explained 55% of the variance of EI and 44 % of the variance of SPIN. Perceived behavioral control had a significant effect of $\beta = 0.21 (p < 0.001)$ on EI and a significant effect of $\beta = 0.14 (p < 0.001)$ on SPIN, indicating support for (H1a) and (H1b). Also, corresponding with hypotheses (H2a) and (H2b), the results show that outcome expectations have a direct effect on both the EI ($\beta = 0.52, p < 0.001$) and SPIN ($\beta = 0.36, p < 0.001$). Among the control variables, gender, entrepreneurial experience, and university spin-off mission positively affected both entrepreneurial intention and spin-off intention. STEM-Discipline showed a positive effect on SPIN. The effects of the control variables on EI and SPIN are shown in *Table 4*.

SHOULD I STAY, OR SHOULD I GO?

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1) Ent. Intention	1															
(2) Spin. Intention	0.70**	1														
(3) Perceived behavioral control	0.43**	0.35**	1													
(4) Job-Satisfaction	-0.09*	-0.02	-0.02	1												
(5) Outcome Expectation	0.55**	0.43**	0.37**	-0.07	1											
(6) Uni. Spin-Mission	0.29**	0.38**	0.13**	0.08*	0.14**	1										
(7) STEM-Discipline	0.21**	0.28**	0.10*	-0.01	0.14**	0.25**	1									
(8) (Post-)Doctoral degree	-0.10*	-0.09*	-0.03	0.00	-0.07	-0.02	-0.08	1								
(9) Professor with leadership responsibility	-0.02	0.06	0.11**	0.09*	0.03	0.09*	0.03	0.08	1							
(10) Professor without leadership responsibility	-0.08	-0.09*	0.03	-0.05	-0.09*	-0.02	-0.16**	0.11**	-0.36**	1						
(11) Research assistant	0.09*	0.02	-0.13**	-0.05	0.04	-0.06	0.11*	-0.17**	-0.62**	-0.51**	1					
(12) Temp. work contract	0.15**	0.12**	-0.08	-0.04	0.07	0.07	0.05	-0.10*	-0.37**	-0.21**	0.52**	1				
(13) Employment level	0.02	0.10*	-0.04	0.02	0.01	0.05	0.26**	0.04	0.29**	-0.13**	-0.16**	-0.22**	1			
(14) Woman	-0.09*	-0.20**	-0.10*	-0.09*	-0.03	-0.11**	-0.26**	-0.05	-0.14**	-0.08	0.19**	0.10*	-0.25**	1		
(15) Age	-0.15**	-0.09*	0.13**	-0.04	-0.12**	-0.01	-0.11**	0.15**	0.41**	0.29**	-0.63**	-0.45**	0.06	-0.12**	1	
(16) Swiss citizens	-0.08	-0.07	0.02	0.01	-0.02	-0.04	-0.08*	-0.03	-0.02	0.01	0.01	-0.02	-0.10*	0.05	0.05	1
(17) Ent. experience	0.36**	0.33**	0.31**	-0.12**	0.20**	0.08	0.08*	-0.04	0.10*	0.02	-0.11**	0.04	-0.07	-0.08	0.09*	0.0

Table 3 Pearson correlation coefficients with pairwise-deletion and statistical significance based on Bonferroni Correction.

Note: * indicates $p < 0.05$. ** indicates $p < 0.01$.

SHOULD I STAY, OR SHOULD I GO?

		Research Model		Low Job-Satisfaction		High Job-Satisfaction		
		Overall (n=593)		(n _{Low} =332)		(n _{High} =261)		
Path		St. path coefficient	p	St. path coefficient	p	St. path coefficient	p	
Outcome Expectation	--->	EI	0.52	< 0.001	0.55	< 0.001	0.47	< 0.001
Perceived behavioral control	--->	EI	0.21	< 0.001	0.23	< 0.001	0.17	< 0.001
Job-Satisfaction	--->	EI	- 0.02	0.59				
Uni. Spin-Mission	--->	EI	0.20	< 0.001	0.16	< 0.001	0.28	< 0.001
Gender women	--->	EI	- 0.04	0.22	- 0.08	0.09	0.01	0.93
Age	--->	EI	- 0.09	0.05	- 0.09	0.14	- 0.09	0.18
Professor	--->	EI	0.04	0.29	0.06	0.24	0.03	0.61
Entrep. experience	--->	EI	0.23	< 0.001	0.27	< 0.001	0.20	< 0.001
Employment level	--->	EI	0.04	0.33	0.02	< 0.05	- 0.06	0.31
Nationality	--->	EI	- 0.03	0.33	0.02	0.68	0.09	0.08
Temp. work contract	--->	EI	0.08	0.05	0.08	0.16	0.11	0.09
(Post-)Doctoral degree	--->	EI	0.10	0.05	0.04	0.78	0.16	0.30
STEM-Discipline	--->	EI	0.40	0.28	0.07	0.17	0.03	0.60
<i>R</i> ²		EI	0.55		0.62		0.54	
Outcome expectation	--->	SPIN	0.36	< 0.001	0.37	< 0.001	0.36	< 0.001
Perceived behavioral control	--->	SPIN	0.14	< 0.001	0.14	< 0.01	0.12	0.08
Job-Satisfaction	--->	SPIN	- 0.05	0.24				
Uni. Spin-Mission	--->	SPIN	0.30	< 0.001	0.30	< 0.001	0.34	< 0.001
Gender women	--->	SPIN	- 0.10	< 0.05	- 0.15	< 0.05	- 0.05	0.39
Age	--->	SPIN	- 0.08	0.09	- 0.18	< 0.05	0.03	0.70
Professor	--->	SPIN	0.04	0.51	- 0.03	0.61	0.02	0.77
Entrep. experience	--->	SPIN	0.24	< 0.001	0.31	< 0.001	0.13	< 0.05
Employment level	--->	SPIN	0.04	0.33	0.11	< 0.05	0.01	0.83
Nationality	--->	SPIN	- 0.03	0.47	- 0.02	0.65	- 0.02	0.65
Temp. work contract	--->	SPIN	0.10	< 0.05	0.08	0.15	0.11	0.09
(Post-)Doctoral degree	--->	SPIN	0.10	0.35	0.08	0.35	0.13	0.42
STEM-Discipline	--->	SPIN	0.10	< 0.05	0.06	0.23	0.13	< 0.05
<i>R</i> ²		SPIN	0.44		0.48		0.42	
<i>Model Fit</i>								
X ²	=	407.7	df=186	< 0.001	608.9	df=336	< 0.001	
RMSEA	=	0.046			0.053			
CFI	=	0.941			0.942			
TLI	=	0.923			0.928			

Table 4 Structural model path coefficients, *R*², and fit statistics for the models. EI – Entrepreneurial Intention, SPIN – Spin-off intention.

Testing the Moderation

In order to test the moderating effect of job satisfaction, a SEM multi-group analysis in lavaan R package v. 0.6-5 (Rosseel 2012) was conducted. By applying a median split of the aggregated items of job satisfaction (Mean = 5.1, SD = 1.12, Median = 5.2), two groups were created (high job satisfaction; n = 261 and low job satisfaction; n = 332. For this analysis, the items of the outcome expectations scale were aggregated. This procedure was applied previously in other entrepreneurship studies (e.g., Obschonka et al. 2012).

SHOULD I STAY, OR SHOULD I GO?

Subsequently, a number of mean difference tests of the manifest variables of each scale (e.g., mean value of the EI) were performed. The two groups did not differ in terms of the dependent variables *EI* ($t[550.4] = 0.96, p = 0.35$), *SPIN* ($t[549.3] = 0.37, p = 0.71$), *gender* ($X^2[1] = 0.43, p = 0.51$), and *discipline* ($X^2[1] = 0.30, p = 0.58$). The dissatisfied academics did not have statistically significant higher values for outcome expectations (Mean = 4.05, SD = 1.17) than the highly satisfied academics (Mean = 3.9, SD = 1.28; $t[518.1] = 1.50, p = 0.13$). According to the multi-group model outcome expectations showed a significant effect of $\beta_{\text{LowSatisfaction}} = 0.55$ ($p < 0.001$) on EI among academics with low job satisfaction and an effect of $\beta_{\text{HighSatisfaction}} = 0.47$ ($p < 0.001$) on EI among academics with high job satisfaction, indicating a negative moderating effect of job satisfaction (*Table 4*). The effects of outcome expectations on SPIN did not essentially differ within the low job satisfaction group ($\beta_{\text{LowSatisfaction}} = 0.37, p < 0.001$) compared to the group with high job satisfaction ($\beta_{\text{HighSatisfaction}} = 0.36, p < 0.001$).

The group of low job satisfaction demonstrated a lower correlation between EI and SPIN ($r_{\text{LowSatisfaction}} = 0.65, p < 0.001$) compared to the group with high job satisfaction ($r_{\text{HighSatisfaction}} = 0.76, p < 0.001$) suggesting that the perception of differences between the two constructs increases with higher levels of job dissatisfaction.

In terms of variance elucidation, dependent and control variables explained more variance in EI ($R^2_{\text{LowSatisfaction}} = 0.60, R^2_{\text{HighSatisfaction}} = 0.54$) compared to the explained variance in SPIN ($R^2_{\text{HighSatisfaction}} = 0.47, R^2_{\text{LowSatisfaction}} = 0.42$)

Next, differences in job satisfaction between the two groups were evaluated. A Chi-square difference test revealed that the unconstrained and constrained (factor-loadings, measurement intercepts) did not differ in their fit ($\Delta X^2 [16] = 22.0, p = 0.15$), indicating measurement invariance across both groups. The next step was to test the unconstrained model against models, where one of the paths was always set equal across both groups (*see Figure 2*). A significant moderating effect in the case of the link between outcome expectations and EI was revealed, but not in the case of outcome expectations and SPIN (as indicated by the significant ΔX^2). While evidence in support of hypothesis (H3a) was weak, the moderation analysis indicated a negative moderation effect of job satisfaction on the relationship between outcome expectations and EI in support of hypothesis (H3b) (*Table 5*).

SHOULD I STAY, OR SHOULD I GO?

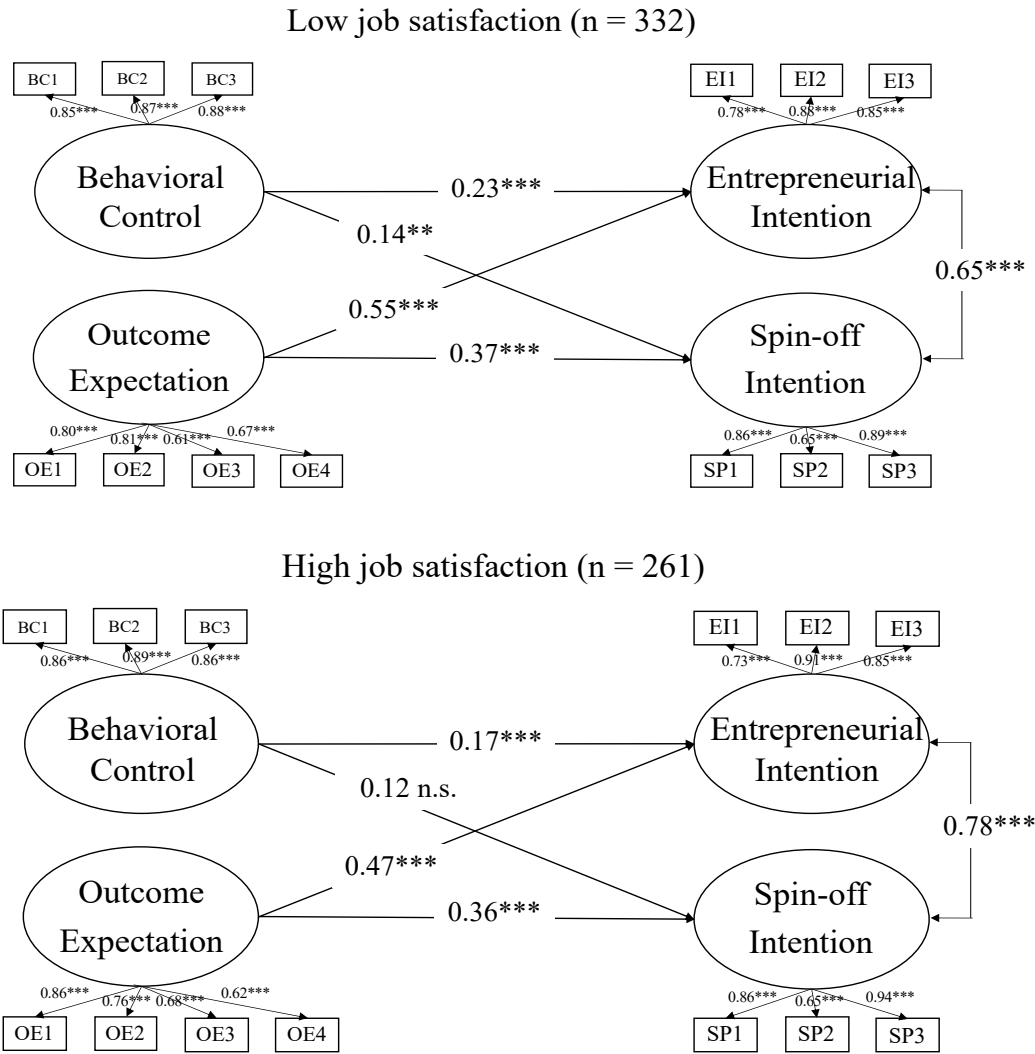


Figure 2 Multi-group analysis (Moderator: Job Satisfaction), Behavioral Control . Note: Standardized coefficients are given. All effects are controlled for gender, field, nationality, venture already founded, academic status, qualifications and contract of employment.

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Models – Moderation	X^2	df	CFI	RMSEA	ΔX^2	Δdf
Unconstrained model I	609***	336	0.94	0.053		
Perceived behavioral control → EI set equal across groups	610***	337	0.94	0.052	1.31	1
Perceived behavioral control → SPIN set equal across groups	609***	337	0.94	0.053	0.22	1
Outcome Expectation → EI set equal across groups	615***	337	0.94	0.053	5.5*	1
Outcome Expectation → SPIN set equal across groups	610***	337	0.94	0.053	0.51	1

Table 5 Fit indices and X^2 difference test for moderation effect of job satisfaction.

Note * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Exploratory analysis of outcome expectation on the spin-off and entrepreneurial intention

Associations between the outcome expectations and entrepreneurial and spin-off intentions were examined (*see Figure 2*). The items of the outcome expectations items for autonomy, profit, satisfaction, and quality of life were individually included as independent variables in the model (additionally, the control variables and perceived behavioral control), resulting in strong model fit ($X^2 [157] = 365, p < 0.001$, RMSEA = 0.05, CFI = 0.96, TLI = 0.94). Regarding EI, the empirical model indicated a direct effect of outcome expectation self-realization ($\beta = 0.31, p < 0.001$) and outcome expectation quality of life ($\beta = 0.27, p < 0.001$) on entrepreneurial intention. By contrast, no effect of outcome expectations autonomy ($\beta = -0.06, p = 0.11$) and outcome expectations financial profit ($\beta = 0.04, p = 0.92$) was evident for EI. Regarding SPIN, besides outcome expectations self-realization ($\beta = 0.16, p < 0.01$) and outcome expectations quality of life ($\beta = 0.18, p < 0.001$), no effect of outcome expectations profit ($\beta = 0.07, p = 0.13$) or outcome expectations autonomy ($\beta = -0.04, p = 0.34$) was statistically significant. These results suggest that both entrepreneurial and spin-off intentions are driven by an expectation of improvement in the quality of life and self-realization.

Discussion

Our study examined the motivation and subjective perception of the environment in which an academic researcher considers their potential career as an entrepreneur. We investigated academics from Swiss Universities of Applied Sciences, obtained from an online survey conducted in Spring 2019. The study's results enhance our understanding of the relationship between job-satisfaction and entrepreneurial career decisions among researchers, making an important distinction between entrepreneurial intention and spin-off intention. Academic spin-offs (based on intellectual property or knowledge and skills) are considered to be a specific form of academic entrepreneurship. They are an essential part of the commercial knowledge transfer, a vital task of entrepreneurial universities (Etzkowitz 2017; Meek and Wood 2016) and thus a considerable extension of an academic career. By providing insight into entrepreneurial intention we gained a greater understanding of general entrepreneurial activities that extend beyond the academic context as well as activities of knowledge transfer.

Little is currently known about the motivational factor driving entrepreneurial career decisions among researchers. This is particularly true when it comes to the differences in academic entrepreneurship (i.e., spin-offs) and other forms of entrepreneurial activities among academic researchers. We revealed that the relationships between outcome expectations and entrepreneurial decisions were variable and often context dependent. Generally, academic researchers in our sample showed a high level of job satisfaction. A multi-group analysis revealed no statistically significant moderating effects of job satisfaction on the relationship between outcome expectation and spin-off

SHOULD I STAY, OR SHOULD I GO?

intention. However, a moderating effect of job dissatisfaction between outcome expectation and entrepreneurial intention was evident, leading to two possible explanations. First, it is possible that participants perceived entrepreneurial careers and spin-off careers as distinct alternatives. Second, as hypothesized, different psychosocial micro-processes may be involved when studying academic entrepreneurship in the form of spin-offs compared to general entrepreneurial decisions among academic researchers.

The results from this study provide new evidence for the importance of accurate operationalization of entrepreneurial action and the need to clearly distinguish entrepreneurial intentions, e.g., for spin-offs, from other forms of entrepreneurial action. Spin-offs are considered a specific case of entrepreneurship, but entrepreneurial intention may also include extramural forms of entrepreneurship and thus modes of entrepreneurship which are not related to knowledge transfer. Our results add to the literature in that entrepreneurial-minded researchers are more likely to engage in entrepreneurial activities, rather than spin-off activities if they are dissatisfied with their current employment. This implies that previous findings from the entrepreneurship literature, which demonstrated that job-dissatisfaction increases the probability of the transition to self-employment (Chang and Edwards 2015; Guerra and Patuelli 2016; van Dick et al. 2004; Werner et al. 2014), may also be equally applicable to academic researchers.

Recently published research has postulated a relationship between job satisfaction, organizational commitment, and entrepreneurial activities (Singh and Onahring 2019). Our results do not support the assumed effect that entrepreneurial researchers with high job satisfaction develop a more substantial interest in spin-off activities. It could be argued that scientists who are satisfied with their current position may seek to maintain the status quo and not pursue additional spin-off activities. Prior qualitative research has shown that academics are developing a second identity as entrepreneurs within the entrepreneurial university, alongside their traditional academic identity (Boffo and Cocorullo 2019). The two forms of identity may converge when the traditional scientific identity also benefits from the entrepreneurial role's successes. However, a key criterion for scientific identities to become more entrepreneurial would be for universities to broaden their goals in terms of spin-off activities beforehand. In the current study, only thirty-six percent of respondents stated that their universities would significantly or partially support spin-offs activities of researchers. We, therefore, assume that spin-off activities do not yet have a high priority at all higher education institutions, and that success in spin-off activities may not yet strengthened academic careers.

We also argue that perceived feasibility in the form of perceived behavioral control does matter when deciding to move into entrepreneurship. Ajzen (2002) considered perceived feasibility in form of the concept of self-efficacy as part of a superordinate construct of perceived behavioral control. While mostly measured as a one-dimensional construct, self-efficacy was shown to be a significant predictor of entrepreneurial intention in prior academic entrepreneurship research (Díaz-García and Jiménez-Moreno 2010; Guerrero et al. 2008; Huyghe and Knockaert 2015). Per our results,

SHOULD I STAY, OR SHOULD I GO?

entrepreneurial intention, as well as spin-off intention, were positively influenced by perceived behavioral control. Our results indicate that participants with a higher level of perceived behavioral control showed a greater likelihood to develop entrepreneurial as well as spin-off intentions when controlling for prior entrepreneurial experience and other personal control variables (e.g., age, discipline, and gender, entrepreneurial mission of the university). This finding is consistent with prior entrepreneurship literature (Brettel et al. 2013; Díaz-García and Jiménez-Moreno 2010; Krabel and Mueller 2009; Moog et al. 2015; Obschonka et al. 2010; Obschonka et al. 2012; Obschonka et al. 2015). Our study therefore supports perceived behavioral control as an interesting construct to study beliefs of dealing with ease or difficulties in entrepreneurial task performance.

However, our study adds to the literature with evidence that the relevance of perceived behavioral control for spin-off intention is weaker than for other entrepreneurial activities. Our analysis revealed that perceived behavioral control has a greater, albeit slight, influence on predicting entrepreneurial intentions when compared to spin-off intentions. Spin-offs are more likely to manifest in research teams as it reduces individual pressures to manage every step to become a successful founder. Also, universities, technology transfer offices, science parks, and incubators offer opportunities, such as coaching and training to acquire skills needed to create spin-off activities, suggesting less responsibility for the individual. Previous research has shown that these opportunities have a positive effect on perceived behavioral control (Miranda et al. 2017). One likely explanation for this outcome is that individuals may not need to rely exclusively on their skills when selecting a spin-off career, because spin-offs are mostly founded by teams rather than individuals. Therefore, feasibility may play a less crucial role in spin-off decisions than in other forms of self-employment. We urge future research to investigate the role of individuals' perceived behavioral control in early entrepreneurial teams.

With respect to personal motivation, we tested the hypothesis articulated in SCCT that outcome expectation would be a predictor for entrepreneurial intention. We noted a positive effect of outcome expectation on both entrepreneurial intention and spin-off-intention, suggesting that higher outcome expectations encourage a transition into entrepreneurship. However, the effect of outcome expectation was more important for predicting entrepreneurial intention than for spin-off intention. Our analysis also revealed that expected profit and autonomy were not significant motivations for spin-off or entrepreneurial intentions. Furthermore, self-realization and expected improvements in quality of life explained entrepreneurial intention more reliably when compared to spin-off intention. When considering other outcome expectations, we found that reputation and extrinsic rewards were stronger predictors of spin-off decisions than self-realization and quality of life. This finding is consistent with postulates from SCCT and the literature that suggests that motivations in the form of specific outcome expectations explain entrepreneurial career decisions (Antonioli et al. 2016; Goethner et al. 2012; Guerrero and Urbano 2014; Lam 2015; Miranda et al. 2017; Morales-Gualdrón et al. 2009). However, our results show that entrepreneurial career decisions are not necessarily linked

SHOULD I STAY, OR SHOULD I GO?

to expected pecuniary gains as a primary goal. Other scholars referred to additional pecuniary advantages such as compensation for their time and efforts spent on entrepreneurial activities driving intentions rather than pure motivation (Hossinger et al. 2020; Morales-Gualdrón et al. 2009).

Our study provides evidence that the probability of a spin-off intention is positively influenced by previous entrepreneurial experience, gender (e.g., women show a lower level of spin-off intention), fixed-term employment contracts, employment in the STEM disciplines, and a perceived spin-off mission by the university. By contrast, age, academic status, level of employment (in percent), nationality, and highest degree obtained did not significantly account for spin-off intention. These findings support the results of prior research where entrepreneurial intention has been found to be positively influenced by prior entrepreneurial experience and an explicit spin-off mission of the university, suggesting that the promotion of an entrepreneurial mission within universities contributes significantly to spin-offs and to other entrepreneurial activities (e.g., Huyghe and Knockaert 2015; Foo et al. 2016).

Limitations and Further Research

Analysis of academic entrepreneurship and job satisfaction is prone to several well recognized limitations, which ultimately inform possible avenues for future research. One consideration is our survey data, despite representing a large sample size, refers specifically to the context of Swiss UAS in 2019. In Switzerland, salaries are comparatively high, and researchers have opportunities to switch into industry, which must be considered when interpreting results regarding outcome expectations and entrepreneurial intention. The results may also be viewed as lacking generality because UASs demonstrate atypically strong ties to industry compared to other countries, leading to greater opportunities for entrepreneurial activities on the margins of academic employment. Future studies should focus on other countries with lower opportunity costs for entrepreneurial activities and higher unemployment rates to study the relationship between job-satisfaction and entrepreneurial activities among academics. In this study, a distinction was made between entrepreneurial intentions and spin-off intentions by assuming that spin-off intentions were a specific case of entrepreneurial intentions. Additional research distinguishing between spin-off intentions and extramural forms of entrepreneurship is warranted and could yield more contrasting outcomes.

This study was designed to generate cross-sectional data, this longitudinal data to assess the impact of possible interactions between organizational conditions and academic entrepreneurial behavior may be insightful. In particular, longitudinal studies could elicit the extent to which spin-offs and start-ups arise from long-term job dissatisfaction. Additionally, future studies are urged to follow a multi-level approach and test the extent to which different academic positions and team-related factors influence entrepreneurial behavior. A methodological limitation of this study was the lack of validated measurement scales. In particular, a re-validation of the job satisfaction scales within academia is required for future studies. Additionally, a mixed-methods approach could be used to investigate the

SHOULD I STAY, OR SHOULD I GO?

extent to which spin-off careers are seen as alternative career paths and whether they could be developed by training and a stronger presence of role models.

Conclusion

This study contributes new knowledge to the existing literature on the determinants of entrepreneurial activity among academics in three specific areas. First, this study demonstrates that job-dissatisfaction fosters the re-evaluation of outcome expectations to define entrepreneurial career goals. Our data did not confirm a positive moderating effect of job-satisfaction on the relationship between outcome expectations and spin-off intention. Taken together, our results support the role of job satisfaction as an interesting variable in academic entrepreneurship research. Second, the results emphasize that entrepreneurial activities are associated with specific expectations, including improvements in self-realization and quality of life. Individuals make critical choices between employment and self-employment to maximize the benefits of career choice when considering expected outcomes (Douglas and Shepherd 2000). Third, this paper represents an empirical application of the framework of SCCT, as recommended by Liguori et al. (2018) and Tran and Korflesch (2016), to investigate academic entrepreneurship. This contribution also addresses the recommendations of Singh and Onahrng (2019) to examine the relationship between job satisfaction and entrepreneurial intention. Our analysis emphasized that several motives are driving the entrepreneurial goals among academics that warrant further research. Overall, this study underlines the importance of individual outcome expectations and perceived behavioral control, which merits greater attention by practitioners and knowledge-transfer agencies. In conclusion, pecuniary satisfaction is not the primary motive for a scientist to become entrepreneurial. Instead, non-pecuniary satisfaction such as personal fulfillment of one's ideas in combination with job-dissatisfaction proved to be a more compelling motivator.

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RESEARCH ARTICLE

From a Deliberative to an Implementing Mindset A process-oriented view of the formation of academic entrepreneurial intention

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Abstract:

Background: Previous intention-based research has not considered whether participants are in the motivational or in the actional phase. In turn, this creates a gap of knowledge concerning the cognitive and motivational processes involved in the formation of entrepreneurial intention (EI). By applying the theory of planned behavior (TPB), the present study addresses the formation of EI to commercialize research knowledge, focusing on the transition from motivation to implementation in the context of academia.

Methods: Drawing on cross-sectional data of 490 researchers, segmented regression analysis were conducted to analyze the influence of entrepreneurial engagement on EI-growth. Multi-group Structural Equalization Modeling (SEM) was then used to test the moderation effects of engagement on the relationship between motivational factors and entrepreneurial intention.

Results and Discussion: The analysis revealed a direct influence of engagement on EI, as well as a threshold of EI-growth per the context of a Rubicon crossing after the initiation of the first gestation action. Our data also show a growing influence of endogenous factors (e.g., attitudes and perceived behavior control) on EI during the venture creation process. The second part of the study contributes by testing the effects of entrepreneurial rewards on TPB-antecedents moderated by engagement.

Conclusion: Until today, research mostly relied on cross-sectional data to predict and measure the strength of EI in the phase preceding the launch of a new business without considering whether participants are in the motivational or in the actional phase. Our finding highlights the need to shift from focusing entrepreneurship research solely on intentions to now including the process and implementation perspective.

Keywords: entrepreneurial intention, academic entrepreneurship, institutional framework, theory of planned behavior, mindset theory of action phases, implementation perspective.

1. INTRODUCTION

Entrepreneurial intentions (EI) are considered the first step in a venture creation process. Scholars thoroughly examined the motivational factors that explain EI, for example, in the theory of planned behavior. However, previous intention-based research has not considered whether participants are in the motivational phase (i.e., aspiring entrepreneurs) or in the actional phase (i.e., nascent entrepreneurs focused on implementation). Only recently, scholars applied the mindset theory of action phases [2] and found evidence that cognitive processes differ in the motivation and actional phases [1]. In turn, this creates a lack of knowledge concerning the cognitive and motivational processes involved in the formation of EI, also referred as goal intentions, within the phase preceding the launch of a new business.

Transitioning entrepreneurship research from goal-oriented motivations to an implementation-oriented phase is based upon the mindset theory of action phases (MAP) and the related Rubicon model of action phases [3, 4]. In response to the increasing demand for approaches that reflect the complexity of implementing entrepreneurial action, recent studies [1, 5, 6] applied the Rubicon model, which is associated with two different types of intentions: the “goal intention”; and, the “implementation intention” [7]. The formation of goal intention (i.e., a mental representation of the desired outcome) is the first step in a venture creation process, followed by implementation intentions in the pre-actional and actional phases. Entrepreneurship research recently confirmed the Rubicon model’s assumption that the transition from a motivational to a volitional stage (i.e., the crossing of the Rubicon) is associated with a change in the cognitive mindset [1]. Accordingly, it was reported that individuals in the motivational phase focused exclusively on information relevant to achieving their goal, instead of those individuals in the motivational phase, whose focus was evaluating desirability and feasibility [1]. The authors also noted that the intention construct used in TPB related to the construct of goal intention in the motivational phase of the Rubicon model.

However, previous intention-based research has not considered whether participants are in the motivational phase or in the actional phase. In turn, this creates a lack of knowledge concerning the cognitive and motivational processes involved in the formation of goal intentions. Highlighting, prior research’s lack of controlling for whether individuals implemented gestation actions were derived from a deliberative or implemental mindset. Against this background, three research questions become evident. First, there are insufficient data on the role of entrepreneurial engagement (ENG) in the motivational processes behind entrepreneurial (goal-) intention. Secondly, future research must integrate and examine engagement as a construct in entrepreneurship research using established explanatory models for entrepreneurial intentions [8, 9]. Thirdly, there is a lack of knowledge regarding the effect of engagement on the relationship between established endogenous and exogenous factors (e.g. entrepreneurial rewards) on entrepreneurial intention. To fill these voids, the aim of the present study is twofold.

Based on the TPB and MAP, the first part of this study investigates whether there is a positive effect of entrepreneurial engagement, which extended beyond the antecedents of TPB to explain entrepreneurial intention. Furthermore, we investigate if intention increased linearly during the entrepreneurial process or if growth peaked for EI per the context of a Rubicon crossing. We also test whether ENG moderates

the relationship between TPB predictors (e.g., social norms, attitudes, and perceived behavioral control) and EI. Part one construct an improved picture of EI before progressing into part two of the study.

The second part of this study addresses the lack of understanding concerning the effects of framework conditions on the entrepreneurial decision-making process. The study analyze the institutional determinants of EI by combining motivational aspects of TPB and environmental factors to predict EI. Part two commenced with an institutional perspective [10] by addressing environmental factors, namely entrepreneurial rewards that encourage entrepreneurship among academics to predict EI [11–13].

Overall, this study investigated the extent to which engagement alters the motivational effect of exogenous factors on TPB predictors and goal intention in the phase preceding the launch of a new business. We draw on data from academic entrepreneurship. Academic research commercialization is crucial for transmitting knowledge from research to society [14]. Experts considered academic entrepreneurship as all commercialization activities (e.g. spin-off activities) outside the regular university tasks of basic research and teaching [15]. Academic spin-offs are defined as “companies founded by individuals from the scientific community, including people with substantial research experience such as professors, assistants, researchers, and doctoral students and based on a core technology that is transferred from the parent organization” [11]. Therefore research on academic entrepreneurship is an example of the pivotal role of intention-based research and of the application of TPB [16, 17].

The present research used a cross-sectional data set of academic researchers from Switzerland and employed Structural Equation Modelling. In doing so, this paper yielded interrelated contributions to the literature and highlights the essential role of action-related approaches for studying entrepreneurial intention.

2. LITERATURE REVIEW

2.1 Entrepreneurial Intention

Entrepreneurial intentions are considered to be the “single best” predictor of entrepreneurial behavior [18]. Following this statement, the use of EI as a surrogate for action in empirical research has been established within entrepreneurship research. Many motivational theories are based on the concept of intention and their antecedents to predict subsequent actions [8, 18–20]. While these theories primarily capture future action as outcome variables, the majority of research has focused exclusively on predicting EI rather than performance [21].

In particular, the TPB [8], an extension of Ajzen’s Theory of Reasoned Action [22], comprised most of the research on intention within the field of entrepreneurship [21]. TPB is a psychological theory, and posits the process of EI formation as determined by three independent constructs: positive or desirable assessment of a certain behavior (shorted as ATT); the perceived social norm (shorted as SN); and, the perceived feasibility of performing or not performing a certain behavior (shorted as PBC). The effects of ATT, SN, and PBC are mediated by EI on subsequent behaviors [23].

In academic entrepreneurship research, TPB is utilized to investigate the motivational influence of personal and contextual factors on entrepreneurial goal-setting [24–26]. Based on TPB, Feola *et al.*, [11] investigated how entrepreneurial universities influence EI among scientists². To assess for the success of certain framework conditions in entrepreneurship, the scholars considered the strength of EI as a sufficient predictor of the probability of taking action.

While a positive relationship between intention and subsequent behavior has been corroborated in studies in the field of entrepreneurship [27], the predictive value remains limited. For example, by using longitudinal data, Kautonen *et al.* [27] demonstrated that (goal-) intention elucidated about 30% of the variance in subsequent entrepreneurial actions. Furthermore, the authors noted that only 37% of the respondents who reported positive EI in the first wave took subsequent action, in the second wave.

Earlier research showed that EI strength is greater among those who are currently involved in implementing a business project [28], however there is a lack of empirical studies that explicitly control whether individuals started to implement their entrepreneurial goals. As meta-analytically shown, the effect size of manipulating goal intention strength is rather limited [29]. Therefore, it is worth questioning whether goal intentions increase linearly during the entire business process or whether EI growth reaches a plateau after entrepreneurship has been defined as a goal.

In line with this, van Gelderen *et al.* [6] recently stated that the strength of EI is not a sufficient predictor of subsequent behavior. By drawing on MAP, the authors found a moderated mediation, in which implementation intention mediated the effect of goal intention on taking entrepreneurial actions.

2.2 From a Deliberative to an Implementing Mindset

Based on the Rubicon model [4, 30], decision-making and action implementation are processed in two different phases. First, in a *motivation phase*, goals and alternatives are weighed against each other in terms of feasibility and desirability [30]. Therefore, costs (e.g., in terms of effort) and benefits are compared rationally to make final (goal-) decisions [3]. This process leads to the formation of goal-intention, which is a construct comparable to the motivational TPB-concept of intention. After goal-setting, individuals set out to implement and achieve the goals [30].

Second, in a *volitional phase*, implementation intentions are formed, related to the question of *'How can I achieve my goal'* [31]. Social psychologists refer to the transition from a deliberative to an implementing mindset, as the crossing of the Rubicon. In this stage, an implemental mindset automatically facilitates the initiation of goal-oriented action by drawing the decision-maker's attention to available implementation strategies for achieving goals. In contrast to the *motivation phase*, individuals in the volitional phase are focused on how to achieve desired goals, whereby both feasibility and desirability of goals are perceived in a rather partial and overly optimistic way [4]. Furthermore, information that challenges the usefulness of goals or raises any lingering doubts is not well processed. New information is only perceived if it is relevant to the achievement of goals (i.e., closed-mindedness) so that the attention is guided towards available resources for deploying the decision.

²For an overview of applications of the TPB in the field of academic entrepreneurship see the recently published reviews [16, 17]

3. DEVELOPING HYPOTHESES

3.1 Entrepreneurial engagement positively predicts EI

Delanoë-Gueguen and Fayolle [1] recently proposed and empirically demonstrated that entrepreneurial engagement (measured by the sum of gestation action³) could be operationalized to determine whether potential founders crossed the Rubicon. Based on longitudinal data, the authors found evidence of a positive influence on both ENG and goal intention, on subsequent entrepreneurial action, and a moderating effect of ENG on the relationship between intention and behavior. As theorized, by applying the Johnson-Neyman technique (moderation technique), the positive effect of intention on behavior disappeared beyond the ENG threshold of three gestation actions. This finding suggests that at a certain point in the entrepreneurial process, EI was less powerful for predicting action. Delanoë-Gueguen & Fayolle [1] interpreted this moment as representing the presence of a Rubicon crossing, and argued, that the initial gestation actions represent a way to generate goal-oriented information in the motivation phase. This result contrasts with the assumption that the transition of a Rubicon is theoretically considered to be the moment when individuals actively engage in implementation [30]. Depending on the context and the topic of entrepreneurial projects (e.g., cultural versus technological entrepreneurship), both the order and the content of gestation action differ.

As mentioned above, intention strength is considered a sufficient predictor for the achievement of goals (e.g., in the context of TPB). We argue that a linear growth of EI, especially concerning goal-intention, along the entrepreneurial process can be questioned. EI growth is likely to reach a threshold where the rate of increase slows after leaving the motivation phase. An example of a possible EI threshold was demonstrated in entrepreneurship education. A meta-analysis [34] of 73 studies revealed only a weak correlation between education and EI. If, however, the authors controlled for pre-education intention strength, then the correlation was insignificant. In entrepreneurship education research, this effect has been discussed previously as a result of a bias in self-selection [35], indicating that EIs are unlikely to grow if people with a high level of interest enroll in such a course [34]. For example, Fayolle and Gailly [36] showed that while education has a positive effect on AT and PBC, among all participants, it does not positively influence the EI of participants with previous entrepreneurial experience. Their results suggested EI-growth peaked as soon as goals were defined.

In line with Delanoë-Gueguen and Fayolle [1], Mwangi and Rotich [28] recently showed that ENG elucidated variance in EI. Yet, a gap remains concerning the empirical knowledge of EI strengths continued growth after the transition from motivational to volitional phase. However, psychologists argue, that detected difficulties and obstacles in achieving goals during implementation, increase the overall motivation and goal-commitment, as it supports the process of imitated goal pursuits by mobilizing effort [37]. In turn, the long-term goal is constantly updated by carrying out micro-tasks for implementation.

³Gestation action refers to the necessary action that are required to be undertaken to create a new venture. Some scholars use the actual number of gestation actions undertaken by individuals to determine whether they are actively involved in the development process of their venture [32]. Delanoë-Gueguen and Fayolle [1] adapted the gestation action suggested by Reynolds [33] to predict a psychological Rubicon.

Thus, an increase in goal intention during implementation is likely, as the person becomes more committed to the goal by continually updating the desirability and feasibility of the long-term goal.

Drawing on prior research, we assume ENG to predict EI at the beginning of the entrepreneurial process (motivational phase), and we further assume a significant difference of EI-growth (i.e., threshold) after initiating the first gestation action. Considering the theoretical assumptions of MAP and the results of prior research, we hypothesize that:

H1a) Entrepreneurial engagement positively predicts EI.

H1b) A threshold of EI growth can be determined in relation to ENG, so that ENG has a greater influence on EI before the threshold than after the threshold.

3.2 TPB-antecedents in the motivation and volition phase

In addition to the unique and significant relationship between entrepreneurial engagement and EI, we expect an interactive effect of engagement and TPB to emerge in the model. This prediction is supported by the aforementioned concept of the Rubicon Model, and the related different cognitive processes involved before and after crossing the Rubicon [30]. We assume that the influence of TPB-antecedents on EI, before and after engaging in implementation varies. An implementing mindset promotes a positive assessment of the goal (i.e., desirability) and encourages an optimistic assessment of its achievability [30]. Following our prior argumentation, while individuals with an implementation mindset are centered on specific information related to the successful implementation of their entrepreneurial projects [1], the TPB-antecedents (ATT, SN, PBC) theoretical respond to the motivation phase and thus to the prediction of goal intention.

Previous academic entrepreneurship research yielded mixed results regarding the strength of the influence of TPB-antecedents on EI [24, 25]. For example, Miranda *et al.* [24] found no significant effect of SN on EI, while other scholars documented a strong effect of SN on EI [11]. Some scholars found evidence that ATT has the greatest effect on EI [24, 26, 38], while other suggested PBC to have the greatest influence on EI [11]. However, most of these studies did not control for whether participants were currently involved in the motivational or implementation phase.

Given the mixed results regarding the effects of TPB, and the antecedents of EI, we assume entrepreneurial engagement to moderate the relationship between TPB-antecedents and EI. Following our prior evaluation, individuals with an implementation mindset use different cognitive information processes in relation to the successful implementation of their entrepreneurial projects, in contrast to those individuals with a deliberative mindset [1]. In the motivational phase, new information is assessed more objectively than in the volitional phase [30]. Therefore, nascent entrepreneurs in the implementation phase, focus on how best to achieve their chosen goal and perceive both feasibility and desirability, rather partially and optimistically [1]. In contrast to the motivational phase, individuals in the implementation phase display higher levels of self-esteem [39], a lower assessment of their vulnerability to controllable and uncontrollable risks [40] and prefer information that leads to the implementation of

goals, with an optimistic view of future performance. Since positive information contributes to justifying a difficult and risky goal-decisions like entrepreneurial goals, we argue that the TPB-predictors are more crucial for predicting EI after crossing the Rubicon. Overall, we hypothesize entrepreneurial engagement to moderate the relationship between TPB-antecedents and EI and we assume that the effect of TPB antecedents in explaining EI strength will increase with engaging in implementation.

H1c) ENG has a moderating effect on the relationship between TPB-antecedents and entrepreneurial intentions (the criterion), such that when ENG is low the relationship is weaker and when ENG is high the relationship is stronger.

3.3 Applying the interaction approach on the context of academic entrepreneurship: Entrepreneurial Rewards

Institutions such as universities can guide the process of entrepreneurial decision-making among students [41] and scientists [11, 12, 24] and support their implementation with concrete measures [42]. Institutional theory [10] presents a compelling approach to investigate entrepreneurial behavior in organizations determined by culture and incentives [43]. In particular, Kirby *et al.* [44] outlined formal factors (e.g., infrastructure and financial support) and informal factors that promote entrepreneurial behavior among university scientists. Similarly, Huyghe and Knockaert [13] empirically analyzed how university culture (e.g., entrepreneurial mission and role models) as well as climate (e.g., financial rewards for commercialization of research) influence entrepreneurial intention among scientists. Based on survey data, the authors found evidence of a unique and direct relationship between university rewards for spin-offs (i.e., start-ups) and EI.

Incentives and rewards are decisive instruments that foster organizational norms in terms of entrepreneurship within universities [45, 46] and influences EI among scientists. In particular, rewards refer to social or financial benefits that influence employees' attitudes towards a particular issue and, in the case of entrepreneurship, increase the likelihood that academics will pursue such goals [47]. As demonstrated by Muscio *et al.* [48] the existence of monetary incentives embodies the converging signals for researchers to engage in technology transfer activities. For example, Guerrero and Urbano [49] evaluated researchers enrolled in Spanish universities and found evidence for a direct influence of university policies (e.g., including financial rewards) on individual attitudes towards entrepreneurship. Similarly, Miranda *et al.* [24] obtained comparable results by examining the influence of personal (e.g., self-confidence, business experience) and university-specific entrepreneurial conditions (e.g., business environment) on entrepreneurial intentions mediated by TPB-antecedents amongst a sample of Spanish scientists. Based on previous research [50], we assume that entrepreneurial rewards as part of the institutional climate positively influence the motivation and behavior of institutional members.

It is acknowledged that the institutional environment is a critical element in the formation of EI among academics (44, 51). Moreover, the entrepreneurial climate within universities, which is positively influenced by cooperation with industry, has a significant influence on ATT of academics. For example, Goethner *et al.* [25] observed that the climate created by collaboration with industry indirectly influences

the EI by affecting the ATT. Similarly, Foo *et al.* [12] pointed out that scientists with an entrepreneurial background can be stimulated to develop entrepreneurial goals through an encouraging environment. The authors explained that this is influenced by socialization processes within institutions. Also, Obschonka *et al.* [52] found evidence of socialization effects using data collected from university scientists. When the participants identified with their institution, they tended to adopt attitudes from their social environment, while the institutional environment strongly influenced their entrepreneurial decisions.

Several recent studies have consistently shown that the relationship between contextual factors and EI is mediated by TPB-antecedents such as PBC, SN, and ATT [11, 25]. Therefore, we propose that ATT and SN mediate the relationship between entrepreneurial rewards and entrepreneurial intention. In line with TPB's assumption [8] that contextual factors indirectly influence the EI by altering ATT, SN, and PBC, we propose a mediated relationship. Given the above information, the following hypotheses concerning entrepreneurial rewards were derived:

H2a) AT mediates the relationship between entrepreneurial rewards and EI.

H2b) SN mediates the relationship between entrepreneurial rewards and EI.

Mwangi and Rotich [28] noted that the application of MAP in entrepreneurship research draws attention to the complex interaction between situational, contextual, and psychological factors in the development process of EI. Based on our prior argumentation, we assume the influence of entrepreneurial rewards on TPB-antecedents to differ before and after engaging in entrepreneurial implementation. Therefore, we argue that entrepreneurial rewards are most important as part of the entrepreneurial climate in university faculties during the motivation phase. In this phase, the advantages and disadvantages of entrepreneurial action are examined to generate goal-intentions (i.e., the so-called readiness for entrepreneurial action). Again, by drawing on MAP, it can be assumed that in the implementation phase, concrete measures, such as formal factors (e.g., business support), will become more important than motivating incentives. Therefore, we hypothesize a moderating effect of ENG on the relationship between entrepreneurial rewards and ATT, respectively SN.

H2c) ENG moderates the relationship between entrepreneurial rewards and ATT.

H2d) ENG moderates the relationship between entrepreneurial rewards and SN.

4. METHODS

4.1 Data collection

This research is based on cross-sectional data collected in a nationwide, online survey of academics at the seven public Swiss universities of applied sciences (UAS) in 2019. Since 1995, the Swiss UAS expanded its activities in research and development, which is anchored in the legal performance contract [53]. Intensive cooperation with non-institutional actors in the context of practical or business-oriented education and practice-oriented research is seen as a central feature of the profile of UASs [54, 55]. In recent years, the promotion of science-based start-ups has become an integral part of the service spectrum of higher education in Switzerland. Accordingly, many universities and UASs introduced measures to promote the commercialization of research and demonstrate a high entrepreneurial potential [54].

From January to March 2019, 8,905 academics were randomly invited via e-mail to take part in an online survey to examine their entrepreneurial behavior and organizational environment. Participants could choose between three languages (German, English, and French). Only 2,442 academics followed the link to the survey tool and accessed the privacy policy on the first page. In the invitation e-mails, as well as in the introduction to the questionnaire, all participants were informed about the length of the survey and about the background of the questions concerning commercial knowledge transfer. The security of data storage and the maintenance of anonymity in the evaluation of the questionnaire were promised to reduce the tendency of respondents to give socially desirable answers [56]. Participation in the study was voluntary, and responses were anonymous. Beforehand, the questionnaire and the procedure were both tested and optimized using an independent sample population. Participants received three reminder e-mails, each after one week.

4.2 The Sample

The study sample size contained 490 participants. Previously, we removed the respondents from our sample who did not provide any data and those with missing data on gestation actions, and entrepreneurial intention as both variables are key aspects of this study. On average, participants were 44.4 years old (SD = 10.7, range 24-69) and 73.5% (n = 360) of them were male, 69.8% (n = 342) were Swiss citizens, 39.4% (n = 193) stated to hold a PhD as their highest educational qualification. Of the academics responding, 33.3% (n = 163) stated their work as being a professor. About 54.7% (n = 268) of the participants represented the STEM disciplines, which include mathematics, computer science, science, and technology, while the others represented humanities and art, and economics. Further descriptive data are listed in *Table 1*. The sample corresponds to the demographic distribution in terms of age, nationality, gender, and education of scientists at the Swiss UASs [57].

Table1. Descriptive statistics of the sample (n = 490).

		Frequency	Percentage
Gender	Male	360	73.5
	Female	130	26.5
Age	Mean (SD)	44.4 (10.7)	
	Median [Min, Max]	45.0 [24.0, 69.0]	
Discipline	Humanities	222	33.3
	Natural and Technical Sciences (STEM)	268	66.7
Occupational status	Lecturer / Professor with leadership responsibility	163	33.3
	Lecturers without leadership responsibility	123	25.1
	Research assistant	204	41.6
Employment level	Mean (SD)	79.5 (24.8)	
	Temporary Employment contract	163	33.3

4.3 Measures

Self-reporting scales employed in this study were successfully applied in previous research and relate to the target behavior of academic entrepreneurship [13, 52, 58]. To test our hypothesis, we drew on previous research to assess entrepreneurial intention as a dependent variable [11, 13, 25, 59]. The questionnaire and data are available upon request from the authors.

4.3.1 Dependent Variable

Entrepreneurial intention (EI). The responses were measured using a seven-point Likert scale ranging from 1 (Absolutely disagree) to 7 (Strongly agree) to measure EI, (e.g., ‘You have the firm intention of becoming an entrepreneur one day’) based on prior research [1, 60]. Scale reliability, which was measured using Cronbach’s α , was found to be 0.86. This was above the generally accepted criterion of 0.70, indicating high reliability for the collected data [61].

4.3.2 Independent Variables

TPB-Social norm (SN) factors were measured using three items on a five-point Likert scale [52], referring to academic colleagues and superiors at the workplace. Participants received the following question: *Which of the following people think that you should participate in the development of a business idea to commercialize your research? (i) (work) colleagues; (ii) supervisor or superior; (iii) family and friends.* Again, the items were assessed on a five-point Likert scale from 1 (Absolutely disagree) to 5 (Strongly agree) and averaged ($\alpha = 0.85$).

TPB-Attitudes (AT) towards academic entrepreneurship refers to the degree to which a person develops a positive or negative assessment towards entrepreneurial behavior. AT was measured on a five-level bipolar adjective scales. For example, “I consider participation in the development of a business idea to commercialize my research. . .”

Responses included: Item 1: 1 = “boring”, 5 = “exciting”; Item 2: 1 = “unattractive”, 5 = “attractive”; Item 3: 1 = “uninteresting”, 5 = “interesting”; Item 4: 1 = “waste of time”, 5 = “worth investing as much time as possible.” The scale was found to be internally consistent with a scale reliability of Cronbach’s $\alpha = 0.90$.

TPB-Perceived behavioral control (PBC), four items were used on a seven-point Likert scale to measure PBC, with responses ranging from 1 (strongly disagree) to 7 (strongly agree). The three items were (1) “I can control the creation process of a new company,” (2) “I know how to develop an entrepreneurial project,” (3) “I know the necessary practical details to start a company,” and (4) “If I tried to start a firm, I would have a high probability of succeeding.” The resulting scale reliability was Cronbach’s $\alpha = 0.90$.

University rewards for commercialization. Based on Huyghe and Knockaert [13], we created five items to deduce whether the university reward system values academic entrepreneurship. Using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree) all participants were invited to rate the following statement: “Please indicate the activities for which you will receive (social, financial) recognition at your university: (1) Involvement in spin-off/start-up creation, (2) Involvement in patenting and licensing (3) Involvement in consulting/services (4) Providing scientific services for private companies, and (5) Involvement in contract research.” Conducting PCA uncovered the existence of two factors, accounting for 60% of the cumulative variance, we named “*entrepreneurial rewards*” (Items 1 and 2; Cronbach’s $\alpha=0.75$) and “*rewards on contract-research and consulting*” (Items 3, 4, and 5; Cronbach’s $\alpha=0.73$). Consequently, we generated summarized measures for the two constructs. In the following analyses, we controlled for “*emphasis on contract-research and consulting*.”

Entrepreneurial engagement (ENG). To reflect the level of engagement of respondents, we followed the approaches used by prior research [1, 32], which relied on the count of gestational actions reported by individuals. The distribution of the number of gestation actions is displayed in Table 2. The survey included 14 adjusted gestation actions based on lists compiled by Delanoë-Gueguen and Fayolle [1] and the US. Panel Study of Entrepreneurial Dynamics (PSED) [33]. Participants were asked: “Which of the following actions have you already undertaken to set up your company?” Respondents were asked to select all activities they had participated in, including: *preparation of a business plan, contacts to obtain financing, full-time work on this project, search for public aids, renting and/or equipping a business space, significant investment in the development and/or manufacture of products or services, gathering of information regarding administrative formalities for company creation; meeting with potential clients, registration of patent, name, or trademark, gathering and preparing specific information for potential investors, taking advice from professionals about the implementation of the project, savings to invest in this project, developed and realized prototypes, and already launched products on the market.*

Table 2. Entrepreneurship - Evaluated based on the number of Gestation actions reported by individuals.

Entrepreneurial engagement	Frequency	Percentage
(0)	201	41.0
(1)	62	12.7
(2)	41	8.4
(3)	40	8.2
(4)	31	6.3
(5)	26	5.3
(6)	24	4.9
More than (7)	65	13.3
Total	490	100

4.3.3 Control Variables

Based on findings from academic research on entrepreneurship [16, 17], we selected gender (0 = male, 1 = female), age, occupational status, and highest educational qualification, employment level, and discipline, as control variables to reduce the possibility of alternative explanations for the following results. Prior research showed that male academics had more social contacts with the outside world, and fewer systematic barriers than female academics, which explained the greater entrepreneurial activity by men [62–64].

We controlled for employment level to ensure that academics were comparable across all of the involved universities. Furthermore, we controlled for discipline (0 = humanities and art, 1 = STEM) since the research discipline and activities affect entrepreneurial intention [13, 65]. In particular, academics working in applied research and in technical disciplines (e.g., engineering and physics) are more likely to be involved in entrepreneurial activities, while academics in the humanities are more likely to work in consultancy and contract research [43, 59, 63].

4.4 Construct Validity and Reliability

Before testing the hypotheses, exploratory factor analysis (EFA) was used to extract and evaluate the initial construct validity and reliability of the metrics. EFA included examining for items with communalities, their factor loadings, and Cronbach’s α . As suggested by Hair *et al.* [66], items with communalities below 0.50, or factor loadings below 0.50 and significant cross-loading were removed. This included the following items: SN (3) family and friends. After adjustments, the item’s communalities exceeded the threshold of 0.50, and the six factors explained 66% of the total item variance. The items’ factor loadings and labels of extracted factors are reported in Table 3. The measurement items loaded to their respective factors as expected, indicating initial convergent and discriminant validity as factor loadings exceeded 0.50, and cross-loadings were below 0.30. The Cronbach’s alpha coefficients for the measurement items all exceeded 0.70, indicating internal consistency [66].

A confirmatory factor analysis (CFA) was conducted to evaluate the convergent and discriminant validity of the measurement items. Unlike most regression models, the null hypothesis in a SEM is the model perfectly predicts the data; the Chi-square test for the measurement model was significant ($\chi^2[120] = 288.7, p < 0.01$), indicating a poor fit. However, since the Chi-square value is strongly influenced by sample size, leading to a statistically significant test, but predictively insignificant model. Hence, alternative fitting indices were used. To further investigate the goodness-of-fit, evidence of model fit was obtained through multiple sources: Chi-square statistic (χ^2), assessing the difference between the expected covariance matrix and the observed covariance matrix; Root Mean Square Error of Approximation (RMSEA), which assesses the fit between the covariance matrix of the best fit model and the covariance matrix of the data; and Comparative Fit Index (CFI). The CFI and RMSEA showed a good fit for the measurement model (CFI = 0.96, RMSEA = 0.05) [67] and confirmed a sufficient convergent and discriminatory validity as items loaded significantly on their respective factors and all factor loads exceeded 0.60. Convergent validity can be investigated by calculating the Average Variance Extracted (AVE) using a cut-off of 0.50 [68]. The inspection of the AVE values (*Table 3*) for all factors suggests acceptable validity was obtained.

Table 3. Reliability and Convergent Validity Analyses.

Construct	Item	Factor Loadings	Cronbach' Alpha	Average Variance Extracted (AVE)	\sqrt{AVE}
Entrepreneurial Intention (EI)	EI 1	0.84	0.86	0.69	0.83
	EI 2	0.81			
	EI 3	0.61			
Social Norms (SN)	SN 1	0.91	0.85	0.74	0.86
	SN 2	0.74			
	SN 3	0.47			
Perceived Behavioral Control (PBC)	PBC 1	0.82	0.90	0.72	0.85
	PBC 2	0.86			
	PBC 3	0.90			
	PBC 4	0.66			
Attitudes towards Academic Entrepreneurship (ATT)	AT 1	0.75	0.90	0.70	0.83
	AT 2	0.88			
	AT 3	0.84			
	AT 4	0.73			
Entrepreneurial Rewards	Ent. Rewards1	0.94	0.75	0.57	0.76
	Ent. Rewards2	0.50			
Contract-Research Rewards	Cont.Rewards1	0.78	0.73	0.50	0.71
	Cont.Rewards2	0.56			
	Cont.Rewards3	0.72			

Discriminant validity was evaluated by comparing the constructs' values of the Squared Root of AVE (\sqrt{AVE}) with the correlation of the other constructs [69] (shown in Table 3). A value of \sqrt{AVE} that is higher than the coefficient of the correlation between factors provides evidence of discriminant validity. All factors met the criterion and demonstrated discriminant validity. Second, discriminatory validity was assessed using the heterotrait-monotrait ratio of correlation (HTMT) [70]. HTMT is the average of the heterotrait-heteromethod correlation relative to the average of the monotrait-heteromethod correlation. If HTMT is below 0.90, a discriminatory validity between two constructs can be assumed. Results show that the HTMT values between the respective constructs appeared to be below 0.90 (highest value of HTMT = 0.61 for the link between Spin-off Rewards and Contract-research Rewards, lowest HTMT = 0.08 for Contract-research Rewards and PBC). The results provide evidence for convergent and discriminant validity.

A methodological problem that must be accounted for is Common Method Variance (CMV). CMV occurs when a method bias affects all measures equally [71] by systematically distorting participants' responses to surveys (e.g., according to social desirability). To investigate the potential for CMV, all study variables were loaded to one factor to investigate the fit of the CFA model. If the one-factor CFA model fits the data, CMV is considered as responsible for the relationship between the variables [72]. Within this data, a one-factor CFA model did not represent the data well ($\chi^2[134] = 2'935$, $p < 0.001$, CFI = 0.38, RMSEA = 0.21), suggesting that the items were not just different aspects of an underlying construct (CMV).

4.5 Analytic strategy

Hypothesis testing was estimated using Structural Equation Modelling performed with Lavaan (Version 0.6-5) [73] in R [74]. SEM examined the relationship between the latent variables and tested the specific hypotheses. Given the sample size, we included only cases with complete data in each analysis. Our data being non-normal and incomplete, we used the *Robust Maximum Likelihood* (MLR) estimation method [75]. The MLR estimator generates maximum likelihood parameter estimates with standard errors and χ^2 test statistics that are robust to non-normality and missing data. Model fit was estimated using several convergent indices: the robust Yuan-Bentler scaled Chi-square test; RMSEA; and CFI. To assess the model fit, we used the following criteria for a satisfactory fit: CFI > 0.90; RMSEA < 0.08, $\chi^2/df < 3.00$ [67, 76]. For measurement invariance tests, we used criteria for large samples: p-value of < 0.01 for $\Delta\chi^2$ (scaled difference Chi-square test; [77]) and $\Delta CFI > 0.002$, which indicated a lack of measurement invariance [78].

Segmented regression analysis [79] is used for empirical detection of the EI-breakpoint analysis. A segmented regression (i.e., Broken-stick-regression), is a method of regression analysis in which the independent variable, namely entrepreneurial engagement, is partitioned into intervals and each interval is assigned a separate line segment. Segmented regression was calculated in segmented [80] using entrepreneurial engagement as the independent variable, and EI served as the dependent variable. The

algorithm must be supplied with one or more initial guess parameter(s) for the breakpoint(s). We used an initial parameter of $\psi_0 = 1$. In piecewise regression, the relation between the response and the predictor is piecewise linear (i.e., two or more lines are connected at the change point(s)). Empirically determined breakpoints were tested for statistical significance using the Davies test [81]. Using results from the segmented regression, two groups were obtained (pre-breakpoint vs. post-breakpoint). Multi-Group SEM analyses were conducted to determine whether the link between TPB variables and EI was moderated by entrepreneurial engagement.

5. RESULTS

Descriptive statistics and zero-order correlations among variables are listed in Table 4, and the reported correlations are in the expected direction. TPB-antecedents (ATT, SN, and PBC) showed positive correlations with intentions. ENG revealed positive correlations with EI and the TPB constructions. Entrepreneurial rewards correlated with EI, while commercialization rewards did not correlate with EI.

Table 4. Means, standard deviations, and correlations with confidence intervals.

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. Values in square brackets indicate the 95% confidence interval for each correlation. The confidence interval is a plausible range of population correlations that could have caused the sample correlation [82]. Note: * indicates $p < 0.05$. ** indicates $p < 0.01$.

Variable	<i>M</i>	<i>SD</i>	(1)	(2)	(3)	(4)	(5)	(6)
(1) Entrepreneurial Intention (EI)	3.25	1.61						
(2) Attitudes towards academic entrepreneurship (ATT)	3.75	1.02	0.44** [0.37,0.51]					
(3) Perceived behavioral control (PBC)	4.42	1.35	0.41** [0.33, 0.48]	0.19** [0.11, .28]				
(4) Social Norms (SN)	3.24	1.66	0.33** [0.25, 0.41]	0.24** [0.16, .32]	0.22** [0.13, 0.30]			
(5) Entrepreneurial Rewards (ER)	2.66	1.53	0.20** [0.11, 0.28]	0.20** [0.12,0.29]	0.06 [-0.03,0.15]	0.32** [0.24, .40]		
(6) Contract-research Rewards	4.23	1.47	0.07 [-0.02, 0.16]	0.12** [0.03, 0.21]	-0.01 [-0.10, 0.08]	0.23** [0.14, 0.31]	0.44** [0.37, 0.51]	
(7) Entrepreneurial Engagement	2.28	2.57	0.40** [0.32, 0.47]	0.20** [0.12,0.29]	0.45** [0.38,0.52]	0.30** [0.21,0.38]	0.16** [0.07, .25]	0.08 [-0.01,0.17]

5.1 The empirical path model for predicting entrepreneurial intention

We tested our hypotheses on unique main effects as well as moderating effects of ENG in the prediction of EI (hypotheses 1a-c), thereby employing path analysis. All effects were controlled in terms of gender, age, occupational status, nationality, discipline, and employment level.

The model showed a marginal fit $Y-B \chi^2(253) = 641.21$, $p < 0.001$; SRMR = 0.09; CFI = 0.89; RMSEA = 0.06 (90% CI of 0.056, 0.067). The examination of the indices of modification (MI) revealed the addition of entrepreneurial engagement as an independent variable to further explain PBC (MI = 84.56), SN (MI = 40.07) and ATT (MI = 16.56). The fit of the final re-specified model was acceptable, $Y-B \chi^2(299) = 522.09$, $p < 0.001$; SRMR = 0.06; CFI = 0.95; RMSEA = 0.04 (90% CI of 0.037, 0.049), indicating the measurement of the latent variables as sound [67, 76]. The model explained 45.8% of the variance of EI among respondents. The results for the SEM are depicted in Figure 1.

In hypothesis (H1a), we expected that entrepreneurial engagement would predict EI, beyond the effect of the TPB variables. In accordance with prior research, the three TPB-antecedents, ATT ($\beta = 0.37, p < 0.001$), SN ($\beta=0.12, p < 0.05$), and PBC ($\beta=0.33, p < 0.001$), were positively associated with EI. ENG exerted a positive influence on EI ($\beta=0.18, p < 0.001$). Results provided support to the hypothesis (H1a) that there was a unique main effect of entrepreneurial engagement when predicting EI.

We also found evidence of a direct impact of ENG on TPB-antecedents. More specifically, the effect of engagement on PBC ($\beta=0.44, p < 0.001$), on ATT ($\beta=0.16, p < 0.001$), and on SN ($\beta=0.31, p < 0.001$). Among the control variables, age ($\beta = -0.11, p = 0.06$), gender ($\beta = 0.04, p = 0.39$), employment level ($\beta = -0.07, p = 0.18$), discipline ($\beta = 0.03, p = 0.55$), and nationality ($\beta = -0.09, p = 0.83$) were not significantly related to EI.

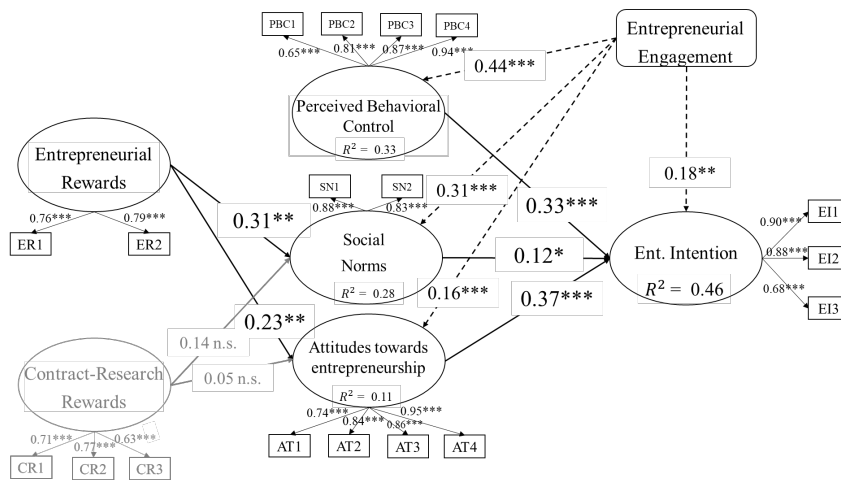


Figure (1). Structural equalization model of the TPB, participants ($n = 490$). Note: Standardized coefficients are given. All effects are controlled for gender, age, occupational status, nationality, discipline, and employment level. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

5.2 Segmented regression to estimate the EI growth breakpoint

In hypothesis (H1a), we expected EI to increase during the entrepreneurial process, and for hypothesis (H1b), EI growth to have a breakpoint per the context of a Rubicon crossing. First, an OLS regression revealed a positive effect of $b_0=0.23$ ($p < 0.001$) on EI ($R^2=0.12$). To create the scale of EI, values consisting of three items were aggregated. The piecewise regression estimated a breakpoint at 1.05 (St. Err = 0.56), suggesting two different segments of EI-growth. This breakpoint was statistically significant according to the Davis test for a change in the slope ($p < 0.05$; 95% CI = 0.04, 2.15). The next step was to perform an adjusted OLS regression, which revealed that the effect of engagement on EI in the first segment (Engagement < Breakpoint, $b_1 = 0.82, p < 0.001$) differed compared to the second segment (Engagement > 1 Breakpoint, $b_2 = 0.20, p < 0.001$). The results showed that the growth of EI was stronger before an initial entrepreneurial action was taken and continued to grow at a lower rate. The results supported hypothesis (H1b) that a breakpoint in intention growth was visible at that moment respondents engaged in implementation (See Figure 2).

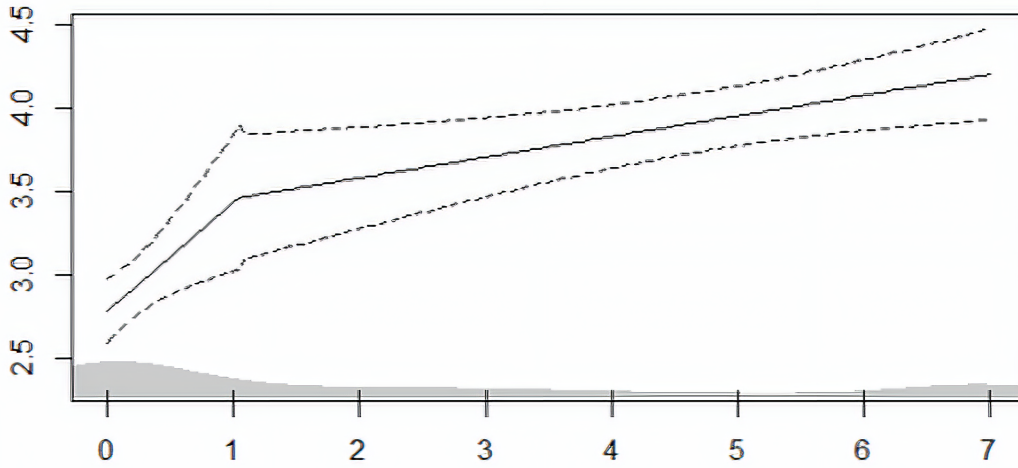


Figure (2). Segmented regression, breakpoint = 1.048, x-axis entrepreneurial engagement, y-axis effect of engagement on entrepreneurial intention.

5.3 Moderating effects of entrepreneurial engagement within TPB framework

In hypothesis (H1c), we postulated a moderating effect of entrepreneurial engagement on the relationship between TPB-antecedents and entrepreneurial intentions (the criterion). A series of mean difference t-tests were performed, using the mean values of the manifest variables of each scale to create the variables. The two groups (pre-breakpoint vs. post-breakpoint) differed in PBC ($t [432.2] = 10.1, p < 0.001, d=0.89$), ATT ($t [444.6] = 5.77, p < 0.001, d= 0.56$), SN ($t [465.8] = 8.54, p < 0.001, d= 0.74$), EI ($t [485.3] = 9.71, p < 0.001, d =0.84$), and university spin-off rewards ($t [505.2] = 2.53, p < 0.001, d= 0.21$). The respondents in the group pre-breakpoint had a higher TPB-values ($M_{PBC} = 3.67, SD_{PBC} = 1.54; M_{ATT} = 3.59, SD_{ATT} = 1.13; M_{SN} = 2.80, SD_{SN} = 1.52$) compared to individuals in the post-breakpoint group ($M_{PBC} = 4.89, SD_{PBC} = 1.26, M_{ATT} = 4.11, SD_{ATT} = 1.13; M_{SN} = 3.86, SD_{SN} = 1.40$).

With regard to the control variables, we found group differences in age ($t[517.31] = 3.5, p < 0.001, d = 0.30$), occupational status (Professor: No/Yes, ; $\chi^2[1] = 4.33, p < 0.001$; scientific assistants: No/Yes, ; $\chi^2[1] = 7.18, p < 0.01$); and gender ($\chi^2[1] = 17.87, p < 0.001$) between the groups. Respondents in the pre-breakpoint group were slightly younger ($M = 42.6, SD = 10.3$) than the post-breakpoint group ($M = 45.7, SD = 10.8$). Additionally, in the post-breakpoint group, respondents were more likely to be male and professor. However, we did not find group differences in terms of employment level ($t [530.28] = 1.16, n.s.$), discipline ($\chi^2 [1] = 1.13, n.s.$) or nationality ($\chi^2 [1] = 0.01, n.s.$).

The results of the multi-group model show that in both groups, a different magnitude of EI variance was explained by the model (27.9% and 44.2%). Per our expectations, the TPB- antecedents positively explained EI (PBC: $\beta = 0.19, p < 0.05$; ATT: $\beta = 0.36, p < 0.001$; SN: $\beta = 0.17, p < 0.05$) within the pre-breakpoint group. In the post-breakpoint group, intention was significantly explained by ATT ($\beta = 0.41, p < 0.001$) and PBC ($\beta = 0.39, p < 0.001$), but not by SN ($\beta = -0.01, p = 0.92$). The results indicate that in the post-breakpoint group, the TPB antecedents PBC and ATT gain influence on the EI.

Next, we tested whether the group differences between the paths of TPB-variables and EI were statistically significant. We first tested a model that introduced no equality constraints as a function of order. This unconstrained model was tested against a model in which all factor loadings and all regression paths and covariance between latent variables were constrained to be equal across groups. Imposing equality constraints on the regression paths and covariance did not cause a significant reduction in model fit ($\Delta SBS-\chi^2(18) = 23.78, n.s.$), suggesting measurement invariance across both groups. Per the hypothesis (H1c), we tested the unconstrained model using three models in which one of the three paths of TPB variables to intentions was always set equal across both groups (see Table 5). We found evidence of a moderation effect in the case of the ATT-EI path and the PBC-EI path (as indicated by the significant $\Delta SBS-\chi^2$); thus, the hypothesis (H1c) was partially supported.

Table 5. Fit indices and χ^2 difference test for moderation effect of entrepreneurial engagement (Pre-/post breakpoint). Note: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.5$.

Models	χ^2	df	CFI	RMSEA	$\Delta SBS - \chi^2$	Δdf
Unconstrained model	621.77	426	0.929	0.047		
ATT \rightarrow EI set equal across groups	626.25	427	0.927	0.048	5.904*	1
PBC \rightarrow EI set equal across groups	634.85	427	0.924	0.049	12.824***	1
SN \rightarrow EI set equal across groups	623.67	427	0.929	0.047	1.412 n.s.	1
ER \rightarrow SN set equal across groups	622.22	427	0.929	0.047	0.383 n.s.	1
ER \rightarrow ATT set equal across groups	622.53	427	0.929	0.047	0.758 n.s.	1

5.4 University entrepreneurial rewards

In hypothesis (H2a-b), we expected an indirect effect of the university spin-off rewards on EI, mediated by AT and SN. The SEM depicted in Figure 1 displayed a positive effect of spin-off rewards on SN ($\beta = 0.31, p < 0.01$) and ATT ($\beta = 0.23, p < 0.01$). Our additional control variable, the reward for commercialization for conducting contract research, had no positive effect on SN ($\beta = 0.15, p = 0.07$) or ATT ($\beta = 0.01, p = 0.90$). Thus, only university spin-off rewards and not commercialization rewards met essential criteria to serve as mediators [83] and were used for the following mediation analysis.

Regarding the mediation analysis, the overall model for SN and ATT as mediators between spin-off rewards and EI. The mediation hypothesis was supported by a significant indirect effect via ATT and SN on intention ($\beta_{ATT} = 0.10; p < 0.001$), which showed a possible range between $CI_{0.95} = 0.07, 0.17$, and via SN on intention ($\beta_{SN} = 0.07; p < 0.001$) showing a possible range between $CI_{0.95} = 0.04, 0.13$ ($R^2_{TotalMed} = 0.27$). SN and ATT mediated the relationship between university spin-off rewards and EI ($\beta_{Total} = 0.32; p < 0.001, \beta_{Direct} = 0.15; p < 0.01$), providing support for the hypothesis (H2a-b).

In hypothesis (H2c-d), we expected a moderating effect of entrepreneurial engagement on the relationship between spin-off rewards and AT and SN. To test the hypotheses, the multi-group SEM analysis, as previously presented in *Table 5* was used. Therefore, we tested the unconstrained model using two models in which one of the reward paths SN and ATT was, in both cases, set equal across both groups. We found no evidence of a moderation effect in either the ER-ATT path or the ER-SN path.

6. DISCUSSION

This article is an initial step towards evaluating the influence of entrepreneurial engagement on the cognitive processes of potential entrepreneurs in the context of the TPB. The present study intended to uncover the effects of entrepreneurial engagement in the formation of entrepreneurial (goal-) intention. While this study sought to join together the broader research domain towards overcoming the differentiation of intention-based and action-based entrepreneurship research - more importantly, it responded to calls in the entrepreneurship literature. For example, Fayolle *et al.* [9] proposed a rethinking of the theoretical and conceptual use of intention in the phase preceding the launch of a new business. The present study builds on MAP to explain the influence of motivational factors on entrepreneurial intention. We investigated entrepreneurial decision-making in the academic field using a sample of Swiss scientists from various applied disciplines.

The concept of EI is an important instrument for investigating entrepreneurial conditions in the phase preceding the launch of a new business that favor subsequent entrepreneurial behavior. This study began to elucidate the deeper cognitive mechanisms that go beyond the predictors of the theory of planned behavior by adopting an action perspective. Building on the TPB and MAP models, we theorized a positive effect of entrepreneurial engagement, which extended beyond the antecedents of TPB (e.g., attitudes, perceived behavioral control, and social norms) to explain EI. Furthermore, we investigated whether EI increased during the entrepreneurial process or whether the growth for EI peaked per context of a Rubicon crossing. Due to a changing cognitive mindset when moving into implementation, we investigated whether entrepreneurial engagement moderates the relationship between TPB predictors and entrepreneurial intention.

Briefly, the results of our empirical analyses demonstrated that ENG positively impacts EI beyond the TPB-antecedents. However, a segmented regression revealed that EI growth significantly changed after implementing the first gestation action, suggesting the existence of an entrepreneurial Rubicon-like demarcation during the pre-start-up phase. Furthermore, we found supporting evidence (with exception of SN) for our hypothesis that ENG moderates the relationship between TPB-antecedents and EI (the criterion); such that pre-Rubicon the relationship is weaker and post-Rubicon the relationship is stronger. However, no moderating effect between SN and EI was evident in our data. These findings in the first part of our study, constructed an improved picture of EI before progressing into part two of the study.

Since we drew on cross-sectional data from the field of academic entrepreneurship, we further investigated whether the effects of university entrepreneurial rewards on TPB- antecedents vary after the transition to an action phase. While our data supported evidence of a positive indirect effect of entrepreneurial

university rewards mediated via social norms and attitudes on the EI, we found no further moderating effect pre-/post-Rubicon for the relationships between entrepreneurial rewards and social norms, as well as rewards and attitudes.

6.1 Implications and further research

For three decades, scholars centered on EI rather than entrepreneurial performance when examining the role of personal and environmental drivers and barriers of entrepreneurship [9, 27]. The same trend is evident in the emerging field of academic entrepreneurship [11, 25, 52, 84]. Implications of the current study are twofold - theoretical and practical. From a theoretical point of view, the conceptualization herein enlarged the existing body of intention-based entrepreneurship research [11, 84, 85].

Consistent with prior findings [11, 24], our results demonstrated that all TPB-antecedents positively predicted EI. When controlling for ENG, the TPB-construct ATT revealed the greatest effect on EI, which also agreed with a prior meta-analysis [21]. We hypothesized engagement as an additional predictor of EI. Our analysis revealed a unique primary effect of engagement on EI, beyond the TPB antecedents and control variables, as well as a significant positive effect of engagement on the TPB-antecedents. Our data confirmed that scientists engaged in entrepreneurial implementation exhibited higher values of EI, and higher values of ATT, PBC, and SN. Consistent with 28 [28], ENG also contributed to the variance elucidation of the EI beyond the TPB antecedents and, thus, represents a meaningful predictor of intention.

Second, our study expands the intention-based literature by uncovering the cognitive mechanism during the transition from a *motivational* to an *actional phase*. The Rubicon model, based on MAP, postulates a change of the cognitive mindset, referred to as the crossing of the Rubicon when passing from a *motivational* to a *volitional phase* [3]. The crossing of the Rubicon relates to the fact that the gathered information positively contributed to the perceived desirability of an entrepreneurial behavior in the *motivational phase* such that individuals take initial gestation action for goal achievement. We hypothesized EI growth to peak per the context of a Rubicon demarcation, or the point when individuals start to engage in implementation. The results of our segmented regression confirmed that EI growth decreased after initiating the first gestation action. Although our analysis indicated that EI growth during the *motivation phase* was higher than EI growth after initiating gestation action, and despite being lower, it was still positively significant.

Scholars have noted, that numerous barriers must be overcome and micro-tasks completed before entrepreneurial goals can be turned into action [86], and that some people may stay for a long time in the so-called “still-trying phase” (87). However, the long-term goal is constantly updated by carrying out micro-tasks for implementation. In turn, an increase in goal intention during the implementation phase is likely, as the person becomes more committed to their entrepreneurial goals by constantly updating the desirability and feasibility of the overlaying goals [37]. Frese [86] refers to the concept of loss aversion (i.e., the prospective theory, 88), explained that individuals, after starting to invest, or in this case after performing a certain number of gestation actions, become tied to the achievement of goals. Our data

showed a difference for the TPB-predictors before and after an EI-growth breakpoint. In particular, an increase in the values of the TPB-antecedents, can be interpreted as a reaction to cognitive dissonance after decision-making (i.e., post-decision dissonance effect; 89). Consequently, individuals are selective about new information and are more likely to focus on the information that supports their decisions retrospectively.

While our findings agree with the theoretical assumption of the MAP, they contrast with prior entrepreneurship research, which assumed that a few initial gestation actions were necessary to gather relevant information for decision-making in the motivational phase [1]. While we assumed, per the MAP, a Rubicon demarcation after the first gestation action, Delanoë-Gueguen & Fayolle [1] found a Rubicon demarcation after three gestation actions. The reason for these divergences is caused by the deviating contexts and analytical methods to determine the Rubicon. Based on longitudinal data and moderation-analysis, Delanoë-Gueguen & Fayolle [1] assumed that the entrepreneurial Rubicon demarcation is the moment when goal-intention loses the predictive power to explain behavior. However, per the MAP, our data showed that the Rubicon demarcation is likely to be the tipping point when individuals become involved in implementation behavior and thus biased proponents of their projects. We urge future research to test our operationalization through the application of longitudinal laboratory data in order to investigate cognitive mechanisms related to the demarcation of an entrepreneurial Rubicon.

Third, in response to the mixed, measured research of Delanoë-Gueguen & Fayolle [1], we theorized that the motivational mechanisms described by TPB vary after the transition to implementation. They [1] conducted interviews with prospective and nascent entrepreneurs and found cognitive mechanisms in the motivation phase to differ from those in the *implementation phase*. In particular, the authors noted that in the *motivation phase*, difficulties were presented in an abstract and unspecific way, whereas in an *action phase*, participants reported more realistically about needs and current tasks.

We theorized an interactive effect of ENG and TPB-antecedents to emerge in the model. To prove the hypothesis, we drew on our prior findings (the demarcation of an entrepreneurial Rubicon) and constructed two groups (pre-and post-breakpoint of EI-growth). In contrast to the pre-Rubicon group, the post-Rubicon group contained all participants that reported being involved in implementation. SEM-multi-group analysis revealed a positive moderation effect of the TPB-intentions link. Across both groups, the “routes” toward the formation of EI were different. Notably, our moderation test showed that the effects of perceived behavioral control and attitudes on EI differed significantly between both groups. While the effect of SN on the EI was not moderated, PBC and ATT gained importance for predicting EI among participants in the post-Rubicon group.

Prior research found PBC to be a strong predictor of entrepreneurial performance [27]. In a recently published interview, Ajzen assumed that complex goals such as entrepreneurial activities have to be viewed from a micro-task perspective, which in turn requires implementation intention [90]. By identifying higher means of PBC in the advanced entrepreneurial process, our results confirm that the participants developed the necessary skills to initiate the implementation. These findings are in line with research from social psychology, which shows that participants in an implemental mindset exhibit a higher level of self-

efficacy [39] and more risk-taking behavior [40]. Our data demonstrated that during the entrepreneurial process, ATT and PBC gained importance as a direct predictor of EI.

In the second part of our study, we drew on institutional theory (North 1990) to analyse the influence of environmental factors, namely entrepreneurial rewards on the TPB-antecedents, to indirectly predict EI. While prior research found a direct effect of university rewards on EI [13], we tested for a mediation effect using SN and ATT as mediators. The results indicated that entrepreneurial rewards indirectly affect EI. Then we investigated whether the effect of rewards on SN and ATT was moderated by entrepreneurial engagement. We argued that in the *motivational phase*, rewards serve as the initial inspiration for hypothetical behavior and, therefore, directly influenced EI. Our results are consistent with [47], who claimed that social prestige and financial rewards are important incentives to foster academic entrepreneurship.

6.2 The influence of entrepreneurial engagement on intention

In line with Krueger [91], our study intended to re-fuel the discussion concerning the importance of EI in entrepreneurship research. In entrepreneurship research, intentions are considered a major immediate antecedent of behavior. Entrepreneurship research [1, 5, 6] recently introduced MAP into the field to predict entrepreneurial action. The application of action-oriented approaches has several advantages.

First, it supports investigating the entire entrepreneurial process from intention-formation to implementation of actions. Various endogenous and exogenous determinants can be investigated against the background of the individual entrepreneurial process, and practical consequences can be derived more precisely. Therefore, the application of the MAP to study endogenous and exogenous determinants of entrepreneurial action presents an intriguing avenue for future research.

Second, MAP allows for a distinction to be made between a goal and implementation intentions, which leads to a precise prediction of future entrepreneurial behavior [6]; though this distinction regarding intentions is rarely applied in entrepreneurship research. A recently published longitudinal study demonstrated that implementation intention mediated the relationship between goal intention and actual performance. However, goal intention moderated the relationship of implementation intention on performance [6]. Implementation intention requires effective planning and concerns people following the enactment of a goal-directed behaviors [7]). Moreover, strong effects of if-then plans related to implementation intention, only emerge when participants hold strong respective goal intention [92], suggesting the importance of goal-intention in the pre-launch phase of a new business. Future research is needed to examine whether cognitive strategies differ in detail at critical moments within the entrepreneurial process, before and after engaging in implementation. Future research could also examine the role of team processes related to the formation of goal-and implementation intention.

Our study contributed to the existing intention-based research by emphasizing that engagement is a significant predictor of EI, as well as of the TPB-antecedents. Academic entrepreneurship research, which applied intention-based approaches, has focused almost exclusively on the notion of EI by referring to goal-intention (e.g., as part of the TPB), which directs the focus towards only the motivational aspects of EI, without considering whether participants are in the *motivation* or *implementation phase*. However,

our results highlighted that the transition from a motivational to a volitional stage (i.e., the crossing of the Rubicon) is associated with a change in the cognitive mindset. More research is required to understand the needs related to cognitive mechanisms in the implementation phase among scientists. Scholars using the TPB [8] should critically rethink the role of EI when examining conditions for entrepreneurial behavior. Our study encourages scholars to consider whether participants are in the pre-decisional phase (e.g., aspiring entrepreneurs) or the actional phase (e.g., nascent entrepreneurs focused on implementation). Overall, we urge future research to follow the new trend in entrepreneurship to apply action-related approaches [93].

Our study has important practical implications for policymakers and entrepreneurs. For practitioners, the results highlighted that environmental conditions, namely spin-off rewards, positively influence the perception of desirability along the entrepreneurial process. In line with prior research [11, 16, 94], universities need to develop instruments to support entrepreneurial decision-making according to the individual founding process. Individual information processing and specific needs, in terms of support, is altered by the individual entrepreneurial progress.

LIMITATIONS AND RECOMMENDATIONS

We acknowledge that our study is not free of caveats and that the limitations of this study offer opportunities for future research. Firstly, cross-sectional approaches are subject to criticism since there are no controls for individual-level effects. Our results should be verified with longitudinal data to further investigate an entrepreneurial Rubicon, and estimate the non-linear threshold effect we postulate. Second, the current study sought to measure the status of entrepreneurial progress as the sum of gestation actions. The measurement of entrepreneurial engagement should be validated using different samples and contexts. Different gestation actions require different amounts of time and effort (e.g., informing friends and family about the project vs. developing a prototype) and, therefore, individual gestation actions are hardly comparable and cannot be aggregated. Furthermore, the content of gestation actions is hardly transferable to all areas of entrepreneurship. Future research must rely on measures that address this problem by not referring to specific actions. For example, by applying a 10-point-Likert-scale and asking: “If you are currently in the process of founding your own company, where would you place yourself or your team in this process?” and provides options such as 1: “Not existing/Start-Up idea” to 10: “The Company has already been founded.”

Third, more exogenous factors, such as formal factors per Kirby et al. [44], should be included in the analysis to contrast our analysis, considering entrepreneurial rewards. As formal factors tend to address concrete problems in the implementation phase, we would expect formal factors to be more important in the (pre)-action phase. Furthermore, our study has contextual limitations as our sample contained very few women and scientists from Swiss UASs. These individuals also have a very high level of entrepreneurial experience, which is not unusual for UAS in Switzerland, as previous research shows [55]. We urge future research to test different contexts, including cross-country and multi-discipline comparisons.

CONCLUSION

Using academic entrepreneurship as an intended career choice [47, 95], our insights highlighted the need for targeted and personalized support for spin-off creation. Universities should offer individual-adaptable support in the form of coaching and training. Therefore, this study supports the call to analyze more action-relevant factors when examining the framework conditions for venture creation [9]. Our results increased the available knowledge concerning entrepreneurship and supports the need for future research to control for entrepreneurial engagement while addressing EI. However, to guide policymakers, much more research untangling the cognitive mechanisms behind the business implementation is required.

LIST OF ABBREVIATIONS

ATT	Attitudes towards academic entrepreneurship
EI	Entrepreneurial intentions
ENG	Entrepreneurial engagement
ER	Entrepreneurial rewards
MAP	Mindset theory of action phases
PBC	Perceived behavioral control
TPB	Theory of planned behavior
SN	Social norms
SEM	Structural equalization modeling
STEM	Natural and technical sciences
UAS	Universities of applied sciences

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

Not applicable.

HUMAN AND ANIMAL RIGHTS

Not applicable.

CONSENT FOR PUBLICATION

Informed consent was obtained from all the participants when they were enrolled.

AVAILABILITY OF DATA AND MATERIALS

The data that support the findings of this study are available from the corresponding author upon request.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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Liebe Kollegin, lieber Kollege

Wie erleben Sie Ihre Arbeitsbedingungen im Bereich F&E? Unterstützt Sie Ihre Hochschule ausreichend bei der Umsetzung Ihrer Erkenntnisse und Ideen? Wie könnte Ihre Hochschule Sie in Zukunft besser unterstützen?

Bitte beantworten Sie die nachfolgenden Fragen möglichst vollständig. Aufgrund der Filterfragen werden weniger als 15min für die Befragung benötigt.

Ihre Angaben werden streng vertraulich und nach den neuesten Datenschutzrichtlinien behandelt. Ein Rückschluss auf Personen ist nicht möglich.

Haben Sie noch Fragen? Dann berät Sie gerne unser Forschungsteam.

**Fachhochschule Nordwestschweiz
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ERSTE INFORMATIONEN ZUR IHRER PERSON

1-- Bitte geben Sie Ihr Geschlecht an: *Männlich* *Weiblich*

2-- Bitte geben Sie Ihren Jahrgang an:

3-- Bitte geben Sie Ihre Nationalität(en) an: *Schweiz* *Andere:* _____

4-- Bitte wählen Sie Ihren höchsten Bildungsabschluss aus:

- Maturität (Gymnasial, Berufs- oder Fachmaturität)
- Eidg. Fachausweis / höhere Fachschule / eidg. Diplom
- Bachelor (FH, Universität, ETH)
- Master (FH, Universität, ETH)
- PhD / Doktorat (Universität, ETH)
- Habilitation
- Andere, nämlich:

5-- An welcher Fachhochschule sind Sie hauptsächlich tätig?

Zum Beispiel: Fachhochschule Nordwestschweiz, Hochschule für Angewandte Psychologie

6-- Bitte wählen Sie Ihre Personalkategorie aus.

- Dozierende mit Führungsverantwortung
- Dozierende ohne Führungsverantwortung
- Assistierende/ & wissenschaftliche Mitarbeitende
- Direktion, admin & technisches Personal
- Andere, nämlich:

7-- Bitte geben Sie Ihren Anstellungsgrad an (laut Anstellungsvertrag).

Prozentangabe: _____ %

8-- Besitzen Sie einen zeitlich befristeten Arbeitsvertrag?

- Ja Nein

TEIL A - ZU IHRER ARBEITSSITUATION

9-- Wie beurteilen Sie die folgenden Aussagen?

	Trifft überhaupt nicht zu	Trifft nicht zu	Trifft eher nicht zu	Teils, teils	Trifft eher zu	Trifft zu	Trifft voll und ganz zu
Ich identifiziere mich sehr mit Kolleginnen und Kollegen in der Hochschule.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich bin sehr zufrieden mit den Karrieremöglichkeiten an meiner Hochschule.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insgesamt bin ich mit meiner aktuellen Stelle sehr zufrieden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich fühle mich persönlich als Teil der Gruppe am Institut/Fachbereich	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insgesamt bin ich mit meinem Gehalt sehr zufrieden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insgesamt bin ich sehr zufrieden mit der Führungsweise meines/r Vorgesetzten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich fühle mich meinen Kollegen und Kolleginnen am Arbeitsplatz sehr verbunden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Insgesamt bin ich sehr zufrieden mit dem Aufgabenspektrum in meiner Anstellung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10-- Haben Sie aktuell neben Ihrer beruflichen Tätigkeit an der Hochschule noch weitere relevante Verpflichtungen?

- Betreuung eines/mehrerer Kinder
- Pflege von Verwandten/Freunden
- Ehrenamtliche/politische Tätigkeit(en)
- Weiterbildung/ Qualifikation
- Anderes, nämlich _____

11-- In welchen Leistungsbereichen waren Sie im Jahr 2018 an Ihrer Hochschule tätig?

Bitte schätzen Sie den Umfang Ihrer Tätigkeit in Prozentwerten ein (gemessen an 100%):

PROZENTWERTE			
Ausbildung (BA/MA)	Forschung & Entwicklung	Weiterbildung	Dienstleistung
.....%%%%

12-- Von welchen Akteuren/Institutionen wurde Ihre Tätigkeit in Forschung & Entwicklung im Jahr 2018 (hauptsächlich) finanziert? Mehrfachantworten möglich.

- Innosuisse
- Budget der Hochschule/Departement
- EU-Programme
- Stiftungen
- SNF
- Auftragsforschung vorwiegend privater Unternehmen
- Auftragsforschung vorwiegend der öffentlichen Hand
- Andere, nämlich:

13-- Die Ziele einer Hochschule im Bereich des Wissenstransfers können sehr unterschiedlich sein. Bitte geben Sie hier an, für welche Tätigkeiten Sie an Ihrer Hochschule (sozial, finanziell) Anerkennung erhalten.

Bitte wählen Sie die am ehesten zutreffende Antwort aus.

	Trifft überhaupt nicht zu	Trifft nicht zu	Trifft eher nicht zu	Teils, teils	Trifft eher zu	Trifft zu	Trifft voll und ganz zu
Anzahl und Qualität der Publikationen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beteiligung an Beratungen/Dienstleistungen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beteiligung an Auftragsforschung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beteiligung an Patentierungen und Lizenzierungen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Leistungen in der Lehrtätigkeit (gute Bewertung durch Studierende)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beteiligung an Spin-off-Gründungen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Drittmittelakquise (SNF, EU Programme etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Weiterbildung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Erbringen von wissenschaftlichen Dienstleistungen für Privatunternehmen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Anderes, nämlich:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

SPIN-OFF/START-UP*: Als Spin-offs werden an einer Hochschule angesiedelte Gründungsprojekte bezeichnet, die auf geistigem Eigentum beruhen, das an der Hochschule erarbeitet worden ist. Als Start-ups werden Gründungsprojekte von Studierenden oder Mitarbeitenden der Hochschule bezeichnet, die in unterschiedlicher Form und in unterschiedlichem Umfang Unterstützung von der Hochschule erhalten haben (z.B. i.S. von Coaching, Arbeitsinfrastrukturen etc.).

14-- In welche der folgenden Aktivitäten flossen Ihre Erkenntnisse aus Forschung & Entwicklung im Jahr 2018 [hauptsächlich] ein? Bitte weisen Sie den folgenden Aktivitäten einen Rang von 1 – «Sehr häufig» bis 8 – «Sehr selten» zu. Nicht vorhandene Aktivitäten bitte nicht anklicken.

	Rang Nummer
Publikationen (auch in Vorbereitung)	<input type="checkbox"/>
Auftragsforschung	<input type="checkbox"/>
Start-Up/Spin-Off - Aktivitäten	<input type="checkbox"/>
Anmeldung von Patenten und Lizenzen	<input type="checkbox"/>
Lehre (BA/MA)	<input type="checkbox"/>
Entwicklung von Weiterbildungsangeboten	<input type="checkbox"/>
Ausstellungen, Vorträge und Konferenzen	<input type="checkbox"/>
Anderes, nämlich: _____	<input type="checkbox"/>

TEIL B - ZU IHREN PERSÖNLICHEN ERFAHRUNGEN MIT WISSENSTRANSFER

15-- Wie wahrscheinlich ist es, dass Sie Ihre Erkenntnisse aus F&E in folgende Aktivitäten umsetzen? Bitte wählen Sie die am ehesten zutreffende Antwort aus.

	Trifft über- haupt nicht zu	Trifft nicht zu	Trifft eher nicht zu	Teils, teils	Trifft eher zu	Trifft zu	Trifft voll und ganz zu
Sie haben die feste Absicht, eines Tages Unternehmer/in zu werden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sie werden ein Unternehmen (Start-up/Spin-off), basierend auf Ideen, Kompetenzen/Technologien, die an der Hochschule entwickelt wurden, gründen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sie werden einige Ihrer Entwicklungen für die Industrie lizenzieren lassen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sie werden verstärkt Auftragsforschung für die Industrie betreiben.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sie werden an der Gründung eines Unternehmens (Spin-off/Start-up) zur Vermarktung Ihrer Forschung teilnehmen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sie werden alles tun, was nötig ist, um Unternehmer/in zu werden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sie werden Inhaber/in von Rechten geistigen Eigentums (IP) werden (Patent, Copyright, Brands).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sie werden sich an Beratungstätigkeiten (Consulting) beteiligen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sie werden Patente als Ergebnis Ihrer Forschung anmelden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

16-- Haben Sie bereits ein eigenes Unternehmen gegründet? Ja Nein

(17)-- Ist dieses Unternehmen derzeit aktiv? Ja Nein

(18)-- Haben Sie schon einmal daran gedacht, Unternehmer/in zu werden? Ja Nein

19-- Wenn Sie an Kollegen/innen denken, deren berufliche Meinung Ihnen besonders wichtig erscheint, haben diese bereits

	Niemand	Wenige	Einige	Fast Alle	Alle	Vorwiegend Frauen	Vorwiegend Männer	Ausgeglichen
Ein Unternehmen basierend auf Forschung gegründet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ein Patent und/oder eine Technologie-Lizenz angemeldet?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Beratungstätigkeiten wahrgenommen?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sich an Auftragsforschung für die Industrie beteiligt?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

20-- Eine Beteiligung an der Entwicklung einer Geschäftsidee zur Vermarktung meiner eigenen Forschung ist meiner Ansicht nach ...

uninteressant interessant

nicht attraktiv attraktiv

langweilig spannend

Zeitverschwendung sehr viel Investition von Zeit wert

21-- In welchem Feld haben Sie oder würden Sie am ehesten Ihr Unternehmen gründen

- ICT (Internet, mobile, etc.)
- Life sciences (Biotech, usw.)
- Cleantech (energy, water, usw.)
- Cultural entrepreneurship
- Green/ environmental entrepreneurship
- Social entrepreneurship
- Hightech (automobil, electronics, etc.)
- Finance
- Gesundheit/Medtech
- Andere, nämlich:

TEIL C - ZU DEN GRÜNDUNGSANGEBOTEN UND MÖGLICHKEITEN AN IHRER

22-- Bitte lesen Sie die unten aufgeführten Aussagen durch und beurteilen Sie, in welchem Ausmass diese auf Ihre Hochschule zutreffen.

	Trifft überhaupt nicht zu	Trifft eher nicht zu	Teils, teils	Trifft eher zu	Trifft voll Und ganz zu	Nicht bekannt
Ein hoher Grad an Expertise für Ausgründungen ist an der Hochschule vorhanden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
An meiner Hochschule ist Gründen in erster Linie ein Thema für Männer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die Vereinbarkeit von Beruf und Familie für Gründungsprojekte wird gefördert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vorgesetzte unterstützen aktiv Ausgründungsprojekte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Kollegen/ Kolleginnen unterstützen aktiv Ausgründungsprojekte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die Gründungsmotivation meines / meiner Vorgesetzten ist hoch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Zielvereinbarungen schliessen Spin-Off-Aktivitäten ein	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
An unserer Hochschule sind Regelungen zur Gründungen von Spin-offs vorhanden	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spin-Off-Aktivitäten behindern Aktivitäten in der Forschung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Spin-Off-Aktivitäten behindern Aktivitäten in der Lehre	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Start-up/Spin-off-Projekte von Studierenden werden stärker als von Mitarbeitenden der Hochschule gefördert	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Männer haben es bei uns leichter zu gründen als Frauen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

23-- Wenn Sie bereits dabei sind ein eigenes Unternehmen zu gründen. Wo würden Sie sich oder Ihr Team in diesem Prozess verorten? Bitte wählen Sie die am ehesten zutreffende Antwort aus.

- [1] keine Gründungsidee vorhanden
- [2]
- [3]
- [4]
- [5]
- [6]
- [7]
- [8]
- [9]
- [10] Das Unternehmen wurde bereits gegründet

TEIL D - FRAGEN ZUM GEGRÜNDETEN UNTERNEHMEN (START-UP/SPIN-OFF)

24-- Bitte lesen Sie die unten aufgeführten Aussagen durch und beurteilen Sie, in welchem Ausmass diese auf Ihre Hochschule zutreffen.

	Trifft überhaupt nicht zu	Trifft eher nicht zu	Teils, teils	Trifft eher zu	Trifft voll Und ganz zu	Nicht bekannt
Erfolgreiche Gründer/innen sind in der Hochschule bekannt und geniessen eine gute Reputation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die Hochschule sensibilisiert für eigene Gründungsprojekte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die Hochschule ist ein wichtiger Ansprechpartner für laufende Gründungsaktivitäten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die Hochschule informiert über Veranstaltungen u. – Wettbewerbe für Gründungsinteressierte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Es bestehen hohe bürokratische Hürden für Gründungen an meiner Hochschule	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ausgründungen sind als Karriereoption an der Hochschule denkbar	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gründungserfahrung wird in Berufungsverfahren geschätzt	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hochschulen gehen bei der Erfüllung der Bedürfnisse von Wirtschaft und Industrie zu weit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die Hochschule bietet gute Möglichkeiten der Weiterbildung an, damit Forschende ihr unternehmerisches Potenzial entwickeln können	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

25-- Welche der folgenden Personen sind der Meinung, dass Sie Ihre Forschung durch die Gründung eines eigenen Unternehmens verwerten sollten?

Bitte wählen Sie die am ehesten zutreffende Antwort aus.

	Trifft ganz und gar nicht zu	Trifft nicht zu	Trifft eher nicht zu	Teils, teils	Trifft eher zu	Trifft eher zu	Trifft ganz und gar zu
Meine (Arbeits-)Kollegen/Kolleginnen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mein Supervisor/in bzw. Vorgesetzten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Familie und Freunde/innen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Andere, nämlich:	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

26-- Wie schätzen Sie das Ausmass der Förderung von Gründungsaktivitäten an Ihrer Hochschule ein? Das Ausmass der Unterstützung ...

Bitte wählen Sie die am ehesten zutreffende Antwort aus und geben Sie bitte auch jeweils ganz rechts an, ob Sie die jeweiligen Angebote bereits nutzen bzw. ob diese Ihnen evtl. nicht bekannt sind.

	Sehr gering	Gering	Teils, Teils	Eher gross	Sehr gross	Selbst genutzt	Nicht Bekannt
Bei der Identifikation von Businessideen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bei der Bewertung von Geschäftsideen und -konzepten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Durch Mentoring und Beratung für Gründungsprojekte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bei Vermittlung von Gründungsschreibungen / -wettbewerben	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Durch Freistellung (unbezahlt) für eigene Gründungsprojekte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Durch Freistellung (bezahlt) für eigene Gründungsprojekte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bei der Suche nach geeigneten Co-Gründern/Gründerinnen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bei der Finanzierung in der Phase von «business creation», z.B. Finanzierung von Prototypen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bei der Finanzierung in der «growth phase», z.B. beim Finden von Investoren etc.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Für das Team-Building von Co-Gründern/Gründerinnen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Durch Coaching-Angebote bei Teamproblemen/Konflikten	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Für die Nutzung von Forschungsinfrastruktur	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Für die Entwicklung eines Prototypen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Durch das Überlassen von gewerblichen Schutzrechten (IP und Lizenzen) zu günstigen Konditionen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Durch einen Zugang zu Inkubatoren und Science Parks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

27-- Wie viele Personen umfasst Ihr Gründungsteam? _____

28-- Haben Sie ein Start-up/Spin-off in Ihrer Freizeit (vs. Arbeitszeit) gegründet?

Ja Nein

29-- Richtet sich Ihr Geschäftsmodell auf den Bereich "Produktentwicklung" oder "Services und Consulting"?

- Produktentwicklung
 Services & Consulting
 Sowohl Produktentwicklung als auch Services & Consulting

30-- Basiert Ihre Ausgründungsidee auf einem an der Hochschule (von Ihnen) mitentwickelten Patent bzw. einer Lizenz ?

Ja Nein Teilweise

31-- Besteht Ihr Gründungsteam aus Kollegen/innen Ihrer Hochschule?

Ja Nein Teilweise

32-- Haben Sie berufliche Erfahrungen im Privatsektor?

Gar keine Erfahrung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sehr viel Erfahrung
Sehr negative Erfahrung	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Sehr positive Erfahrung

33-- Gibt es in Ihrem Bekanntenkreis jemanden, der sich selbständig gemacht bzw. ein Start-up/Spin-off gegründet hat?

Ja Nein

34-- Haben Sie schon einmal für ein junges Unternehmen (Start-up/Spin-off) gearbeitet, an welchem Sie nicht als Gründer/in beteiligt waren?

Ja Nein

35-- Wann haben Sie Ihr Unternehmen gegründet? _____ z.B. 2010

36-- Welche Rechtsform hat Ihr (zukünftiges) Unternehmen?

- AG – Aktiengesellschaft
GmbH – Gesellschaft mit beschränkter Haftung
Kollektivgesellschaft KG
Einzelunternehmen
Verein
Anderes, nämlich:

37-- Wie viele Mitarbeitende sind in Ihrem Start-Up/Spin-Off zum jetzigen Zeitpunkt an-
gestellt? (ohne Co-Founder)

- Keine Mitarbeitenden
- 1 Mitarbeitende/r
- 2 -4 Mitarbeitende
- 5-10 Mitarbeitende
- > 10 Mitarbeitende

38-- Können Sie sich vorstellen in einem Gründungsteam mitzuwirken, welches von ei-
ner Frau geführt wird?

Ganz und Gar nicht Sehr

39-- Waren Ihre Eltern (bzw. ein Elternteil) selbständig bzw. hat ein Start-up/Spin-off
gegründet

- Ja Nein

40-- Falls Sie Mitarbeitende haben, wie viele davon sind Frauen?

In Prozent (%) : _____

41-- Haben Sie bereits einen Preis für Ihre Gründungsidee gewonnen?

- Ja Nein

42-- Haben Sie Ihre Gründung in einem Gründungszentrum /Inkubator /Accelerator
entwickelt?

- Ja Nein

43-- Der geplante Jahresumsatz für das laufende Jahr (2019) ist

- Etwa gleich wie im Jahr 2018
- Mehr als doppelt so hoch wie im
Jahr 2018
- Doppelt so hoch wie im Jahr 2018
- Es existiert noch kein Umsatz

44-- Welche der folgenden Schritte haben Sie bereits unternommen, um Ihr Unternehmen aufzubauen?

Vorbereiten eines Geschäftsmodells	<input type="checkbox"/>
Ich habe meine Freunde/innen oder Kollegen/innen schon darüber informiert, dass ich ein Unternehmen gründen werde	<input type="checkbox"/>
Vorbereiten eines Geschäftsplans	<input type="checkbox"/>
Finanzierungskontakte geknüpft	<input type="checkbox"/>
Kontakte mit Partnern/innen geknüpft (für die Unternehmensgründung notwendig)	<input type="checkbox"/>
Vollzeitbeschäftigung mit diesem Projekt	<input type="checkbox"/>
Suche nach öffentlicher Unterstützung (z. B. Innosuisse)	<input type="checkbox"/>
Mieten und/oder Einrichten von Geschäftsräumlichkeiten	<input type="checkbox"/>
Bedeutende Investition in die Entwicklung und/oder Herstellung von Produkten oder Dienstleistungen	<input type="checkbox"/>
Einholen von Informationen bezüglich der administrativen Formalitäten einer Unternehmensgründung	<input type="checkbox"/>
Treffen mit potenziellen Kunden/-innen	<input type="checkbox"/>
Registrierung eines Patents, Namens oder Markenzeichens	<input type="checkbox"/>
Einholen und Vorbereiten von spezifischen Informationen für potenzielle Investoren/-innen	<input type="checkbox"/>
Einholen von Ratschlägen von Fachkräften zur Umsetzung des Projekts	<input type="checkbox"/>
Sparguthaben, die in dieses Projekt investiert werden sollen	<input type="checkbox"/>
Prototypen entwickelt und realisiert	<input type="checkbox"/>
Produkt bereits am Markt lanciert	<input type="checkbox"/>
Externe Investoren/innen für Ihr Start-Up gefunden	<input type="checkbox"/>
Kunden/innen akquiriert	<input type="checkbox"/>

45-- Inwiefern stimmen Sie den folgenden Aussagen zu?

	Trifft überhaupt nicht zu	Trifft nicht zu	Trifft eher nicht zu	Teils, teils	Trifft eher zu	Trifft zu	Trifft voll Und ganz zu
Wenn ich versuchen würde, ein Unternehmen zu gründen, wäre ich bestimmt erfolgreich.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich bin in der Lage, den Gründungsprozess zu steuern.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich weiss, wie man ein unternehmerisches Projekt entwickelt.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich kenne die notwendigen praktischen Einzelheiten, um ein Unternehmen zu gründen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich probiere gerne neue und ungewöhnliche (untypische) Aktivitäten aus, die nicht risikoreich sind.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich habe bereits viele Kontakte und Netzwerke zu Praxispartnern (z.B. Industrie, Dienstleistung, Behörden etc.).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich werde ein Unternehmen (Start-up/Spin-off) mit Kollegen/innen an der Hochschule gründen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich werde alles daran setzen, ein eigenes Unternehmen zu gründen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

46-- Bitte geben Sie an, ob Sie sich dazu bereit fühlen bzw. fühlen würden, die unten aufgeführten Aufgaben wahrzunehmen.

	Trifft überhaupt nicht zu	Trifft nicht zu	Trifft eher nicht zu	Teils, teils	Trifft eher zu	Trifft zu	Trifft voll und ganz zu
Ein Brainstorming für eine neue Idee, für ein Produkt oder eine Dienstleistung durchführen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ein Produkt oder eine Dienstleistung konzipieren, das oder die Kundenbedürfnisse und -wünsche erfüllt.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Den Bedarf für ein neues Produkt oder eine neue Dienstleistung abschätzen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Einen konkurrenzfähigen Preis für ein neues Produkt oder eine neue Dienstleistung bestimmen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die Höhe von Start-up-/Spin-off-Mitteln und Arbeitskapital schätzen, die für die Gründung Ihres Unternehmens erforderlich sind.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Konzipieren einer effektiven Marketing-/Werbekampagne für ein neues Produkt oder eine neue Dienstleistung.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mitarbeitende in ihrem Unternehmen betreuen und leiten.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mitarbeitende für ihr Unternehmen zu rekrutieren.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aufgaben und Verantwortlichkeiten an Mitarbeitende in Ihrem Unternehmen delegieren.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mit den täglichen Probleme und Krisen in Ihrem Unternehmen wirksam fertig werden.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ihre Mitarbeitenden inspirieren, ermutigen und motivieren.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mitarbeitende für Ihr Unternehmen schulen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die Finanzbuchhaltung Ihres Unternehmens organisieren und führen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die Vermögenswerte Ihres Unternehmens verwalten.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die Jahresabschlüsse Ihres Unternehmens lesen und interpretieren.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Andere für Ihre Vision gewinnen und sie davon zu überzeugen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Networking – d.h. mit anderen Kontakte knüpfen und den Austausch pflegen.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ihre Geschäftsidee in Alltagssprache verständlich und präzise mündlich/schriftlich erläutern	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

TEIL F -- ZU IHREN EINSTELLUNGEN GEGENÜBER DEM THEMA GRÜNDEN

47-- Es gibt unterschiedliche Gründe unternehmerisch aktiv zu sein. Inwiefern stimmen Sie den folgenden Aussagen zu?

	Trifft über- haupt nicht zu	Trifft nicht zu	Trifft eher nicht zu	Teils, teils	Trifft eher zu	Trifft zu	Trifft voll Und ganz zu
Ich gehe gerne meinen eigenen Weg beim Erlernen neuer Dinge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich verfare und handle oft unkonventionell, wenn ich nach neuen Problemlösungen suche	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Für gewöhnlich handle ich vorausschauend und antizipiere Probleme, Bedürfnisse oder Veränderungen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In risikobehafteten Situationen agiere ich eher «kühn»	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Tendenziell plane ich bei Projekten voraus	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich ziehe es vor, Initiativen selbst in Projekten zu ergreifen statt zu warten, bis jemand anderes es tut	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meine Forschung inspiriert mich für eigene Gründungsprojekte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
In meiner jetzigen Tätigkeit kann ich selbst bestimmen, mit welchen Personen ich zusammenarbeite	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meine jetzige Tätigkeit gibt mir viel Freiheit und Unabhängigkeit bei der Planung und Durchführung der Arbeit	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich gehe gerne mutig vor, indem ich mich ins Unbekannte wage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ich bin bereit, viel Zeit und/oder Geld in etwas zu investieren, das einen hohen Ertrag bringen könnte	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Unternehmer/in zu sein, würde eine sehr hohe Autonomie mit sich bringen	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Der finanzielle Ertrag, den ich als Unternehmer/in erwirtschaften könnte, wäre sehr hoch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Die persönliche Befriedigung als Unternehmer/in wäre sehr hoch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meine Lebensqualität als Unternehmer/in wäre sehr hoch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meine Lebensqualität als Unternehmer/in wäre sehr hoch	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Wir danken Ihnen für Ihre Teilnahme!

Wären Sie auch an einem Interview zu dieser Thematik interessiert?
(Ihre EMAIL-Adresse wird in diesem Fall unabhängig von Ihren Daten gespeichert)



Haben Sie weitere Anregungen und Hinweise zum Thema oder zu
dieser Befragung? Dann können Sie diese hier notieren

