Gender-Specific Constraints on Academic Entrepreneurship and Engagement in Knowledge and Technology Transfer

Anna Sinell, Roda Müller-Wieland, and Antonia Muschner

> *"To be honest, setting up a spin-off is the greatest way to exploit a research result. The effort is extraordinary, which deters some. Probably a lot of colleagues here think, hey, you are founding a company – you might as well be planning a mission to the moon!"*
>
> A male scientist at a research institute
> and interview subject for this study

This article analyzes gender-specific constraints impacting scientists' engagement in knowledge and technology transfer and entrepreneurial activities at public research institutions in the fields of science, technology, engineering, and mathematics (STEM). To this end, we followed an exploratory case study approach and conducted qualitative, semi-structured interviews with 40 academic entrepreneurs. The analysis revealed constraints impacting scientists' active engagement in transfer and entrepreneurship on two levels. On the meta-level, we identified constraints related to: i) nationwide transfer culture and ii) funding guidelines and structures. On the operational level, we identified constraints related to: i) organizational strategies and practices; ii) organizational culture; and iii) individual attributes and attitudes. By analyzing gender differences among these constraints, the study contributes to an understanding of varying needs for gender-specific founding support programs. The study also derives several implications for managing transfer at research organizations.

Introduction

The promotion of innovation capacity is a key element in political strategy in developed countries. In this regard, new impulses for the development of technological and social innovation are expected from academia: research is not to be conducted for its own sake, rather it is to be transferred to other stakeholders of the innovation systems including industry, politics, and society in order to create an impact beyond the "ivory tower" of academia. Increasingly valued in political agenda setting and funding schemes, this knowledge and technology transfer has become imperative for institutions in academia in various national innovation systems in recent years (Acs et al., 2017; Carayannis & Campbell, 2009; Grimaldi et al., 2011; The Wissenschaftsrat, 2016). Knowledge and technology transfer – and academic entrepreneurship as a particular form of transfer – are valued as means of enhancing innovation capacity.

Despite their various benefits and the outlined political pressure, contemporary measures have fallen short of expectations (European Commission, 2017). In Germany, only 6% of newly founded companies constitute academic spin-offs, and this number has even decreased in the past decade (Braun-Thürmann et al., 2010; BMBF, 2017).

Among these academic entrepreneurs, only 10% are women (Best et al., 2016). Moreover, female scientists interact less often with industry (Link et al., 2007; Perkmann et al., 2013) and submit fewer patent applications (Haller et al., 2007). Therefore, research institutions need to develop new approaches and support services that meet the needs of all scientists in order to engage both men and women in transfer and entrepreneurial activities.

By addressing the gender gap and engaging more women in knowledge and technology transfer, such activities can be fostered both quantitatively and qualitatively.

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Promoting the participation of female scientists can lead to transfer outcomes that pursue different goals and address different markets. In the case of entrepreneurship, research has shown that female-led companies do not solely aim for quick commercial success but follow a financially sustainable strategy (Dalborg et al., 2012; Reichborn-Kjennerud & Svare, 2014). Women-led companies also differ in their objective – oftentimes they pursue a goal of solving societal challenges (Lortie et al., 2017). Looking at academic founders specifically, recent research confirms this tendency. Examining different motives of female and male academic entrepreneurs, Iffländer, Sinell, and Schraudner (in press) showed in their qualitative study that male scientists are more likely to be motivated by career-related benefits and the potential of capitalizing on their research, whereas female scientists are more likely to aim to solve a societal challenge and to foster the utilization of their research. Considering women as producers of innovation and thereby focusing on the inclusion of a specific group of people, this article contributes to the understanding of the "people dimension" of the suggested framework for inclusive innovation by Schillo and Robinson (2017).

Based on these observations, the article aims to shed light on reasons for insufficient innovation capacity in Germany. We therefore analyze the following research questions:

- *What constraints prevent scientists from engaging in knowledge and technology transfer and entrepreneurial activities at public research institutions in STEM fields?*
- *Do women and men face different constraints that impact their engagement in transfer activities?*

We thereby aim to derive implications for practice to help overcome and reduce such constraints and thus foster innovation and technology transfer at research institutions.

In what follows, we review existing research on constraints and factors influencing the formation of academic spin-offs by scientists. We then present and discuss our findings on constraints in STEM fields of German academia.

Factors Impacting Knowledge and Technology Transfer and Entrepreneurial Engagement

Academic entrepreneurship encompasses different transfer activities including patenting and licensing, contract research, and spin-off creation (Wright et al., 2008). Given that there are different definitions of academic spin-offs (Fryges & Wright, 2014; Pirnay et al., 2003) we herein define academic spin-offs in accordance with our empirical cases as research-based companies i) whose business model is based on the transfer of knowledge (e.g., a technology) from an academic institution and ii) are initiated by scientists of this academic institution while or after being affiliated with the organization (Clarysse & Moray, 2004). Academic spin-offs are considered to play a primary role in knowledge and technology transfer because they have been associated with various long-term advantages. For instance, they help to transfer scientific innovations directly to the public, create jobs, and promote national competitiveness and business growth (Egeln et al., 2003; Vincett, 2010; Walter & Auer, 2009). Because of their remarkable capacity for innovation, they are linked to the production of profound economic impact that will encompass multiple markets (Dickel, 2009)

On a practical level, the increased significance of knowledge and technology transfer and academic entrepreneurship has led to diversified support measures provided by academic institutions (Siegel & Wright, 2015a) as well as external actors, slowly establishing an entrepreneurial ecosystem supporting academic founders. On a theoretical level, academic entrepreneurship has become a research topic in its own right, resulting in numerous publications employing different theoretical lenses as well as research foci (Rothaermel et al., 2007; Skute et al., 2017). To meet the increased political demand for successful knowledge and technology transfer, one large stream of research is trying to understand successful transfer strategies and the factors influencing scientists transfer engagement as well as successful spin-off creation and company development.

The focus and narrative prevailing in those articles address positive influences on transfer activities. Barriers and constraints implicitly accompany findings but are seldom the whole focus. Influencing factors on transfer engagement and on founding in general will be discussed in the following sub-section, referencing gender-specific findings when available. Reviewing this literature, these aspects can be grouped into two different segments – meta-level factors and operational-level factors – following a systematization by Sinell, Iffländer, and Muschner (2018).

Meta-level factors

Considering the *meta-level,* findings address factors that may be specific to national innovation systems,

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while others can be generalized for developed countries and are systemic for societies at large. Acquainting oneself with relevant national laws, policies, and administrative procedures for starting a business requires different amounts of effort depending on the specifics of the national innovation system. A need for substantial investment of temporal and financial resources constitutes an obstacle to founding (EFI, 2014).

Further, the entrepreneurial sphere is highly connoted with being male and led by men (Dautzenberg et al., 2013), suggesting that individuals with female gender identities may have a harder time asserting themselves in a culture that favours male-gendered approaches (Benschop & Doorewaard, 1998). A case in point are studies that demonstrate that there is a gender bias in the financing of startups, showing that, with identical pitches in front of investors, male entrepreneurs are favoured over female entrepreneurs (Brooks et al., 2014). Masculine hegemony is challenged when there are female partners in the venture capital firms, making it 50% more likely that startups with female members will receive investment (Brush et al., 2014). In the case of founding an academic spin-off, the perception prevails that entrepreneurship and academia systematically differ in their work logics (Sinell et al., 2015; van der Sijde et al., 2014): entrepreneurship is seen to have little appeal to scientists who are also uncertain about how to cross over into the business sphere.

Operational-level factors

Considering the influences on transfer engagement on an *operational level,* findings are more specific for academic entrepreneurship, particularly with respect to the organizational characteristics of research institutions and universities. In order to support transfer activities, numerous organizations implemented technology transfer offices, hoping they will bridge gaps between academia and industry (Siegel & Wright, 2015b). However, studies show that the mere existence of technology transfer offices is not necessarily sufficient to increase founding rates, and scientists are often not even aware of their existence (Clarysse et al., 2011; Huyghe et al., 2016). Important factors that determine the acceptance by scientists as well as their success include strategy (Link et al., 2015; Sinell et al., 2018), interdisciplinarity, and established structures (Caldera & Debande, 2010; Lautenschläger et al., 2014). Also, the presence of role models, interaction with entrepreneurial peers, and financial and career-relevant incentives rewarding founding efforts positively influence spin-off formation (Fritsch & Krabel, 2012; Huyghe & Knockaert, 2015; Moog et al., 2015).

Essential for the success of these measures is a proactive communication strategy that ensures scientists are aware of the measures (Lautenschläger et al., 2014). A lack of awareness is a key reason scientists bypass technology transfer offices (Huyghe et al., 2016). On the level of the direct work environment of the scientist, norms and rules influence the decision of the individual scientist to partake in knowledge and technology transfer (Jong, 2006; Stuart & Ding, 2006). If the leader of the group or other direct colleagues have previously been involved in knowledge and technology transfer, scientists feel encouraged and are more likely to engage in such activities themselves (Bercovitz & Feldman, 2008).

Research has shown that, instead of supplanting one another, different modes of transfer interrelate and reinforce one another; in other words, a previous commitment to transfer activities may lead to future transfer engagement (Crespi et al., 2011; Perkmann et al., 2013; van Looy et al., 2011). Sufficient resources to promote transfer activity are also necessary prerequisites for scientists to consider commercializing (Rasmussen et al., 2014). According to Busolt and Kugele (2009), female scientists have fewer resources at their disposal than their male colleagues with respect to financial resources, lab time, and time for research and training.

Ultimately, the decision to get involved in knowledge and technology transfer and academic entrepreneurship is an individual one. Field of study and business experience, proximity to application, diverse capabilities, and self-confidence in one's own abilities positively influence engagement in knowledge and technology transfer (Fritsch & Krabel, 2012; Kirkwood, 2009; Kulicke, 2006; Moog et al., 2015).

For the most part, the findings discussed above focus on supportive factors for fostering transfer activities of scientists. However, they do not consider whether female and male scientists perceive obstacles and promoting aspects the same way. Taking into account that motivations differ (Iffländer et al., in press), it is also plausible that female and male scientist are discouraged by different circumstances.

Method and Sample

Our analysis is based on 40 qualitative semi-structured interviews with scientists. The sample consisted of scientists in STEM fields who are employed by universities or public research organizations of applied science

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and who either intended to incorporate an academic spin-off or had done so recently (see Table 1 for the sample description). The interviews were conducted either by telephone or face-to-face between October 2016 and January 2017, lasted approximately 90 minutes, and were recorded and then transcribed. The data was gathered within the project "Gender in Knowledge and Technology Transfer" project (tinyurl.com/y6veglvx), which is funded by the German Ministry of Education and Research. The project aims at developing new approaches that can help encourage researchers, particularly women, to participate in knowledge and technology transfer. This article presents the findings from this project that describe specific barriers to transfer and spin-off activities in Germany.

The semi-structured interview guideline was developed with reference to a review of the relevant literature. The questions focused on personal traits, motives of entrepreneurial involvement, relevant conditions and barriers for transfer and entrepreneurial activities – in particular, the decision-making and business-starting processes, gender-related experiences, as well as the employers' work conditions, culture, and support. However, only results regarding barriers and constraints are considered in the current article, and they were analyzed using Mayring's (2010) open-ended, qualitative method of content analysis. The identified main constraints are assigned to the meta-level and the level of operation, referring to the present state of research as well as to Lundvall (2010), Best and colleagues (2016), and Sinell and colleagues (2018). Whereas constraints on the meta-level act rather indirectly, constraints on the level of operation are more multilayered and act directly. The findings are described in detail in the following sections, accompanied by quotations from the interview subjects to clarify the argumentation of the presented characteristics (Haas & Scheibelhofer, 1998).

Given that the study is exploratory in nature, generalization of the presented findings on gender beyond the sample should be made cautiously. Even though gender was evenly distributed among the sample, the influence of intervening factors such as differing organizational cultures and local work environment was not fully controlled. The findings serve as propositions for future research regarding gender and inclusive innovation.

Table 1. Sample demographics

		Female	Male	Total
Item and Sample Size	**Category**	**19**	**21**	**40**
Age in years n=37	20–29	5	3	8
	30–39	8	13	21
	40–49	2	3	5
	50–59	2	1	3
Most recent employer n=40	University	10	2	12
	Research institute	8	17	25
	Business firm	1	2	3
Field of expertise n=36	Physics or Mathematics	3	2	5
	Chemistry, Biology, or Medicine	7	3	10
	Humanities	1	2	3
	Engineering	5	12	17
	Media Technology	1	0	1

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Findings: Constraints on the Meta-Level

Consistent with Sinell, Iffländer, and Muschner (2018), constraints on this level include structural and national factors, such as relevant stakeholders and funding programs of the innovation ecosystem or national regulations, procedures, and transfer culture. Findings on this level conglomerate to the two broader sublevels "nationwide transfer culture" and "funding guidelines and structures", which are described below and are listed in Table 2.

Nationwide transfer culture
Interviewees reported poor sensitization and enlightenment about the transfer options and alternative career pathways in general. Moreover, transfer priorities in the research system were perceived as counterproductive, which prevented them from engaging in founding academic spin-offs: Most interviewees observed publications to be the first transfer priority, because there are no incentives, such as prestige or career advantages, for patent applications or academic spin-offs. This perception was amplified by the lack of option for a scientist to return to their original position in the research system if their spin-off fails. Interviewed scientists closely connected such counterproductive transfer priorities – referring to the intended promotion of innovation capacity – to the general German science culture, which lacks role models who commercialize their results and who demonstrate that science and industry are not as incongruent as widely assumed.

> *"You're the bad guys who want to make money [with science]. This is a question of mentality, education, and socialization. I don't know. It's not so valued that science can lead to something of commercial use."* (Female scientist, university)

> *"[...] actually, our life here is secured by the publications, which lead to more and more job contracts."* (Female scientist, research institute)

Funding guidelines and structures
Once scientists decided to get involved in entrepreneurial activities and specifically spin-off creation, they assessed the funding guidelines and structures as non-transparent, stiff, competitive, unfair, complicated, and incompatible. Many public funding programs have strict requirements, for instance, regarding team composition. Interviewees stated that applications demand a large amount of effort and time, whereas the subsequent funding processes are slow and bureaucratic.

> *"It is often the case that this process [of applying for funding programs] takes far too long in Germany. This is a process that is connected with 20- or 30-page pamphlets that then are passed through expert mills for half a year. And the expert mills then pass it on to a different expert, who still has critical questions, about which the investment manager, who decides, has no idea. And then another answer is required for that."* (Male scientist, research institute)

Some programs provide the grants only at a later stage of the founding, some necessitate equity share, and others end their funding abruptly. Interviewees mentioned a gap of finances after the end of a funding program, as such programs often only last for a short period and do not offer follow-up financing. Beside promotion programs, some interviewees judged financing via investors as challenging. First, interviewees found it hard to identify and convince adequate investors. Second, many investors prefer to invest in ideas with very likely profit maximization rather than in socially or ecologically valuable ideas.

> *"Another challenge, at least for us, was the selection or search for suitable investors. I believe that this is a particularly big issue for scientists."* (Female scientist, university)

Gender differences on the meta-level
The analysis allows weak assumptions regarding gender differences in the above-mentioned constraints. Male interviewees apparently perceived stronger constraints on the meta-level than females. Only the male subjects criticized the lack of role models in the science system and the slow processes of funding programs. Moreover, male interviewees mentioned the counterproductive transfer priorities more often than females and demanded alternative career models more often than females. Female interviewees, however, emphasized the strict and complicated requirements of funding and support programs more often than their male colleagues, but there was no gender difference regarding the insufficient financing of such programs. Additionally, male and female equally claimed that they were not aware of the different transfer options and possibilities.

Findings: Constraints on the Operational Level

Following Sinell, Iffländer, and Muschner (2018), constraints on the operational level derive from the work environment, including the organizational culture,

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Table 2. Identified meta-level and operational constraints impacting entrepreneurial attitudes and transfer engagement. Prevalence indicates the frequency at which the constraint was mentioned by interviewees; gender difference indicates which gender experienced the specific constraint.

Level and Constraint	Prevalence	Gender Difference
META-LEVEL		
Nationwide transfer culture		
Early sensitization and awareness raising	20%	–
Offering alternative career pathways	17.5%	Male
Counterproductive transfer priorities	12.5%	Male
Incongruence of science and industry	10%	–
Lack of role models	5%	Male
Funding guidelines and structures		
Strict requirements	22.5%	Female
Insufficient financing	15%	–
Interaction with investors	12.5%	Male
Deficient process of programs	10%	Male
OPERATIONAL LEVEL		
Organizational strategies and practices		
License agreements	25%	Female
Dual role of institutes	22.5%	Male
Organizational culture		
Lack of support from managers and peers	45%	–
Non-transparency of processes and responsibilities	10%	Male
Individual attributes and attitudes		
Business idea and concept	50%	Male
Lack of time	40%	Female
Lack of financial resources	40%	Female
Lack of human resources	37.5%	Female
Lack of knowledge	20%	Female
Lack of exchange with peers	17.5%	Female
Mentality	17.5%	Male
Lack of networks	12.5%	Male
Interaction with externals	10%	Male
Compatibility of family and work	7.5%	Male

strategies, and practices as well as the individual attributes and attitudes (see Table 2). Although half of the interviewees found the development of their business idea and concept challenging, this obstacle is not executed in detail in the following, since it is not specific for academic spin-offs.

Organizational culture

The results reveal the pivotal role of the organization's highest authorities to establish an entrepreneurial culture in which academic entrepreneurship is promoted and appreciated. Interviewees claimed an entrepreneurial supportive environment with different entrepreneurship support programs as helpful to overcome constraints. Still, many interviewees reported a lack of support from managers and peers.

> *"I believe that the main obstacle is always a different one: that's culture."* (Male scientist, research institute)

Managers who would have been able to guide scientists through reported internal non-transparent processes, responsibilities, and structures were often not supporting the spin-off idea of the scientist. They also did not encourage the acquisition of customers, industry, or

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important network partners, usually because of the fear that the researcher leaves the institute in favour of an outside job offering.

> *"This is an institute director who is now two years away from retirement. This is the generation that thinks that all this new German technology transfer is nonsense. They think a research institute is there for research. They say that's just an end in itself."* (Male scientist, research institute)

> *"We were then, when we were founded, or probably still are now, always looked upon as the people who 'soiled our own nest' and were always seen as those who are now somehow capitalizing on science. We can already see that this is actually nonsense –you can earn money with the science you have made."* (Female scientist, university)

Organizational strategies and practices

Once scientists defied the organizational constraints and committed themselves to the spin-off formation, institutes often connected the employee's transfer activities with license and patent agreements and demanded substantial shares in the spin-off. Such license and patent agreements were either perceived as non-transparent, strict, or non-consensual. For instance, public institutes and universities demanded excessive prices that deterred potential investors and they did not support the "open source" attitude of the scientist.

> *"Institutes always try to keep the IP [intellectual property] in house and issue licenses. And that is counterproductive for spin-offs. No investor goes into a license history. An investor always wants to have the IP inside, always in the company. And then there are terribly protracted negotiations with the investors and also with the institutes that the IP is to enter the company and that then the license... there can still be agreed upon a license fee."* (Male scientist, research institute)

Moreover, close cooperation with industry or contract research as a mode of commercializing research findings is in some organizations institutionally-supported and highly desired in contrast to academic spin-offs. Although contract research contributes to the scientist's reputation within the organization, it inhibits their reputation within the scientific community because data from industry projects is often not disclosed and thus is unlikely to be available for use in publications.

The interviewees from research organizations were particularly ambivalent about the dual role of the institutes: institutes are under pressure to grow and develop, but concurrently, spin-offs need resources in terms of both personnel and time. Additional challenges arise when the spin-off's activities are competing with the institute's activities and resources. According to some interviewees, institutes feared the migration of the scientists, in particular when scientists followed their transfer activities as second jobs or self-employment. The ambivalence of the dual role of public institutes was also described by scientists when the spin-off was fundamentally based on the scientist's work in the institute and thus had to be finished before temporary job contracts ended.

> *"Our positions are so short – in two years you can't seriously do research, write research proposals, write publications. [...] And then, incidentally, to push ahead with things such that a patent is applied for or that you get a grant for founding, which is basically not possible within a two-year period of time."* (Female scientist, research institute)

Individual attributes and attitudes

According to most interviewees, daily projects and, in some cases, the high benchmark for industry acquisition result in a lack of time to engage in entrepreneurial activities. In particular, a lack of time comes along with several constraints: interviewees reported not having time to build up knowledge about how to start a spin-off, to network with relevant stakeholders, to recruit adequate teams, and, finally, to care for their families. Additionally, temporary job contracts in the science system increase the time pressure during simultaneously slow bureaucratic processes.

> *"...the most important thing would be to have the freedom to work on your founding idea..."* (Male scientist, research institute)

Financial insecurity and the lack of option to return to the organization in case of a failure hampers entrepreneurial engagement or only allows founding activities as part-time work. Lack of financial resources results in a lack of human resources, because academic spin-offs cannot offer attractive job positions to high-potential employees with the required competences. Once they had formed their teams, interviewees reported difficulties keeping the team members together and find additional personnel in order to grow.

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> *"More competencies are needed; more freedom is needed. And it also requires the decision-making powers to be able to start running with a certain budget. And not to be accountable at all points."* (Male scientist, university)

> "In this phase, it's just extremely difficult to get good team members, because you can't offer anything at all. You cannot offer a job, nor can you offer any kind of security. And the only people I could talk to were people from my circle of friends. Everything else was not possible. And then, of course, only people who just happened to have no job themselves. Because no one would have quit their job at this stage to come to me. We were simply too insignificant for that, it was far too risky. It was very difficult." (Female scientist, university)

In some cases, financial insecurity also negatively affected the scientists' founding mentality. Exchange with peers was suggested as one way to reduce insecurity and foster networking and idea creation.

Gender differences on the operational level

Although both male and female interviewees agreed that organizational culture was a decisive factor, the males found that internal communication and decision-making processes were non-transparent and criticized the dual role of the institute more often than the females. However, female interviewees more often described the license and patent agreement an impediment. Slightly more females than males registered the lack of time and financial resources. However, the results reveal notable gender-differences with regard to a lack of human resources, knowledge, and exchange with peers: the females mentioned those constraints clearly more often than the males. On the other hand, the males more often reported struggles with their business ideas and concepts, their interactions with external actors, and their mentality.

Conclusion and Implications

Due to the increasing pressure public research organizations face to demonstrate their relevance to society and promote their knowledge and technology transfer, support programs and entrepreneurship ecosystems have gradually diversified in recent years (Siegel & Wright, 2015a). This study contributes to a deeper understanding of scientists' decisions to actively engage in transfer and entrepreneurial activities by revealing central constraints for knowledge and technology transfer at public research organizations in STEM fields. In order to develop needs-oriented support programs and thereby support all scientists to the same degree, we particularly analyzed gender differences in perceived constraints. This study is the first to reveal insights on gender-specific constraints impacting individual transfer engagement. Due to its explorative nature, findings of the study serve as propositions for future research in fields of gender and inclusive innovation. To conclude this article, we summarize the findings and derive implications for research organizations for more inclusive measures to foster entrepreneurial activities

In line with research on challenges in founding a business in general, major constraints and barriers impacting scientists' engagement in spin-off activities make it challenging to develop a valuable business idea and concept. The analysis therefore contributes to previous studies calling for further educational development programs for scientists to increase business skills and market knowledge (Brodack & Sinell, 2017). To tackle these challenges, research organizations could establish match-making events with experienced entrepreneurs and business coaches. Such events can, on the one hand, help scientists elaborate and foster their business ideas and concepts; on the other hand, the informal exchange can lead to new spin-off ideas. Moreover, such personal exchange can help deconstruct the perceived differences between academic employment and entrepreneurship.

The main constraints specific to academic entrepreneurship and transfer activities identified in this study are on the operational level: i) a hostile organizational culture, ii) a lack of time and financial resources, and iii) a lack of human resources. The analysis of gender differences revealed that females perceive the lack of resources (i.e., time, money, people) and knowledge more often and as greater challenges than their male colleagues. Both women and men stressed the need for relevant support services and awareness raising initiatives for transfer activities. The findings are in line with previous studies (Huyghe & Knockaert, 2015) and underline the importance of early sensitization and role models in the work environment for fostering academic entrepreneurship.

In order to address the identified barriers and thereby foster engagement in transfer and academic entrepreneurship, research institutions need to take action and both create new and modify existing needs-oriented support and funding services. As has been outlined, one major barrier lies in the lack of acknowledgement

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of, and awareness raising for, transfer and entrepreneurial activities. These challenges can be reduced by establishing gender-sensitive incentive schemes relating to different dimensions such as promotion, tenure, or remuneration. The findings moreover indicate that not only the scientists, but also their department heads and transfer managers, need to be rewarded for their transfer engagement. In addition to incentive schemes, research organizations should implement innovation scouting activities to enhance the visibility of the transfer office and discover potential technologies. Ultimately, in order to raise the awareness for transfer and academic entrepreneurship, research organizations must develop communication strategies and actively promote spin-off successes as well as learnings from failures.

To foster inclusive innovation in terms of social groups, the consideration of gender diversity in founding teams must be acknowledged and addressed by support programs. In this study, female interviewees in particular assessed programs' requirements as strict and reported a lack of knowledge and resources. As women and men are likely to follow different business strategies and motivations, the need for gender-specific communication and arrangement of programs becomes apparent. Research institutions should therefore aim to achieve an impact with their research and transfer activities that goes beyond economic dimensions.

Given its exploratory approach, this study has limitations; however, the presented findings may induce further research and in-depth analysis on this matter. Even though the gender distribution within the sample is practically equal, variations in different factors occurred. The majority of female scientists were employed in universities when founding their spin-off, whereas men were employed by research universities. As the local work environments and institute cultures differ, the different institutional settings could provide an alternating explanation over the gender dimension. Further research is therefore necessary to confirm and expand upon these findings.

About the Authors

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