

FEMSPIN Report

Spin-Offs and Start-Ups of Female Academics at Swiss Universities: Activities and Support



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This report is part of a Swiss project (2022-2024) that aims to foster female academic entrepreneurship in the field of start-up and spin-off creation at Swiss Universities and in non-university research institutes (<https://femspin.ch>). Partners of the project are the Swiss Federal Institutes of Technology ETH Zurich and EPFL, the universities of Basel, Bern, Geneva and Zürich, the universities of applied sciences FHNW, HES-SO and SUPSI as well as the Paul Scherrer Institute.

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1 Abstract

Switzerland led the Global Innovation Index for the twelfth year in a row in 2022. Swiss universities make an important contribution to this success by promoting spin-offs and start-ups based on new knowledge and technologies. However, reporting on entrepreneurial activities at universities and research institutes in Switzerland is still insufficient. In particular, there is a lack of data and knowledge to assess the situation of female academic entrepreneurs in Switzerland.

This report aims to encourage reflection, exchange, and knowledge building on female academic entrepreneurship. Based on a national survey, data on the participation of female academics in spin-off and start-up creation at Swiss federal institutes of technology, universities, universities of applied sciences and five major research institutes are presented and the status quo of measures to promote and support women's knowledge and technology transfer is outlined.

The results show that female academics are only marginally involved in the commercialization of knowledge from research & development. With on average only 17% of all start-ups and only 15% of spin-offs founded by female academics in 2021, considerable innovation potential is lost. This may be due to a lack of promotion: While most Swiss universities and research institutes offer support for academic entrepreneurship in general, few specifically target female academics.

The report provides a first empirical basis to identify the need for action for gender equality policies in research and innovation as well as for other relevant actors inside and outside universities. It illustrates that more activities are needed to support spin-offs and start-ups in all disciplines with a particular focus on women. And it shows that close collaboration between gender equality, knowledge transfer, and innovation is essential to close the existing gender gap in academic entrepreneurship.

2 Introduction

In 2022, Switzerland led the Global Innovation Index (GII) for the twelfth time in a row (WIPO, 2022). Swiss universities and public research institutions make an important contribution to Switzerland's success as an innovation site. This is due to the high quality of university education and research infrastructures, high employment rates in knowledge-intensive fields and the targeted transfer of knowledge and technologies into practice. The promotion of knowledge transfer activities such as patenting and licensing, as well as the creation of science-based spin-offs, are increasingly part of the core tasks of universities, as well as for non-university research institutes (Díaz-García et al., 2015; Kahl et al., 2021). A growing focus on entrepreneurship and innovation has been noted not only in the field of technology development but also in social and cultural sciences (Barjak & Morandi, 2020).

However, female academics are rarely involved in knowledge transfer from research & development (R&D). With only 11.9% of patent applications by women, Switzerland still rates amongst the most poorly performing countries on the European stage, with 19.4% of female academics applying for patents between 2010 and 2019 (European Patent Office, 2022). Even at the highly innovative Federal Institute of Technology in Zurich (ETHZ), the share of women in spin-off creation has averaged only about 8% since the 1980s (Schubert et al., 2019). Alongside this, initial data on Swiss universities of applied sciences (UAS) suggest that female academics are an exception when it comes to developing start-up or spin-off ventures (Schneider et al., 2021). However, aside from these surveys, gender-related data available on spin-off activities at Swiss universities are limited. Most reporting instruments (for example, the SwiTT reports to be found at www.SwiTT.ch) document entrepreneurial activities at universities without referring to gender or other diversity-oriented categories in detail. As international studies have evidenced, the gender gap in spin-off creation appears to be particularly pronounced with regard to R&D in the fields of science, technology, engineering or mathematics (STEM) (see Fini et al., 2017), where women are less represented among students and staff. But also in the less "spin-off friendly" disciplines of humanities and social sciences (HSS), health sciences and education, the number of female start-up and spin-off activities is low (Abreu & Grinevich, 2017).

Women are still under-represented in research and innovation (European Commission, 2021).

The university environment

Studies relating to higher education and academic entrepreneurship identify the university environment as a primary factor for entrepreneurial intentions of female and male academics. Here, structural conditions and cultural factors play a central role (see Lawton-Smith et al., 2017; Bergmann et al., 2018).

Firstly, the different gender representation in universities and their disciplines constitutes a structural factor in terms of the gender gap in the field of entrepreneurship (Abreu & Grinevich, 2017). The relative paucity of women in research, especially in senior R&D positions, could lead to a lack of potential for innovation. Men often act as gatekeepers of decisions related to

innovation and entrepreneurship, both within universities and in research & innovation policy (see Muntean & Ozkasanc-Pan, 2015). The low share of women in these fields coincides with smaller networks and fewer industry contacts, fewer investors and partners for female-led start-up and spin-off projects (Best et al., 2016; Micozzi et al., 2016).

Besides this, culturally shaped behavioral expectations and routines provide a framework for entrepreneurial intentions and activities at universities (e.g., Huyghe & Knockaert, 2015). The way in which spin-off creation is recognized and rewarded highlights the relevance of these activities and forms a normative element for spin-off orientation in higher education (Huyghe & Knockaert, 2015). Beyond that, traditional perceptions and images of innovation and entrepreneurship as a primarily “male” activity act as a latent barrier to women (Nählinder et al., 2015). And while research and innovation in technology and engineering are traditionally characterized by an entrepreneurial mindset, many researchers in the humanities and social sciences are still ambivalent regarding the commercialization of research (Morandi et al., 2019, 2022). But aside from the disciplines they work in, some female researchers seem to be significantly less informed about support measures, and perceive fewer role models, entrepreneurial career options and informal promotion for spin-off projects by academic “superiors” in all fields (Schneider et al., 2021).

Universities encourage or hinder scientists from developing entrepreneurial career intentions (Singh & Onahring, 2019).

There seems to be little awareness about this situation and the need for targeted promotion of female academics in entrepreneurship education as well as in knowledge and technology transfer (KTT) at universities (Schneider et al., 2021). At the same time, activities of gender & diversity offices at universities rarely include the topic in their gender equality policy agendas, because systematic data or reporting on inequalities in the start-up and spin-off sector are rare (Keisu et al., 2015).

2.1 The report

This report provides initial data for an assessment of the situation of female academic entrepreneurs in the context of research and innovation in Switzerland today. In particular it outlines start-up and spin-off activities of female/male students and staff at Swiss universities of all types as well as in major non-university research institutions. It also offers information and knowledge about existing measures and instruments to promote and support female academic entrepreneurship in these organizational contexts. It can serve as a basis for gender equality policy assessment, as well as for planning and strategy development to promote equal opportunities.

3 Methods

This report is based on a national survey of Swiss universities (HEI) and a selection of major non-university research institutes (RI) conducted in autumn 2022. The purpose of the survey was to highlight spin-off and start-up activities undertaken by female academics and students, as well as specific promotion activities in these organizational contexts between 2019 and 2021.

A standardized questionnaire and descriptive-statistical approach were applied. In addition, open questions helped the authors to gather subjective perceptions about the status of support for female entrepreneurs at universities and research institutes by experts from the fields of innovation, KTT and other areas such as gender & diversity. The open responses were analyzed by qualitative content analysis.

3.1 Sampling, data collection and analysis

All major institutions in Swiss higher education, i.e., the two federal institutes of technology ETHZ and EPFL, eleven Swiss universities (UNI) and nine Swiss universities of applied sciences (UAS), as well as five non-university research institutes (RI) in Switzerland, were invited to participate in the study. Universities of teacher education were not included in this study, because of their primary focus on teaching. Of a total of 27 institutions contacted, 24 responded to the survey at least partially, resulting in a response rate of 89%.¹ Partial response was mostly due to missing data; in some cases, data was not available from some organizational units, such as departments or schools of a university.

In each of these organizations, representatives from the field of KTT and research & innovation were contacted to respond to the survey. In some cases, vice presidents of universities, representatives of gender & diversity offices or from entrepreneurship offices also responded.

Data were collected in autumn 2022. The questionnaire started with a description of the aims of the study, and an operational definition of “spin-offs” and “start-ups”:

- **Spin-offs** were defined as a company that emerges from the *intellectual property* of a university or research institute and is founded by *employees or students* in the course of their work at this institution. The company must have a solid and sustainable business idea and business plan. At least one of the founders must be a *(former) employee, doctoral candidate, post-doc, student or professor* at the university or research institute.²
- **Start-ups** were defined as a company that emerges from founding activities of *BA and MA students not employed* at the institution, and from alumni.³

¹ At least partial responses were received from ETHZ and EPFL, from 9 out of 11 universities (HSG, UNIBAS, UNIBE, UNIFR, UNIGE, USI, UNILU and UZH as well as the FU Switzerland), from 8 out of 9 universities of applied sciences (BFH, FHGR, FHNW, HES-SO, HSLU, OST, SUPSI and ZFH [ZFH consisting of ZHAW, ZHdK and HWZ]), and from all five research institutes (CERN, EAWAG, EMPA, IDIAP and PSI). No responses were received from UNIL, UNINE and Kalaidos FH (see list of abbreviations in the annex).

² Specific definitions of spin-offs or start-ups have been described from a total of six institutions. Since these definitions essentially corresponded with the given operational definitions here, all institutions have been included.

³ And are not based on the intellectual property of the institution.

The questionnaire was structured into four parts:

Part A: General information on academic staff and students in the respective institutions as well as numbers of chairs for entrepreneurship.

Part B: Information on the number of spin-offs and start-ups as well as total numbers and share of female/male founders in 2019-2021. For 2021, data on disciplinary origin(s), sectors of economic activity, legal form, and academic credentials of founders (e.g., student, professor) were also collected.

Part C: Promotion and support measures in general, as well as for female founders specifically. Disciplines or departments that provided specific promotion of founders could be indicated as well.

Further questions: Expert views about success factors of (female) entrepreneurial activity, the degree of promotion and support of female founders, and gender-specific barriers were collected based on Likert scales and open questions.

Quantitative data were analyzed with the statistics software R. A specific focus was set on gender comparative analysis as well as a comparison of institutions. In the case of incomplete questionnaires, only the available data were used in the calculation process. The underlying N is indicated in the graphs and tables of the report. The software MAXQDA 2022 (VERBI Software, 2021) was used to support qualitative content analysis (Kuckartz & Raedicker, 2018) of the texts, which were generated by open questions.

3.2 Limitations

The study is subject to important limitations due to missing data: not all Swiss HEI participated in the survey, while at the same time most participating institutions did not return a complete questionnaire. This means that most institutions had not yet tracked the spin-offs and start-ups as well as their founders systematically. A list of the companies and their founders often had to be compiled from scratch. In addition, many institutions were not able to provide an overview of the start-ups founded by their staff or students, as start-ups do not require the IP of the respective institution.

Further, it remains unclear whether the years 2019-2021 can be seen as representative for spin-off and start-up creation numbers due to the Covid-19 pandemic. The economic situation as a result of Covid-19 has taken a toll on many Swiss start-ups (Marchand, 2021). It can be assumed that the creation and promotion of science-based spin-offs and start-ups was also affected: surveys at German universities indicate clear effects of the pandemic on start-up support (Fritzsche et al., 2023). Considering these limitations, the results should generally be interpreted with caution. While trends can be illustrated, it is not possible to draw a complete picture about spin-off and start-up creation by female and male academics in Switzerland from this study.

4 Female academic entrepreneurship

Data from the Federal Statistical Office (FSO) on Swiss higher education institutions (HEIs) show that women and men continue to be unevenly represented in these institutions in 2021 among students and staff (FSO, 2022a). Figure 1 highlights this situation for different institutional contexts in HEI: as is shown, the proportion of women among students and staff at ETHZ and EPFL is particularly low. While a third of all students are female, women are also underrepresented in the mid-level faculty (32%) and make up less than 20% of the senior-level teaching staff.⁴ The situation looks different at Swiss universities (UNI) and universities of applied sciences (UAS). In 2021, significantly more women (57%) than men were studying at the UNI, while the UAS had an almost balanced gender ratio among their students, with a share of 49% women.

In 2021, UNI also employed the same proportion of male and female technical and scientific staff, while at UAS, the proportion of female scientific staff is significantly lower (38%). However, looking at the situation of professors/lecturers with management responsibility, at both types of HEI the number of female academics is significantly lower (28%) than that of their male colleagues (72%).

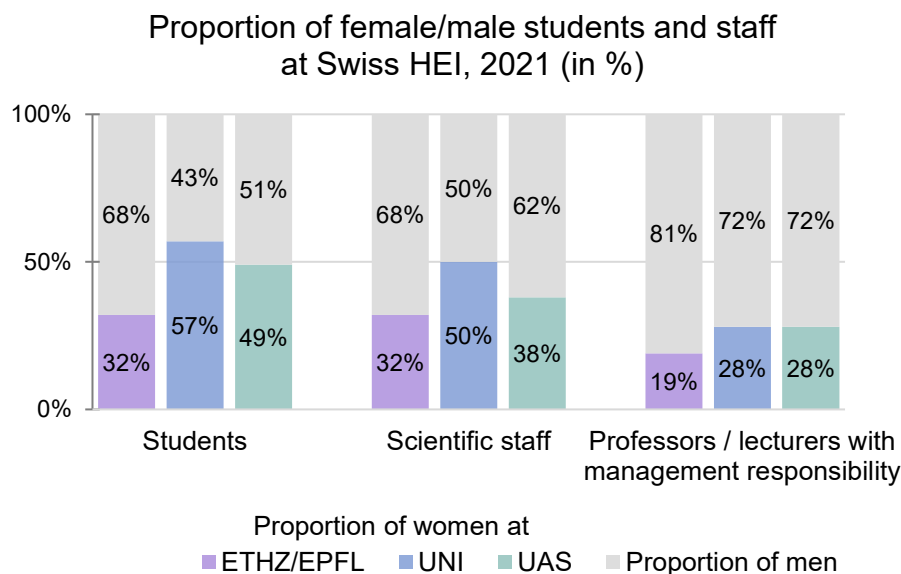


Figure 1: Proportion of female/male students and staff at different types of Swiss HEI, 2021 (in %) (FSO, 2022a)

Gender-specific data on the staff of Swiss RIs are currently not available today. However, the data collected in this study show a low proportion of women (24%) among the RIs included here.

⁴ Meaning professors/lecturers with management responsibility of an organizational unit (Code 51) according to the nomenclature "SHIS personnel categories of higher education institutions" by FSO (2022a).

4.1 Start-up and spin-off activities at Swiss higher education and research institutes

A first look at founding activities of employees and students shows that ETHZ/EPFL were by far the most successful in creating spin-offs and start-ups between 2019 and 2021 (see figure 2). The UAS come second, closely followed by activities in the UNI sector. The five RIs surveyed here report only a few start-ups in this period.

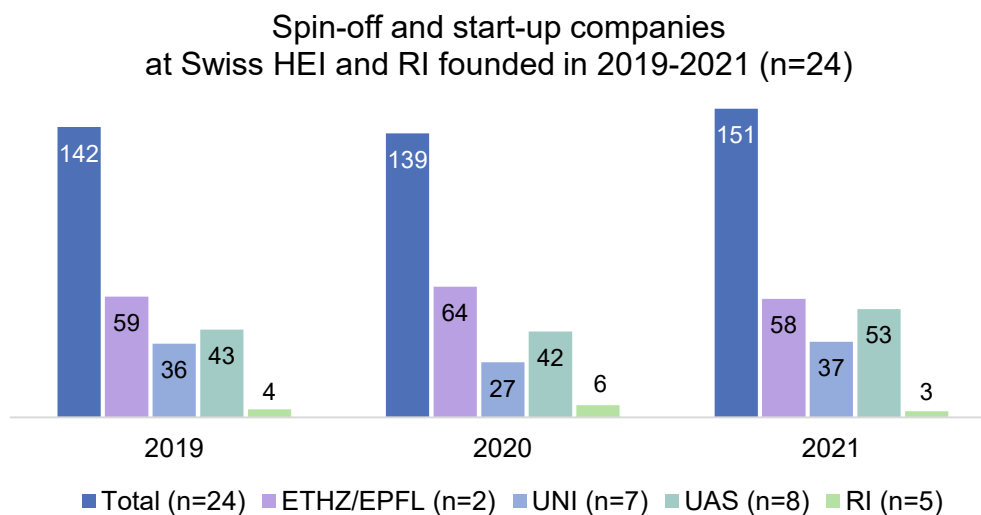


Figure 2: Spin-off and start-up companies at Swiss HEI and RI founded in 2019-2021

On average, 144 spin-off or start-up companies per year were reported by the participating institutions over the three years: between 243 (2019) and 270 (2021) founders were documented, with women accounting for 14% (2019) and 17% (2021) of founders, respectively (see table 1).

When comparing the different types of institutions, considerable differences in gender ratios can be observed. As can be seen in table 1, the highest proportion of female founders in each survey year was reported by UAS. Approximately one in five or one in four founders was female (22%-26%). The data from ETHZ/EPFL show a different picture: 9% (2019) and 14% (2021) of all founders were women, i.e., only about half as many as at the UAS. The UNI data suggest that the number of female founders is located somewhere between these two figures.

Table 1

Spin-offs and start-ups of female founders at Swiss HEI and RI, 2019-2021 (n=22⁵)

Year	Founders	Total	ETHZ/EPFL ⁶	UNI ⁷	UAS	RI
2019	Total	243	128	33	76	6
	Female founders	14% (33)	9% (12)	12% (4)	22% (17)	0% (0)
2020	Total	256	133	38	68	17
	Female founders	16% (42)	13% (17)	18% (7)	22% (15)	18% (3)
2021	Total	270	115	75	72	8
	Female founders	17% (47)	14% (16)	15% (11)	26% (19)	13% (1)

Data in figure 1 (see page 9) can be used to better contextualize these results: ETHZ/EPFL show the lowest potential of female founders of all types of HEI, as they provide comparatively few female students (32%) and female scientific staff (32%) or senior lecturers (19%) for R&D activities. On the other hand, UAS can potentially allow more innovation and entrepreneurship by women, with 49% of female students and 28% of female scientific staff. With 22% to 26% female founders, many women already exploit such results from R&D at UAS. However, despite above-average proportions of female students (57%) and female scientific staff (50%), as well as 28% of female senior lecturers at UNI, they report comparably average proportions of female founders (between 12% and 18%). This implies that the number of female academics and the number of spin-offs and start-ups created at an HEI do not seem to be directly related.

4.2 Spin-offs at Swiss higher education and research institutes

Looking at the number of spin-offs only, ETHZ/EPFL are the Swiss leader in science-based innovation. On the other hand, it is noticeable that the UAS report very few spin-off foundations from research and development compared to their total number of foundations (see figures 2 and 3 for spin-offs and start-ups). As previous studies into the UAS have argued, this is due to the application-oriented approach of R&D at UAS, and the research funding that determines R&D activities (e.g., by Innosuisse). This leaves the exploitation rights of the results and innovations from R&D primarily with the “implementation partners” or external corporate partners, rarely allowing a spin-off to be created by scientist themselves (see Morandi et al., 2019, 2020).

⁵ Including partially completed questionnaires (e.g., the number of start-ups was not reported by many institutions).

⁶ ETHZ/EPFL did only provide data for spin-offs, not for start-ups.

⁷ Due to missing data on founders, the UZH and HSG are not included. UNIBAS data are documented for 2021 only.

Spin-off companies at Swiss HEI and RI founded in 2019-2021 (n=23)

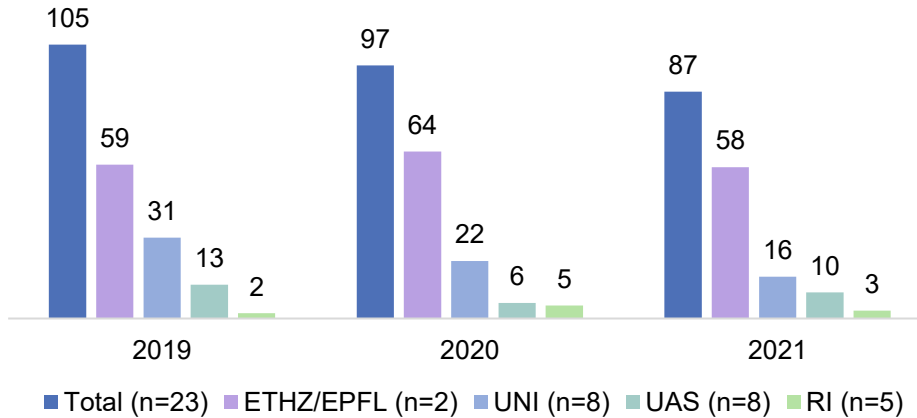


Figure 3: Spin-off companies at Swiss HEI and RI founded in 2019-2021

According to a study conducted by the European Commission (2016), only 9% of spin-offs created at universities in the EU member states between 2010 and 2013 were founded by female academics. Related figures are only slightly higher in the present survey: As table 2 shows, the participation of women in spin-off creation is significantly lower than that of men in all survey years and at all types of institution in Switzerland.

Table 2

Spin-offs of female founders at Swiss HEI and RI, 2019-2021 (n=21)

Year	Founders	Total	ETHZ/EPFL	UNI ⁸	UAS	RI
2019	Total	177	128	24	22	3
	Female founders	10% (17)	9% (12)	13% (3)	9% (2)	0% (0)
2020	Total	180	133	27	6	14
	Female founders	13% (23)	13% (17)	7% (2)	17% (1)	21% (3)
2021	Total	171	115	27	21	8
	Female founders	15% (25)	14% (16)	15% (4)	19% (4)	13% (1)

Table 2 also highlights a substantial increase of spin-offs (co-)founded by women from 2019 (10%) to 2021 (15%). Nevertheless, the participation of female academics in spin-offs that can use the intellectual property of a university or research institution is still notably lower compared to their participation in general founding activities (meaning spin-offs and start-ups at Swiss HEI and RI, see table 1).

⁸ Due to missing data on founders, UZH and HSG are not included. Data from UNIBAS are not included because no differentiation between spin-offs and start-ups was made.

Characteristics of companies and their founders

The analysis shows that most spin-offs result from R&D activities in the field of STEM subjects. Only a small proportion of spin-offs can be identified in disciplines from the fields of humanities and social sciences (HSS). Spin-offs with roots in science, technology, and engineering give rise to companies that are mainly related to economic sectors such as “information and communication”, “manufacturing” and “energy supply” (FSO, 2002b). However, they can also occasionally be located in the sector of “health and social services”. In the vast majority of cases, the legal form of the spin-offs is outlined as either an SA or a Ltd.

The present survey also shows that it is often the “senior levels” in the research hierarchy that (can) exploit research results for a spin-off. Students are also often involved in the founding of start-ups. However, research assistants, PhD students or postdocs are much less frequently mentioned as founders.

5 Promotion of female academic entrepreneurship

Promotion and support measures help to best prepare (potential) founders for R&D spin-offs and entrepreneurial activities through knowledge and information, specific support instruments, and financial support. Female founders can benefit from general measures to promote entrepreneurial intentions, competencies, and activities. However, they derive far greater benefit from promotion and support approaches specifically targeted at their requirements and needs in the group of female founders.

As figure 4 shows, Swiss universities and major non-university research institutes offer a wide range of support and promotion for (potential) entrepreneurs. Information and awareness-raising services for start-up activities are in place at most institutions (20 out of 24), and infrastructures for the development of spin-offs and start-ups are also available here (20 out of 24). Entrepreneurship education as well as advice in the form of counseling sessions are reported by 19 out of 24 respondents. Measures to promote the visibility of founders also feature prominently, with 17 out of 24 institutions from this survey mentioning them. The federal institutes of technology ETHZ/EPFL stand out for their wide range of measures. The range of offers available at UNI and UAS varies considerably from one location to another, while the five RI integrated in this study generally have fewer offerings.

But to what extent do these organizations specifically support female academics in entrepreneurial intentions and activities? Figure 4 shows that measures for the female students and researchers are much less widespread. In the first place, i.e., at 11 out of the surveyed institutions, the “visibility of female founders” is promoted. Only a quarter (6 out of 24) of all institutions offer specific “information and sensitization” activities for (potential) female founders, with RI not offering any initiatives in this area.

Beyond this, few specific measures for female entrepreneurs at universities and research institutions exist. However, most of them are in the field of supporting entrepreneurial skills and knowledge transfer (e.g., “entrepreneurship education” (4 out of 24); “counseling” (3 out of 24);

“mentoring programs”, (3 out of 24)). Prominent examples of this kind are the “feminno” program and the “FEMtrepreneurs” initiative. Very few institutions offer financial support specifically for (potential) female founders.

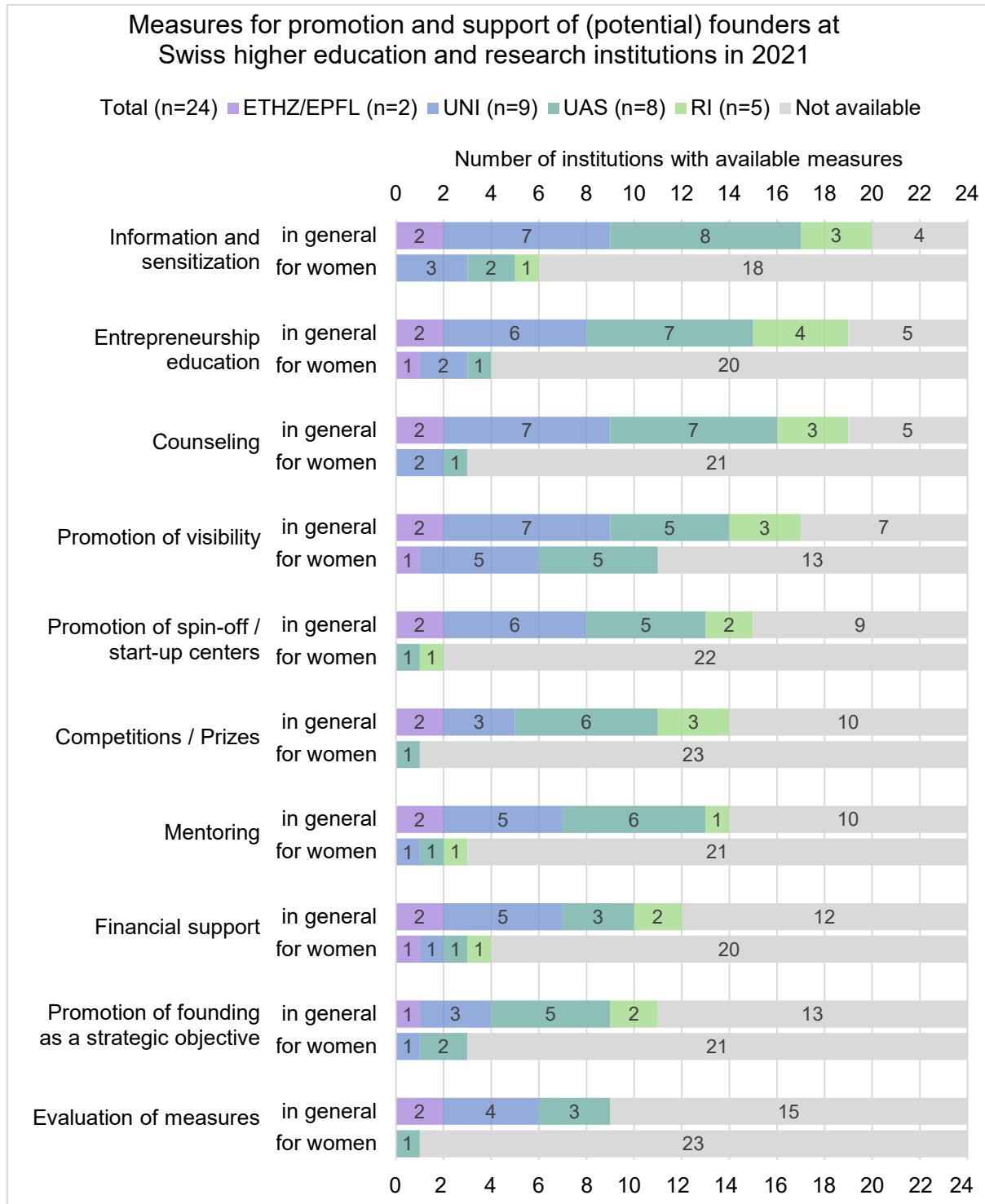


Figure 4: Measures for promotion and support of (potential) founders at Swiss HEI & RI in 2021

What can be done?

What can be done? This question was directed at male and female experts from HEI and RI in the fields of knowledge transfer, innovation, and gender & diversity. Most of these experts still perceive barriers and obstacles for women academics when implementing their entrepreneurial ideas. Most prominently, social prejudices and stereotypical images of entrepreneurship and entrepreneurial behavior as male spheres are mentioned. In addition, the respondents report a lack of female role models in entrepreneurial activities, as well as a weak anchoring of (potential) female founders in start-up networks. And also the incompatibility of work and family life are mentioned as specific obstacles to the entrepreneurial activities of female academics.

"Which (further) measure(s) are needed to specifically promote spin-off/start-up activities by women?" (n=18)

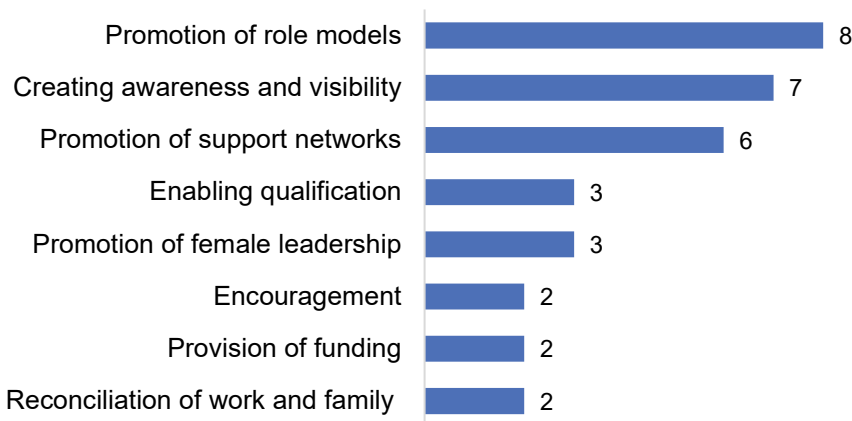


Figure 5: Measures needed to promote women's entrepreneurship intentions: Assessment of experts (n=18)

Against this background, many of the representatives from HEI and RI interviewed in the context of this study point out that their institutions need to do more to promote and support (potential) female entrepreneurs among students and academics (see figure 5). They emphasize three fields of action: firstly, female role models should be reinforced and made more visible; secondly, awareness of the gender dimension of entrepreneurship should be improved and, thirdly, support networks for female entrepreneurs should be expanded.

6 Conclusion

Overall, the 19 HEIs and 5 RIs surveyed here show an average share of female founders of 14%-17% in the years 2019-2021 – with slightly increasing values. If only spin-offs are considered, the share of women is even lower, averaging 10% (2019) and 15% (2021). This means that the spin-off and start-up activities reported in this study are close to most recent data on patenting and inventions by women in Switzerland; and they are located in the lower range of figures for female founders in academia reported in the European and international contexts (European Patent Office, 2022; Niggli & Rutzer, 2021).

While the federal institutes of technology show the highest number of companies founded overall in 2019-2021 in Switzerland, they fall notably behind in terms of the proportion of female founders. The science-oriented RI also stand out with a low share of female founders. In contrast, the UAS seem to offer the best conditions for female founders in a gender comparison: female shares of start-up founders are higher here than among spin-offs founded at this type of institution. It can be assumed that most of the companies founded by women at UAS come from the fields of social work, health, business, arts and culture (see Morandi et al., 2020), while at ETHZ/EPFL and RI they arise from new knowledge and innovations in STEM-related subjects (see Schubert et al., 2019).

Particularly in the field of STEM, which is traditionally geared towards the commercialization of research results, women are underrepresented among students, but also among scientific staff and senior-level teaching staff at Swiss universities (FSO, 2022a). However, as we have seen, this only explains part of the gender disparity: for one thing, figures for female academic entrepreneurship are far below the share of women among STEM graduates and researchers. But on the other hand, the gender gap exists across the entire spectrum of academic disciplines and thus also affects the field of HSS, in which the number of female academics has historically been higher (Dubach et al., 2019).

Further barriers must therefore hinder female academics from start-up and spin-off creation. Many of our interviewees from KTT and innovation state that women still have to struggle with specific barriers that make it difficult or impossible to start a business in their chosen research field (see Hossinger et al., 2020). Many of them tend to be cultural, i.e., based on patterns of perception, thinking, and feeling in relation to innovation and entrepreneurship as a masculine field. But gender relations in general are also still having an impact: As long as women are primary care givers and still mainly responsible for household tasks, they simply have less time for entrepreneurial activities than men. Considerations such as these are supported by studies which suggest that at universities, women in particular report receiving less informal support for spin-off projects. They are less likely to view commercial exploitation of R&D knowledge as a career option and consider the availability of entrepreneurial role models at universities to be low (Schneider et al., 2021).

Scientists start to think and act entrepreneurially when they identify an entrepreneurial career as a possible option (Etzkowitz, 2017).

Although many promotion activities for spin-off and start-up creation exist at Swiss universities in 2021, we see little tailored support for female academics. Up until now, information and awareness-raising about (science-based) entrepreneurship for female students and staff are particularly emphasized in HEI and RI today, as well as activities to make female entrepreneurs more visible. The visibility of successful foundations and their initiators appears to be especially important for the promotion of women, as the existence of entrepreneurial role models can be assessed as low so far (see also Schneider et al., 2021). However, there is still a considerable scope for action and improvement.

6.1 Outlook

The database on start-up and spin-off activities at Swiss universities and research institutions is still scant.⁹ Founding activities have been surveyed especially rarely regarding characteristics such as gender. Also this study cannot provide a complete inventory of female academics as entrepreneurs; thus, even with regard to European and international conditions, only an approximate and comparative view is possible. A systematic monitoring of the conditions for entrepreneurial activity at universities, which takes place for instance in Germany (Fritzsche et al., 2022), is still lacking in Switzerland.

Nevertheless, the findings in this report can serve as an initial basis for discussing the conditions and the promotion of entrepreneurial activities of female academics in university management and research and innovation policy in Switzerland. Primarily, the data show that innovation and entrepreneurship at universities and public research institutes is still largely occurring in a male world. The number of start-ups and spin-offs generated from R&D by female academics is low and has shown little development momentum. And the low proportion of professorships held by women in STEM fields plays an important but by no means exclusive role.

HEI and RI are still called on to work towards improving the conditions for innovation and entrepreneurship by developing support formats specifically tailored to women at all levels of the academic hierarchy. This also means that the promotion of female spin-off intentions and activities should be developed “from the ground up” in STEM disciplines as traditional fields of innovation, but also in health, social sciences, and the arts. The successful promotion of female academic entrepreneurship is based on complex factors that include both formal structures (e.g., education, rewards, funding, infrastructure) and cultural expectations and practices (e.g., social support, entrepreneurial culture, recognition) (Kirby et al., 2011; Morandi et al., 2021). And besides the presence of experienced entrepreneurs of the same gender at universities, the fostering of networks with industry and investors are also key to supporting entrepreneurial intentions and activities among female students and staff in R&D.

At the organizational level, it seems necessary to connect actors in the field of gender equality & diversity more closely with those of KTT and innovation offices, so that their activities to promote female start-ups and spin-offs can develop synergies (Keisu et al., 2015; Liebig & Schneider, 2019). Only a strong collaboration among these actors allows a targeted transfer

⁹ An exception is the EPFL/ETHZ sector, which provides regularly data on the output of start-ups and information on existing support for start-ups (see Schubert et al., 2019).

of knowledge and technologies developed by female academics to be put into practice. In addition, universities and research institutions need to foster contacts to academic founders, business incubators and external investors, to improve the conditions for women to realize their ideas (Alsos & Ljunggren, 2017; Prokop, 2021). All this is likely to have an impact not only on the achievement of gender equality goals, but also on Switzerland's ability to remain highly innovative and successful in the future, and to provide added value to society in the medium and long term.

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8 Annex

8.1 List of abbreviations

HEI	Higher education institutions
ETHZ/EPFL	Federal Institutes of Technology
ETHZ	Swiss Federal Institute of Technology Zurich
EPFL	Swiss Federal Institute of Technology Lausanne
UNI	Universities
FU Switzerland	Franklyn University Switzerland
HSG	University of St. Gallen
UNIBAS	University of Basel
UNIBE	University of Bern
UNIGE	University of Geneva
UNIL	University of Lausanne
UNILU	University of Lucerne
UNINE	University of Neuchâtel
USI	University of Lugano
UZH	University of Zurich
UAS	Universities of applied sciences and arts
BFH	Bern University of Applied Sciences
FHGR	University of Applied Sciences Grison
FHNW	University of Applied Sciences Northwestern Switzerland
HES-SO	University of Applied Sciences and Arts Western Switzerland
HSLU	Lucerne University of Applied Sciences and Arts
HWZ	University of Applied Sciences in Business Administration Zurich
Kalaidos FH	Kalaidos University of Applied Sciences
OST	University of Applied Sciences Eastern Switzerland
SUPSI	University of Applied Sciences Southern Switzerland
ZFH	Zurich University of Applied Sciences
ZHAW	Zurich University of Applied Sciences
ZHdK	Zurich University of the Arts
RI	Research institutes
CERN	European Organization for Nuclear Research
EAWAG	Swiss Federal Institute of Aquatic Science and Technology
EMPA	Swiss Federal Laboratories for Materials Science and Technology
IDIAP	Research Institute Idiap
PSI	Paul Scherrer Institute

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