

2. The entrepreneurial climate at universities: the impact of organizational factors

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INTRODUCTION

The transfer of (technological) knowledge from universities to the marketplace has received increasing attention during the last decades due to its positive effects on social and economic development, regional development, the diffusion of technological innovations and university revenue (Degroof and Roberts 2004; Friedman and Silberman 2003; Mansfield 1991; Niosi 2006; Varga 1999). Overall, knowledge transfer can take various forms, for example, patenting, licensing, research contracts or academic spin-offs. Academic entrepreneurship, in terms of companies specifically created to exploit technological knowledge originated within universities (Grandi and Grimaldi 2005), is one way to facilitate this transfer and to establish new enterprises with innovative knowledge and technologies as their key strategic resource and competitive advantage. Furthermore, spin-offs are probably the most visible form of the commercialization of university research (Landry et al. 2006).

In this respect, specific tools have been introduced in order to foster venture creation (for example, incubators, science parks, departments of entrepreneurship, technology transfer offices, funding programmes). However, these tools primarily target persons at a more advanced venture creation stage. In contrast, little attention has been paid to the question of how different groups of university members (that is, faculty members, students) perceive these structural elements and how those perceptions influence their view on entrepreneurship at their institution.

Hence, a more holistic approach is needed which is able to capture the full entrepreneurial potential at universities, enabling an even more effective technology transfer process. We provide a framework that links different organizational conditions with university members' perceptions of entrepreneurship. Central to this framework, we introduce the concept of

a university's entrepreneurial climate, understood as university members' perceptions of the entrepreneurial environment at their university.

The notion of the climate concept in the field of academic entrepreneurship seems to be promising as research on climate in other disciplines suggests links with satisfaction, quality perception, performance, involvement and behavior (Anderson and West 1998; Glisson 2007; Katz-Navon et al. 2005; Liao and Rupp 2005; Ostroff 1993; Riordan et al. 2005). When we consider entrepreneurial climate as part of the overall organizational climate, we are introducing a new facet that interfaces with other 'sub climates' like innovation climate, justice climate or service climate. Given the proven links between climate concepts and positive outcomes such as performance or satisfaction, the concept of entrepreneurial climate does contribute to entrepreneurship research.

THEORETICAL BACKGROUND

Entrepreneurial Climate

Overall, organizational climate has been conceptualized as the employees' shared perception of different organizational characteristics, such as organizational events, procedures and practices (Patterson et al. 2005). Thereby, two research streams can be distinguished: research on organizational climate and research on psychological climate (Hellriegel and Slocum 1974; James and Jones 1974; Schulte et al. 2006). At an individual stage, one's own perceptions of the organizational environment constitute 'psychological climate'. At an organizational stage, if the single members of the organization agree on their perceptions of their work environment, the aggregated individual perceptions form the organizational climate (Patterson et al. 2005). Furthermore, the organizational members' perceptions are supposed to be primarily descriptive rather than affective or evaluative (Schneider and Reichers 1983). If there are differences in the characteristics of the work environment (for example, interactions, work conditions or managerial behavior) among different units within an organization, different levels of organizational climate may occur (Zohar 2002).

Research has deconstructed the notion of a generalised organizational climate into different dimensions or sub-dimensions during the last decades. Schneider and Reichers (1983) argue that the concept of climate needs to have a specific reference otherwise it is meaningless. We therefore analysed specific organizational facets and a range of different climates, for example, climate for service (Schneider et al. 1998), justice (Liao and Rupp 2005;

Naumann and Bennet 2000), innovation (Anderson and West 1998; van der Vegt et al. 2005) or safety (Katz-Navon et al. 2005; Wu et al. 2007).

Entrepreneurial climate, as used here, refers to the work environment at universities and thereby to an organizational level. The specific reference in the setting outlined is entrepreneurship. Hence, it describes the university members' perceptions of entrepreneurial activities and academic start-ups within the university.

Entrepreneurial Climate and Entrepreneurial Culture

As well as distinguishing psychological and organizational climate, we must differentiate the latter from the concept of culture. Since there is a conceptual and definitional overlap, the terms climate and culture have sometimes been used interchangeably (Crane and Meyer 2006; Patterson et al. 2005).

The concept of organizational climate was first mentioned in the 1950s. In contrast, the concept of organizational culture is much younger and was introduced into organizational literature in the 1970s. In the 1990s both constructs were discussed together for the first time and researchers tended to be confused about their similarities and differences (Glisson 2007). When reviewing present research, we must note that both concepts are employed with different meanings (Denison 1996; Glisson et al. 2008; Rentsch 1990; Schein 2000).

In an organizational context, both constructs are similar concepts referring to the impact of the organizations' contexts on their members' behavior (Denison 1996). Organizational culture refers to the deep-rooted structure of organizations, which could be understood and described as a pattern of basic assumptions that are held by organizational members that guide their behavior. Therefore, research on organizational culture analyses why organizational members behave in the way they do (Schein 1990). In contrast, climate refers to the members' perception and describes how the organization and their members act. Thus, Schein (1990, 2000) distinguishes climate as a surface manifestation of culture.

Furthermore, climate and culture studies have a different time frame. Culture studies mostly focus on the historical evolution and therefore the creation of the social environment within an organization. Research on climate rather provides an ahistorical snapshot of the way the players in organizations perceive the organization and their impact on it (Denison 1996). Owing to the differences in the respective objectives, different research methods are employed. Research on culture often uses qualitative methods while results in climate research are obtained through analysing quantitative survey data.

As Denison (1996) states, the most significant difference between both

Table 2.1 *Contrasting organizational culture and organizational climate*

Differences	Organizational culture	Organizational climate
Level of analysis	Deep-rooted – exploring underlying values and assumptions	Superficial – describing surface level manifestations
Temporal orientation	Historical evolution	Ahistorical snapshot
Methodology	Qualitative field observations	Quantitative survey data
Theoretical foundations	Social construction; critical theory	Lewinian field theory
Role of the individual	Agent and subject simultaneously	Separated from the social context

research streams lies in the theoretical foundations of the concepts. He points out that climate literature could be traced back to the field theory of Kurt Lewin (1951) and culture literature about the perspectives of symbolic interaction and social construction by Mead (1934) and Berger and Luckmann (1966). As a consequence, climate research separates the person from the social context whereas culture research denies this view and treats members in social systems as being agents and subjects simultaneously. Table 2.1 gives an overview of the differences between both concepts.

When we discuss entrepreneurial climate and culture at universities, we could say that entrepreneurial culture exists when university members act in an entrepreneurial fashion. This manifests itself in the visible artifacts, values and basic assumptions held by the members of universities. The pattern of basic assumptions results in observable behavior of employees and visible artifacts, which the members of the organization can see. As a result, this would constitute the entrepreneurial climate.

Since academic entrepreneurship is a relatively new phenomenon in Europe, it is likely that a broad entrepreneurial culture across universities does not yet exist (Etzkowitz and Klofsten 2005). Thus, analysing variables associated with entrepreneurial climate would lead to a better understanding of factors which shape entrepreneurial behavior. This in turn might contribute to the creation of entrepreneurial values and fundamental assumptions required for the sustainable development of entrepreneurial culture at universities (Schneider 2000).

Potential Factors Influencing Entrepreneurial Climate

In reviewing the literature, we noticed that previous research concerning academic entrepreneurship mostly concentrates on tangible factors, such

as incentive and reward systems for faculty and inventors or universities' royalty regulations (Friedman and Silberman 2003; Henrekson and Rosenberg 2001; Lockett and Wright 2005; Markman et al. 2004; Siegel et al. 2003), expenditure by universities on R&D (Coupé 2003) and appropriate infrastructure, like incubators or technology transfer offices (Lockett and Wright 2005; Moray and Clarysse 2005; Siegel et al. 2003). Covering intangible factors, most studies focus on university policies and their impact on spin-off formation (Degroof and Roberts 2004; Di Gregorio and Shane 2003; Power and McDougall 2005; Roberts and Malone 1996). To extend prior literature, we primarily focus on intangible factors besides university policies which might influence the entrepreneurial climate. Prior research mainly neglected this perspective. Furthermore, we concentrate on how factors could be influenced by a university's management without overstressing financial resources. Consequently, we exclude financial incentives and royalties from the study.

Although the climate perspective is a new view on academic entrepreneurship, there are different approaches in the literature that deal with the general and academic spin-off creation process. They provide evidence for factors potentially influencing the entrepreneurial climate at universities. These research streams include corporate entrepreneurship (Hornsby et al. 1999), entrepreneurial environments (Gnyawali and Fogel 1994), entrepreneurial university (Etzkowitz and Klofsten 2005) and academic spin-offs (Di Gregorio and Shane 2003; Grandi and Grimaldi 2005). We will now introduce the factors that potentially impact on a university's entrepreneurial climate.

It is important to mention that in most cases entrepreneurship is not seen as a main goal of universities when referring to academic entrepreneurship. Their traditional goals could be summarized as facilitating research and disseminating knowledge across academic and student communities (O'Shea et al. 2005). During the last decades, fostering the technology transfer process was attributed to them as a third mission in order to overcome limitations in economic development (Degroof and Roberts 2004; Niosi 2006). Hence, an ideal type of new university was developed – the entrepreneurial university. However, until now, this third mission of universities is not clearly implemented everywhere (Etzkowitz and Klofsten 2005). Therefore, it could be argued that the clear perception of *entrepreneurship as a university's goal* and as part of its mission is a key factor in perceiving a university as entrepreneurial and in fostering its entrepreneurial climate (Etzkowitz and Klofsten 2005; Friedman and Silberman 2003; Jacob et al. 2003; Laukkanen 2003; del Palacio Aguirre et al. 2006).

Furthermore, research indicates that the presence of experienced

entrepreneurs acting as successful *role models* is an important factor that influences entrepreneurial activities (Gnyawali and Fogel 1994; Laukkanen 2003; Moray and Clarysse 2005). When we consider the socio-economic condition, we could mention an additional factor that might influence the perception of the entrepreneurial climate, namely, the attitude towards entrepreneurship within the social system. It helps the backing of academic entrepreneurial activities and provides *social support* for entrepreneurs. If university members perceive a positive attitude towards entrepreneurship from their colleagues and management, it is likely that they perceive the university as being more entrepreneurial (Gnyawali and Fogel 1994; Laukkanen 2003; Moray and Clarysse 2005; O'Shea et al. 2005).

When we look at the factors that enhance the awareness of entrepreneurship and entrepreneurial opportunities within the university, we could add non-financial assistance. In particular, this includes the *infrastructure*, such as offices or laboratories offered by the university to academic entrepreneurs (Etzkowitz and Klofsten 2005; Di Gregorio and Shane 2003; Gnyawali and Fogel 1994; Jacob et al. 2003; O'Shea et al. 2005).

Furthermore, *entrepreneurial qualification programs* symbolize the institutionalization of entrepreneurial activities. Such institutionalization might have a positive impact on entrepreneurial climate (Burg van et al. 2008; Etzkowitz and Klofsten 2005; Laukkanen 2003; Moray and Clarysse 2005; del Palacio Aguirre et al. 2006).

Finally, the perceived *exposure to entrepreneurship* within the university in the sense of the frequency of contact with the topic could enhance the awareness of academic entrepreneurship and its perception, thus influencing entrepreneurial climate. This includes the university's official communications, for example, via campus magazines, newsletters or the university homepage, as well as informal communication within the university's daily life, for example, social interaction among university members (Burg van et al. 2008; Klein et al. 2001; Moray and Clarysse 2005; Morgeson and Hofmann 1999).

Consideration of the factors previously mentioned, we could assume that different factors influence the goal perception. They also symbolize the university's effort to implement its mission and goals into its structures and routines and make the mission more visible for university members (Etzkowitz and Klofsten 2005; Moray and Clarysse 2005).

Summarizing, we assume that the following factors might influence either directly or indirectly a university's entrepreneurial climate (see Figure 2.1): the perception of entrepreneurship as a university's goal (goal), the perception of successful role models (role model), the perception of entrepreneurial qualification programs, the perceived exposure to

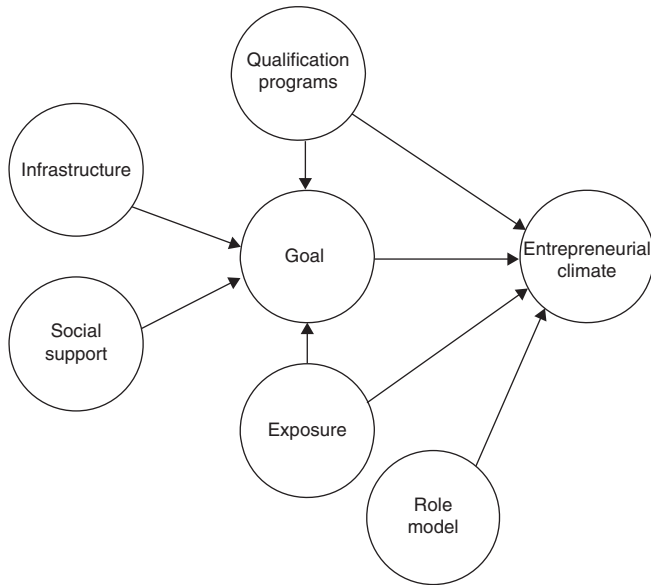


Figure 2.1 Conceptual model

academic entrepreneurship (exposure), the perception of infrastructure and the perception of social support.

EMPIRICAL STUDY

We collected data for this study through a survey at three German universities. Standardized online and paper questionnaires were distributed at the universities. To cater for the different groups of university members we divided them into two groups – students and faculty members. In total, 512 students and 190 faculty members returned the standardized questionnaires. Respondents rated all measures on seven-point Likert-type scales (1 = ‘totally agree’ and 7 = ‘totally disagree’).

The perception of entrepreneurship as a university’s goal was measured with three indicators (for example, ‘The stimulation of new business start-ups is a goal of my university’), the perception of entrepreneurial qualification programs with two indicators (for example, ‘There are a lot of programs for entrepreneurial education and further education at the university’). The perceived exposure to academic entrepreneurship contained three indicators (for example, ‘One comes often into contact with

entrepreneurship at my university'), perception of successful role models one indicator ('There were successful spin-offs during the last three years at my university'). Infrastructure was assessed using five indicators (for example, 'To what extent could students or faculty members use offices for setting-up their businesses at your university?') and the perception of social support with two indicators (for example, 'If you became an entrepreneur, what would your colleagues think about you?'). Finally, entrepreneurial climate was measured with two indicators (for example, 'To my mind, my university is very entrepreneurship-friendly').

Due to the preliminary nature of our study and the lack of theoretical explanations in the field of entrepreneurship regarding the concept of climate, we chose partial least squares (PLS) structural equation modeling (Fornell and Bookstein 1982; Wold 1982) employing SmartPLS 2.0 (Ringle et al. 2005) to analyse the data and estimate the impact of the different factors.

As reported in Table 2.2 and Table 2.3 all measurement models – for both faculty and students – show values above the required thresholds regarding reliability, convergent and discriminant validity (Fornell and Larcker 1981; Hair et al. 2006). Therefore, we suggest that our measures are reliable and valid. Furthermore, a Q^2 value greater than zero in both samples indicates that there is predictive relevance within the structural relationships (Fornell and Cha 1994).

The structural model (see Figure 2.2) demonstrates the direct and indirect influences on entrepreneurial climate for both the faculty and student sample. All examined factors are meaningful with the exception of infrastructure in the faculty sample. For this group the results indicate that the perception of successful role models is most important for creating an entrepreneurial climate. Furthermore, the recognition of entrepreneurship as a university's goal and the general exposure to entrepreneurial topics are important as well. In contrast, the perception of entrepreneurship qualifications seems to have less impact on climate. Regarding the perception of entrepreneurship as a goal of the university and its management, the exposure to entrepreneurial topics plays a prominent role within the factors considered. Interestingly, how available facilities and infrastructure are perceived seems to be less important when it comes to goal perception, and unimportant regarding climate perception. Maybe this instrument targets people who are at a more advanced entrepreneurial stage when the decision to start a company is closer and the person's view is more open to competitive advantage or the possibility of cost reductions. In addition, social support (that is, a positive attitude towards entrepreneurship held by colleagues and professors) has no impact on the perception of the entrepreneurial climate and only a small impact on goal perception.

Table 2.2 Evaluation of the reflective measurement model for faculty (N = 190)

Construct	M	SD	Factor loadings (≥ 0.707)	CR (≥ 0.7)	AVE (≥ 0.5)	Fornell/Larcker (AVE > Corr ²) ^b	R ² (> 0.3)	Q ² (> 0)
Goal				0.88	0.70	0.70 > 0.31	0.33	0.20
University	3.41	1.58	0.87					
School	4.27	1.68	0.91					
Professor	4.48	1.73	0.74					
Qualifications				0.87	0.77	0.77 > 0.37		
Quality	3.41	1.46	0.88					
Quantity	4.27	1.14	0.88					
Exposure				0.79	0.57	0.57 > 0.37		
General contact	3.41	1.60	0.85					
University's communication	4.27	1.65	0.83					
Contact at work	4.48	1.91	0.55					
Role model	2.67	1.36		1.00	1.00	1.00 > 0.25		
Infrastructure				0.92	0.70	0.70 > 0.01		
Offices	3.62	1.37	0.82					
Laboratory	3.46	1.29	0.89					
Equipment	3.68	1.30	0.90					
Production facilities	3.97	1.18	0.85					
Computer centre	3.08	1.23	0.70					

Social support						
Colleagues	2.81	1.37	0.78	0.87	0.78	0.78 > 0.25
Professor	2.68	1.50	0.97			
Entrepreneurial climate						
My university is very entrepreneurship-friendly	3.50	1.48	0.93	0.92	0.85	0.85 > 0.33
There is a very good entrepreneurial climate at my university	3.99	1.35	0.92			0.54
						0.45

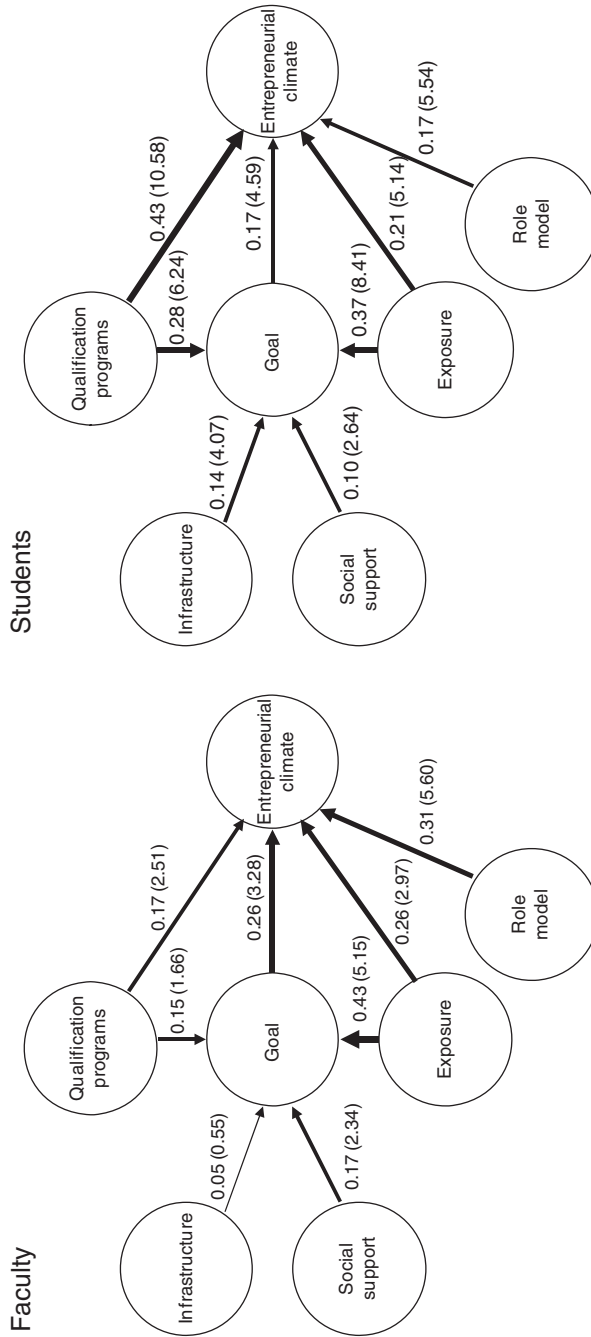
Note: M = mean, SD = standard derivation, CR = composite reliability, AVE = average variance extracted, Corr² = highest squared correlation between the model constructs, R² = coefficient of determination, Q² = predictive relevance (Stone-Geisser criterion).

Table 2.3 Evaluation of the reflective measurement model for students (N = 512)

Construct	M	SD	Factor loadings (≥ 0.707)	CR (≥ 0.7)	AVE (≥ 0.5)	Fornell/Larcker (AVE > Corr ²) ^b	R ² (> 0.3)	Q ² (> 0)
Goal				0.90	0.76	0.76 > 0.38	0.46	0.34
University	4.05	1.56	0.86					
School	4.41	1.73	0.92					
Professor	4.55	1.63	0.83					
Qualifications				0.90	0.81	0.81 > 0.51		
Quality	4.55	1.56	0.91					
Quantity	4.19	1.34	0.89					
Exposure				0.82	0.61	0.61 > 0.46		
General contact	4.39	1.67	0.86					
University's communication	4.91	1.63	0.78					
Contact at work	4.92	1.79	0.69					
Role model	2.78	1.05		1.00	1.00	1.00		
Infrastructure				0.91	0.68	0.68 > 0.11		
Offices	3.74	1.33	0.80					
Laboratory	3.49	1.19	0.86					
Equipment	3.71	1.16	0.84					
Production facilities	3.88	1.23	0.90					
Computer centre	2.83	1.23	0.72					

Social support						
Colleagues	2.68	1.05	0.90	0.91	0.84	0.84 > 0.05
Professor	2.48	1.12	0.94			
Entrepreneurial climate						
My university is very entrepreneurship-friendly	3.85	1.58	0.91	0.91	0.83	0.83 > 0.51
There is a very good entrepreneurial climate at my university	4.23	1.38	0.91			0.61
						0.50

Notes: M = mean, SD = standard deviation, CR = composite reliability, AVE = average variance extracted, Corr^2 = highest squared correlation between the model constructs, R^2 = coefficient of determination, Q^2 = predictive relevance (Stone-Geisser criterion).



Notes:
t-values are in parentheses.
Significant paths ($p < 0.05$) are printed in boldface.

Figure 2.2 Structural model with path coefficients (standardized values)

Table 2.4 Significance of path differences between faculty and students

Path	Faculty	Students	t statistics path differences
Qualification programs → climate	0.17	0.43	3.195**
Qualification programs → goal	0.15	0.28	1.443*
Exposure → climate	0.26	0.21	0.575
Exposure → goal	0.43	0.37	0.706
Goal → climate	0.26	0.17	1.195
Infrastructure → goal	0.05	0.14	1.103
Role model → climate	0.31	0.17	2.334**
Social support → goal	0.17	0.10	0.908

Note: * $p < 0.1$; ** $p < 0.01$.

We can identify several differences in the extent of the path coefficients when we compare faculty and students as shown in Figure 2.2. We used the following formula (Chin 2000) to calculate whether the differences between both samples are significant:

$$t = \frac{Path_{sample1} - Path_{sample2}}{\left[\sqrt{\frac{(m-1)^2}{(m+n-2)} * S.E.^2_{sample1} + \frac{(n-1)^2}{(m+n-2)} * S.E.^2_{sample2}} \right] * \left[\sqrt{\frac{1}{m} + \frac{1}{n}} \right]} \quad [2.1]$$

with m being the cases in the faculty sample (190), n the cases in the students sample (512) and $S.E.$ the standard error of the respective sample.

We identified significant differences regarding the impact of the perception of qualification on climate and goal perception and the impact of successful role models on climate perception (see Table 2.4) when we examined both groups.

For students, the perception of entrepreneurship qualification programs is the most important factor influencing the entrepreneurial climate at the university. The general contact with entrepreneurial topics within the university (exposure) seems to have nearly the same impact as for the faculty group. In contrast, goal perception and successful role models appear to play a minor role in influencing students' perception of the entrepreneurial climate at their university. Furthermore, the perception of available infrastructure for spin-offs and the perceived positive attitude towards entrepreneurial activities by members of faculty do not directly influence climate perception. Both factors affect the goal perception, which in turn

has little impact on climate. Qualification programs and exposure could be added as potential factors when considering the perception of entrepreneurship as a university's goal. Across the groups, it turns out that a general exposure to entrepreneurship (for example, covering successful start-ups by university media, presentations and discussions with entrepreneurs) is a major determinant in the perception that fostering academic spin-offs is a university goal.

DISCUSSION AND IMPLICATIONS

The purpose of this study was to examine how the perception of specific tools aiming to foster academic entrepreneurship (that is, qualification programs, infrastructure, exposure to entrepreneurial topics, fostering entrepreneurship as goal of the university) and related entrepreneurial events or procedures (that is, social support, presence of role models) influences academics' evaluation of the conditions to start a new venture. We conceptualized the institutional conditions as a university's entrepreneurial climate. We expected that the analysed tools and events derived from literature significantly contribute to the university's entrepreneurial climate. Our empirical work tested this core proposition via a survey involving 702 academics. In order to capture all university members and enhance generalizability, we included both students and faculty in the study.

Overall, entrepreneurial climate was directly influenced by the analysed factors in the proposed way. Interestingly, important differences between faculty and students came to light. In line with the work of del Palacio Aguirre et al. (2006), our results showed that qualification programs are most important for shaping students' entrepreneurial climate but least important for faculty members. For the latter, the presence of role models leads to significantly better climate perceptions, relative to students.

An unexpected finding occurred regarding the perception of infrastructure available for academic entrepreneurs. Although there is consensus that infrastructure is important for supporting spin-off creation (Di Gregorio and Shane 2003; Jacob et al. 2003; O'Shea et al. 2005), we did not find significant effects on faculty members' perception of entrepreneurship as a university goal. For students, this link exists but is weak. Reasons for this could be that academics are unaware of existing infrastructure or that university management failed to visibly integrate these structures (Jacob et al. 2003).

In conclusion, the successful introduction of the climate construct allowed us to combine the internal perspective of potential entrepreneurs

with their specific university environment. Academics' perceptions of structural elements constitute the starting point for internal psychological processes related to entrepreneurial decision-making. The climate concept is able to capture a broad range of factors regarding the evaluation of the entrepreneurial environment. Moreover, it includes differences in the relevance of single factors for students and faculty. Thus, entrepreneurial climate might be a powerful variable in explaining entrepreneurial behavior. More importantly, it may even help to explain its absence.

In addition to these implications for entrepreneurship research, our results provide important practical implications. There are new ways in which universities can improve their entrepreneurial climate in a strategic manner. First, university management should increase the visibility of existing efforts to foster academic entrepreneurship. In this light, there is a need to consider perceptual differences between students and faculty. Thus, in order to increase entrepreneurial climate within each group, communication channels and tools should be carefully selected. Respectively, media and tools frequently used by students may emphasize information about entrepreneurial qualification programs. In so doing, the university–entrepreneurship link might be created or enhanced among students, even among those yet unaware of such offers. In contrast, specific communication channels qualified to achieve faculty members' attention may highlight successful academic entrepreneurs to increase role-model perception (for example, using professors and colleagues as multipliers, newsletters of the schools). Second, the impact of tools that foster academic entrepreneurship could be improved. If a university tried to establish a strong entrepreneurial climate, it should include this as a part of the overall university mission and explicitly inform all university members. This in turn contributes to the perceived exposure to entrepreneurship and, therefore, might increase both goal and climate perception. Furthermore, if the university establishes qualification programmes, it will be reasonable to avoid solely focusing on people who are already interested in entrepreneurial topics. Because these programs are the most powerful driver in establishing an entrepreneurial climate for students, it seems worthwhile to include such programs in as many curricula as possible. Thereby, university management might consider particular needs of students to lower initial barriers. With respect to role models, universities might search for recent entrepreneurs with an academic background to demonstrate that this topic is a viable career option. In addition, university management could actively support nascent entrepreneurs who seem to be suitable as successful and authentic role models.

Despite the insights from this study, further research is needed to examine the relationships between entrepreneurial climate and other

important psychological concepts, as attitude toward entrepreneurship or intention to start a new business. Additionally, future research may combine the climate approach with objective indicators of academic entrepreneurship like universities' spin-off rates. This might contribute to our understanding of the effectiveness of different tools and events that have been introduced to foster academic entrepreneurship.

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