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ORIGINAL ARTICLE

Are Entrepreneurial Intentions and Open Innovation complements or substitutes for eliciting activities towards the market commercialization of academic breakthrough technologies?

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ABSTRACT
We investigate how the interplay between academic researchers' and innovators' entrepreneurial intentions and open innovation activities fosters their market commercialization activities. We qualitatively analyse five case studies of European research consortia to propose potential theoretical mechanisms that limit or abet market commercialization activities. Our results show that inbound and coupled open innovation activities compensate for lower entrepreneurial intentions among scientists. However, establishing partnerships remains challenging, particularly in pre-prototyping phases. Noticeably, our findings point towards prosocial motivation as an enabler to make innovation outcomes more publicly available.

Key words: Entrepreneurial intention; open innovation; breakthrough technology; breakthrough innovation

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INTRODUCTION

Policy makers have increasingly asked academics and universities to add the third mission, i.e. commercial applications of their research, to their traditional missions of research and teaching (European Commission, 2012; Martin, 2012). Yet not all scientists have been equally able to realize the potential that their (academic) research provides for commercialization and spin-offs (Etzkowitz & Viale, 2010; Philpott et al., 2011). This especially holds true for Europe, where academic entrepreneurship emerged substantially later than in the United States (Franzoni & Lissoni, 2006). In addition, the number and volume of European university spin-offs have historically lacked behind (Saetr et al., 2009).

As moving from scientific research to participating in commercialization processes of those research ideas constitutes a volitional act, it is purposive and should occur in a planned manner (Ajzen, 1991; Lüthje & Franke, 2003). Research on entrepreneurship showed that multiple personal and contextual factors affect both, the manifestation of entrepreneurial intentions as well as how entrepreneurial intentions transcend into entrepreneurial activities and outcomes. Examples of these factors include personality traits (Schlaegel et al., 2021; Zhao et al. 2010)), education (Bhat & Singh, 2018), as well as institutional and regulatory environments (Doanh, 2021). In light of these findings, an understanding of scientists' entrepreneurial intentions is critical to comprehend how the process of discovering, creating, and exploiting commercialization opportunities stemming from university research projects can be enhanced (Gartner et al., 1994). Looking specifically at academic entrepreneurship, Obschonka et al. (2019) showed that having an entrepreneurial personality increases entrepreneurial activity. Balven et al. (2018) found the same positive effect for education achievements. In terms of institutional environments, especially the role of entrepreneurial supporting bodies provided by universities and governments has been studied extensively (e.g., Neves & Brito, 2020; Urban & Chantson, 2019). Regarding the regulatory framework, Teixeira et al. (2017: 22) highlighted the relevance of "governmental and political factors" in establishing entrepreneurial intentions for European academic scientists to commercialize their research. This is of special relevance for the EU Framework Programmes for Research and Innovation as they specifically aim at establishing environments that enable the pursuit of innovative academic entrepreneurship (Gonzalez et al., 2019). In fact, the European Innovation Council acknowledged that "turning science into business is about recognizing opportunity" (Gray, 2019). In this context, both Horizon 2020 as well as Horizon Europe aim at increased levels of innovation through enabling co-creation. To accomplish this, these funding schemes have implemented innovation grants that require

multiple organizations to team up for their applications. In other words, these programmes have been fostering open innovation activities by targeting basic scientific research and asking them to collaborate with other stakeholders to turn research outcomes into ready-to-use technologies (Salmelin, 2013).

Yet research investigating the interplay of entrepreneurial intentions and open innovation in the context of academic entrepreneurship is scarce. We thus take up this notion by investigating whether and how open innovation activities and entrepreneurial intentions interact in fostering academic researchers' and innovators' activities towards the market commercialization of their academic research results.

Research Question: *How does the interplay of academic researchers' and innovators' entrepreneurial intentions and open innovation activities relate to their market commercialization activities?*

THEORETICAL BACKGROUND

Entrepreneurial intentions

Intentions primarily reflect the willingness to perform a particular behavior. Thus, intentions are antecedents of actual behavior (Ajzen, 1991). To this end, entrepreneurial intentions reflect an individual's perception, estimation, and general plan to become an entrepreneur (Krueger et al., 2000). In the context of academic entrepreneurship, they reflect the strength of motivational factors necessary to actively participate in the process of converting research findings into marketable products.

Kautonen et al. (2015) discussed three characteristics that influence entrepreneurial intentions: a) the own positive evaluation of the targeted behavior; b) the subjective norms about the targeted behavior by a relevant reference group; and c) the ease (or difficulty) of performing the targeted behavior. Schlaegel and Koenig (2014) showed that perceived desirability (a); the degree to which an entrepreneurial career is attractive; and perceived feasibility (c); the extent to which one has the ability to become an entrepreneur; are important predictors of entrepreneurial behavior. Whereas economic success, prior education, and experience provide the basis for a) and c) in many start-ups (Lee et al., 2011; Schenkel et al., 2015), socialization plays a crucial role when it comes to b), the subjective norms. The social context in which people find themselves in has an enormous impact on how individuals shape their own self-image. They develop views of themselves using referents, people they consider similar, to delineate beliefs, goals, and behaviors (Crocetti et al., 2016; Criaco et al., 2017). Consequently, individuals who are still in their formative development process (for example junior scientists) are particularly open to being influenced by others (Tortoriello et al., 2012). These impressions and influences gathered in early career stages continue to shape individual behavior even if they are later exposed to different environments (Attebery et al., 2015). Thus, senior scientists as well as practice-oriented consortium partners with entrepreneurial intentions can act as reflective and supportive role models. They can elicit subsequent entrepreneurial intentions in their students, doctoral candidates, colleagues, or consortium partners.

Open innovation

The open innovation paradigm introduced by Chesbrough (2003) emphasizes the importance of collaborations and knowledge exchanges that extend beyond organizational boundaries. It acknowledges that valuable ideas can originate externally and therefore encourages organizations to engage with external expertise to drive internal innovation processes (Chesbrough, 2003). Open innovation fosters a dynamic innovation ecosystem that draws from connections among a variety of internal and external innovation stakeholders (Wayne Gould, 2012).

Chesbrough and Crowther (2006) defined two types of connections: inbound and outbound. Inbound open innovation comprises collaborations and knowledge exchanges that encompass relevant inputs for innovation activities from outside the organization. Outbound open innovation subsumes innovation partnerships and knowledge flows that the organization shares with outside individuals, organizations, and institutions (West & Bogers, 2014). Enkel et al. (2009) also characterized a third type of open innovation mode, coupled, which combines both, inbound and outbound open innovation.

Originally, the open innovation paradigm was developed in the realm of corporate research and development (Chesbrough, 2017). However, Beck et al. (2022; 2023) recently summarized that all three open innovation modes can occur in (academic) science. In terms of inbound open innovation, citizen/crowd science constitutes a prime example where volunteers not belonging to the research team can provide inputs for the research and development process (Sauermann et al., 2020). Concerning outbound open innovation, more and more scientists make their results and research data openly accessible (Barczak et al., 2022; Laakso et al., 2011). Last, with respect to coupled open innovation, especially co-creation with industry partners has become a predominant technique in distributing academic innovation outcomes. Among others, this takes place through contract research and consulting (Cohen et al., 2002; Perkman & Walsh, 2008), personal relations (Grimpe & Fier, 2010), and even direct collaboration where academic scientists and corporate innovators work side-by-side (D'Este & Perkmann, 2011).

METHOD AND DATA

The aim of this study is to provide possible explanations and mechanisms how the interplay between scientists' entrepreneurial intentions and open innovation activities affects their activities to transform research outcomes into marketable products. We therefore employ case study research as suggested by Siggelkow (2007).

Case selection

We selected our cases from the Breakthrough Innovation Programme for a Pan-European Detection and Imaging Eco-System – Phase-2 (ATTRACT 2) funded through the Horizon 2020 framework of the European Commission. This programme awarded 18 research, development and innovation (R&D&I) projects with 500,000€ to 2,000,000€ each to develop existing proof-of-concepts into market-ready prototypes. ATTRACT 2 thus provides a perfect opportunity for analysing our research question as it specifically aims to generate commercialization opportunities out of basic (academic) research results.[1]

To provide practical relevant implications on the design of funding mechanisms, we explicitly consider that European research and innovation funding programmes like Horizon Europe offer funding for projects that differ across various characteristics such as consortium size, country composition, etc. (Tenhunen-Lunkka & Honkanen, 2024). First, we selected projects exhibiting different levels of cultural diversity, ranging from a project including solely organizations located in two culturally similar countries to a project that includes project partners outside the European Higher Education Area. Second, we included projects comprising various types of organizations, ranging from university and research labs to start-ups, SMEs, and large industry corporates. Third, we included projects from the life sciences, physics, and ecology. To enable a thorough investigation of each individual case, we limited the number of cases to a manageable minimum. After careful deliberations among the authors, we decided that five cases would give us the optimal balance between gaining insights from different perspectives and at the same time allowing for in-depth-analyses of the R&D&I projects.

Data collection and analysis

We generated a semi-structured interview questionnaire based on the existing literature on open innovation and entrepreneurial intentions presented in the theoretical background section.[2] The questions on open innovation activities and activities leading towards market commercialization were held on a project team level and (e.g., "Have you involved potential end-users in the project?"). The questions on entrepreneurial intentions were asked on an individual level (e.g., "What is your major aim for the project in business terms?"). Yet these interview questions only served as an orientation to establish anchor points for the topics. They subsequently allowed interview partners to follow their own interpretations of these topics (Charmaz, 2006). We first interviewed the five project leaders in the beginning of 2023. At the end of these interviews, we asked them to provide us with additional interview partners from their project teams who could be valuable for investigating open innovation activities and entrepreneurial intentions. We then conducted thirteen interviews with team members. Last, following an initial screening of the interviews, we opted to again interview the five project leaders in late 2023 to follow-up on remaining open aspects and identify changes in the activities leading towards market commercialization that occurred during the nearly yearlong study period.

We conducted the interviews virtually via MS Teams and manually edited the transcriptions. The research team comprised four scholars from varying backgrounds including engineering, management, and policy research. We deductively coded the sections pertaining to entrepreneurial intentions, open innovation, and activities towards the market commercialization of the research results. Hereby, the interdisciplinarity of our research team was of high importance given that authors' backgrounds and sensitizing concepts served as starting points for the coding (Charmaz, 2007). For the deductive coding, we relied on the definitions provided in Enkel et al. (2009) according to which open innovation activities constitute all interorganizational innovation collaborations. In terms of entrepreneurial intentions, we followed the framework established by Krueger et al. (2000) by considering any perceptions, estimations and general plans of individuals to become an entrepreneur. In terms of activities leading towards market commercialization, we coded all statements providing insights on the activities project teams conducted to become capable of turning the technological innovation into a market product or service (Datta et al., 2015). Afterwards, following the suggestions outlined in Eisenhardt and Graebner (2007), we inductively generated first- and second-order codes among these categories. We employed MAXQDA 22 for all coding steps.

[1] More information on ATTRACT is available at https://attract-eu.com/

[2] The questionnaire further included questions on diversity and inclusivity which are not relevant for the study at hand.

RESULTS

In the following, we briefly discuss the results of our analysis that led to five propositions. Table A in the appendix provides descriptive information on the five cases and on our interview partners, as well as the associated interview quotations from which we derived our propositions.

We find that all projects embraced open innovation activities. This is not surprising given the specific focus on cross-organizational collaboration outlined by the ATTRACT consortium. Differentiating the types of open innovation activities, our findings reveal that inbound open innovation activities can substitute for a lack of entrepreneurial intentions in academics that engage in commercialization activities. These inbound activities include, for example, bringing in knowledge through the inclusion of experienced businesspeople or relying on advice from technology transfer specialists.

Proposition 1: *Inbound open innovation activities substitute for academics' lack of entrepreneurial intentions.*

We also discovered that coupled open innovation activities can compensate for the absence of entrepreneurial intentions in academics. This is because both collaboration with community peers and partnerships with more business-focused projects can guide activities towards market commercialization. On the one hand, the leaders of projects C and E only began contemplating commercialization activities after discussions with peers at conferences. On the other hand, involving for-profit organizations as partners in the early stages encouraged the leaders of projects B and D to engage more in activities aimed at commercializing their research results.

Proposition 2: *Coupled open innovation activities substitute for academics' lack of entrepreneurial intentions.*

Despite the importance of onboarding partnerships either in the form of inbound or coupled open innovation activities, we counterintuitively find that three out of the five projects found it hard to establish these relationships. Hereby, our interview partners specifically pointed out that there exists a catch-22 dilemma: "So [the partners] are very interested but they say, OK, but please, so we want to see the [prototype] before we invest more money and then this is the difficult part. We need money to create those prototypes. But they don't want to invest until this is ready." (Member of Project C)

Proposition 3: *The causal loop between technological proof and partner-involvement constitutes a major challenge for academics' commercialization activities.*

Another surprising insight arises from our observation that project leaders and members of projects A, B and C state that they would prefer to make their innovation outcomes openly and freely accessible to everyone. They perceive that it is more important that everyone can benefit from their research and innovation outcomes than achieving financial success through commercialization. This highlights the crucial role of academics' prosocial motivation when they move beyond research and make their innovation outcomes publicly available.

Proposition 4: *Academics' exhibiting stronger prosocial motivation have increased intentions to make their innovation outcomes publicly available.*

Last, we find, as expected, that despite being interested in an entrepreneurial pathway for their innovation, some interview partners were rather scared of the negative consequences in case this endeavor fails. As a case in point, project leader B explicitly told us that his goal is to develop the technology to a state where it is bought by an industrial firm. This way, he does not have to engage in the upscaling himself, thus avoiding the risks associated with the commercialization. Talking about the fears associated with founding start-ups as academically trained scientists, project leader C pointed towards the existence of cultural differences, with, in his experience, US-Americans being much less afraid of entrepreneurial failure than Europeans.

Proposition 5: *Fear of entrepreneurial failure negatively influences academics' entrepreneurial intentions.*

DISCUSSION AND CONCLUSIONS

Our results highlight that especially inbound and coupled open innovation activities can substitute for lower entrepreneurial intentions in academically trained scientists. Via this mechanism, inbound and coupled open innovation activities can increase the likelihood of market commercialization of academic research outcomes. Consequently, both, institutionalized efforts like technology transfer offices as well as individual-level contingency factors like personal networks play an important role in commercializing scholarly research results (Belitski et al., 2019). However, we also find that finding partners to establish those inbound and coupled open innovation activities is not trivial, especially in the phases prior to prototyping. Academic entrepreneurs face a strong legitimacy problem with their novel ideas and early-stage innovations. They explicitly have to convince external resource providers of the potential merit of their idea. In turn, resource providers have to trade-off their financial contribution against obtaining a

novel and hitherto unseen product that a) they will only receive after a substantial temporal delay and b) that will be prone to performance-related uncertainties.

This points towards the necessity of research and innovation funding schemes to provide full financial security for the development of a prototype independently of the status of partnerships. While, for example, the European Innovation Council provides grants for up to € 2.5 mio., our results show that is not enough money to develop prototypes, especially in deep-tech breakthrough technologies. In fact, despite receiving up to € 2 mio. funding in ATTRACT 2, the project leaders stressed their severe financial limitations requiring them to draw on personal funds.

We furthermore add to the rising literature investigating societal impact of academic research (Bornmann, 2013; Fecher & Hebing, 2021; Wright, 2014). We show that academic innovators exhibit high prosocial motivations which in turn positively relate to their engagement in innovation activities (Orazbayeva & Plewa, 2022). Consequently, we demonstrate the interconnectedness of technology transfer research with the social innovation and social entrepreneurship literature (Hockerts, 2017; Phillips et al., 2015; Waldman et al., 2022). This highlights social entrepreneurship as a fruitful avenue for academically originating innovation. Importantly, trade-offs between open science (making results and innovation accessible for the wider community) and commercializing innovations appear to conflict with each other for the individual scientists, and they might conflict even stronger for the goals and means of European research and innovation programmes.

In addition to the existing limitations of qualitative research based on case studies (Eisenhardt, 1989; Charmaz, 2006), we transparently acknowledge that our results rely on in-depth analyses of only five cases from ATTRACT 2. Thus, to ensure the generalizability of our findings, we are currently conducting semi-structured interviews with all projects. Nevertheless, the results (even with those included from the thirteen additional project) all stem from ATTRACT 2, a research and innovation program specifically aimed at designing novel mechanisms for funding and conducting high-end tech research. Therefore, our findings might only generalize to research and innovation projects that are at least partially funded through schemes forcing them to collaborate with multiple partners. To this extent, the potential of collaboration for commercialization might even be understated in our findings.

In terms of future research opportunities, we encourage scholars to investigate the causality of the interplay between open innovation and entrepreneurial intentions using experimental and/or longitudinal designs. Hereby, researchers could run a field experiment distributing innovation funding to a treatment group enforced to engage in open innovation activities, a treatment group receiving training on entrepreneurial intentions and a respective control group. Moreover, they could empirically study commercialization activities arising from manifold projects funded through large-scaled initiatives like Horizon Europe (Shaw, 2023). The results would then allow policy makers to finetune future funding requirements for research and innovation programmes to specifically elicit market commercialization activities through increased entrepreneurial intentions and the adoption of open innovation practices.

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REFERENCES

Ajzen, I. 1991. The theory of planned behavior. Organizational Behavior and Human Decision Processes, 50(2): 179-211.

Atteberry, A., Loeb, S., & Wyckoff, J. 2015. Do first impressions matter? Predicting early career teacher effectiveness. AERA Open, 1(4): 2332858415607834.

Balven, R., Fenters, V., Siegel, D. S., & Waldman, D. 2018. Academic entrepreneurship: The roles of identity, motivation, championing, education, work-life balance, and organizational justice. Academy of Management Perspectives, 32(1), 21-42.

Barczak, G., Hopp, C., Kaminski, J., Piller, F., & Pruschak, G. 2022. How open is innovation research? – An empirical analysis of data sharing among innovation scholars. Industry and Innovation, 29(2): 186-218.

Beck, S., Bergenholtz, C., Bogers, M., Brasseur, T. M., Conradsen, M. L., Di Marco, D., ... & Xu, S. M. 2022. The Open Innovation in Science research field: a collaborative conceptualisation approach. Industry and Innovation, 29(2): 136-185.

Beck, S., LaFlamme, M., Bergenholtz, C., Bogers, M., Brasseur, T. M., Conradsen, M. L., ... & Xu, S. M. 2023. Examining Open Innovation in Science (OIS): what Open Innovation can and cannot offer the science of science. Innovation, 25(3): 221-235.

Belitski, M., Aginskaja, A., & Marozau, R. 2019. Commercializing university research in transition economies: Technology transfer offices or direct industrial funding? Research Policy, 48(3): 601-615.

Bhat, I. H., & Singh, S. 2018. Analyzing the moderating effect of entrepreneurship education on the antecedents of entrepreneurial intention. Journal of Entrepreneurship Education, 21(1), 1-10.

Bornmann, L. 2013. What is societal impact of research and how can it be assessed? A literature survey. Journal of the American Society for Information Science and Technology, 64(2): 217-233.

Charmaz, K. 2006. Constructing Grounded Theory: A Practical Guide Through Qualitative Analysis. London: Sage Publishing.
Charmaz, K. 2007. Tensions in qualitative research. Sociologisk Forskning, 44(3), 76-85.
Chesbrough, H. 2017. The future of open innovation: The future of open innovation is more extensive, more collaborative, and more engaged with a wider variety of participants. Research-Technology Management, 60(1): 35-38.
Chesbrough, H. W. 2003. Open Innovation: The New Imperative for Creating and Profiting from Technology. Cambridge: Harvard Business Press.
Chesbrough, H., & Crowther, A. K. 2006. Beyond high tech: early adopters of open innovation in other industries. R&D Management, 36(3): 229-236.
Cohen, W. M., Nelson, R. R., & Walsh, J. P. 2002. Links and impacts: The influence of public research on industrial R&D. Management Science 48 (1): 1–23.
Criaco, G., Sieger, P., Wennberg, K., Chirico, F., & Minola, T. (2017). Parents' performance in entrepreneurship as a "double-edged sword" for the intergenerational transmission of entrepreneurship. Small Business Economics, 49: 841-864.
Crocetti, E., Moscatelli, S., Van der Graaff, J., Rubini, M., Meeus, W., & Branje, S. 2016) The interplay of self–certainty and prosocial development in the transition from late adolescence to emerging adulthood. European Journal of Personality, 30(6): 594-607.
D'Este, P., & Patel, P. 2007. University–industry linkages in the UK: What are the factors underlying the variety of interactions with industry? Research Policy 36 (9): 1295–1313.
Datta, A., Mukherjee, D., & Jessup, L. 2015. Understanding commercialization of technological innovation: taking stock and moving forward. R&D Management, 45(3), 215-249.
Doanh, D. C. 2021. The role of contextual factors on predicting entrepreneurial intention among Vietnamese students. Entrepreneurial Business and Economics Review, 9(1), 169-188.
Eisenhardt, K. M. 1989. Building theories from case study research. Academy of Management Review, 14(4): 532-550.
Eisenhardt, K. M., & Graebner, M. E. 2007. Theory building from cases: Opportunities and challenges. Academy of Management Journal, 50(1), 25-32.
Enkel, E., Gassmann, O., & Chesbrough, H. 2009. Open R&D and open innovation: exploring the phenomenon. R&D Management, 39(4): 311-316.
Etzkowitz, H., & Viale, R. 2010. Polyvalent knowledge and the entrepreneurial university: A third academic revolution? Critical Sociology, 36(4): 595-609.
European Commission. 2012. A European strategy for Key Enabling Technologies – A Bridge to Growth and Jobs. Brussels: European Commission. URL: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2012:0341:FIN:EN:PDF [10 September 2021].
Fecher, B., & Hebing, M. 2021. How do researchers approach societal impact? Plos One, 16(7): e0254006.
Franzoni, C., & Lissoni, F. 2006. Academic Entrepreneurship, Patents, and Spin-Offs: Critical Issues and Lessons for Europe. Universita Commerciale Luigi Bocconi. Working Paper n. 180.
Gartner, W: B., Shaver, K. G., Gatewood, E., Katz, J. A. 1994. Finding the entrepreneur in entrepreneurship. Entrepreneurship Theory & Practice, 18(3): 5-9.
González Fernández, S., Kubus, R., & Mascareñas Pérez-Iñigo, J. 2019. Innovation ecosystems in the EU: Policy evolution and horizon Europe proposal case study (the Actors' perspective). Sustainability, 11(17), 4735.
Gray, R. 2019. Turning Science Into Business Is About Recognising Opportunity. Brussels: European Commission. URL: https://projects.research-and-innovation.ec.europa.eu/en/horizon-magazine/turning-science-business-about-recognising-opportunity [19 April 2024].
Grimpe, C., & Fier, H. 2010. Informal university technology transfer: A comparison between the United States and Germany. Journal of Technology Transfer 35 (6): 637–650.
Hockerts, K. 2017. Determinants of social entrepreneurial intentions. Entrepreneurship Theory and Practice, 41(1): 105-130.
Kautonen, T., Van Gelderen, M., & Fink, M. 2015. Robustness of the theory of planned behavior in predicting entrepreneurial intentions and actions. Entrepreneurship Theory and Practice, 39(3): 655-674.
Krueger Jr, N. F., Reilly, M. D., & Carsrud, A. L. 2000. Competing models of entrepreneurial intentions. Journal of Business Venturing, 15(5-6), 411-432.
Laakso, M., Welling, P., Bukvova, H., Nyman, L., Björk, B. C., & Hedlund, T. 2011. The development of open access journal publishing from 1993 to 2009. PloS One, 6(6): e20961.
Lee, L., Wong, P. K., Der Foo, M., & Leung, A. 2011. Entrepreneurial intentions: The influence of organizational and individual factors. Journal of Business Venturing, 26(1): 124-136.
Lüthje, C., & Franke, N. 2003. The making of an entrepreneur: Testing a model of entrepreneurial intent among engineering students at MIT. R&D Management, 33(2): 135-147.
Martin, B. R. 2012. Are universities and university research under threat? Towards an evolutionary model of university speciation. Cambridge Journal of Economics, 36(3): 543-565.
Neves, S., & Brito, C. 2020. Academic entrepreneurship intentions: A systematic literature review. Journal of Management Development, 39(5), 645-704.
Obschonka, M., Moeller, J., & Goethner, M. 2019. Entrepreneurial passion and personality: the case of academic entrepreneurship. Frontiers in Psychology, 9, 400253.
Orazbayeva, B., & Plewa, C. 2022. Academic motivations to engage in university-business cooperation: a fuzzy set analysis. Studies in Higher Education, 47(3), 486-498.
Perkmann, M., & Walsh, K. 2008. Engaging the scholar: Three types of academic consulting and their impact on universities and industry. Research Policy 37 (10): 1884–1891.
Phillips, W., Lee, H., Ghobadian, A., O'regan, N., & James, P. 2015. Social innovation and social entrepreneurship: A systematic review. Group & Organization Management, 40(3): 428-461.
Philpott, K., Dooley, L., O'Reilly, C., & Lupton, G. 2011. The entrepreneurial university: Examining the underlying academic tensions. Technovation, 31(4): 161-170.

Saetre, A. S., Wiggins, J., Atkinson, O. T., & Atkinson, B. K. E. 2009. University spin-offs as technology transfer. Comparative Technology Transfer and Society, 7(2): 115-145.

Salmelin, B. 2013. The Horizon 2020 framework and open innovation ecosystems. Journal of Innovation Management, 1(2), 4-9.

Sauermann, H., Vohland, K., Antoniou, V., Balázs, B., Göbel, C., Karatzas, K., ... & Winter, S. 2020. Citizen science and sustainability transitions. Research Policy, 49(5): 103978.

Schenkel, M. T., D'Souza, R. R., Cornwall, J. R., & Matthews, C. H. 2015. Early influences and entrepreneurial intent: Examining the roles of education, experience, and advice networks. Journal of Small Business Strategy, 25(2): 1-20.

Schlaegel, C., & Koenig, M. 2014. Determinants of entrepreneurial intent: A meta–analytic test and integration of competing models. Entrepreneurship Theory and Practice, 38(2): 291-332.

Schlaegel, C., Engle, R. L., Richter, N. F., & Taureck, P. C. 2021. Personal factors, entrepreneurial intention, and entrepreneurial status: A multinational study in three institutional environments. Journal of International Entrepreneurship, *19*(3), 357-398.

Shaw, J. 2023. Peer review in funding-by-lottery: A systematic overview and expansion. Research Evaluation, 32(1), 86-100.

Siggelkow, N. 2007. Persuasion with case studies. Academy of Management Journal, 50(1), 20-24.

Teixeira, S. J., Casteleiro, C. M. L., Rodrigues, R. G., & Guerra, M. D. 2018. Entrepreneurial intentions and entrepreneurship in European countries. International Journal of Innovation Science, 10(1), 22-42.

Tenhunen-Lunkka, A., & Honkanen, R. 2024. Project coordination success factors in European Union-funded research, development and innovation projects under the Horizon 2020 and Horizon Europe programmes. Journal of Innovation and Entrepreneurship, 13(1), 7.

Tortoriello, M., Reagans, R., & McEvily, B. 2012. Bridging the knowledge gap: The influence of strong ties, network cohesion, and network range on the transfer of knowledge between organizational units. Organization Science, 23(4): 1024-1039.

Urban, B., & Chantson, J. J. T. J. 2019. Academic entrepreneurship in South Africa: testing for entrepreneurial intentions. The Journal of Technology Transfer, 44, 948-980.

Waldman, D. A., Vaulont, M. J., Balven, R. M., Siegel, D. S., & Rupp, D. E. 2022. The role of justice perceptions in formal and informal university technology transfer. Journal of Applied Psychology, 107(8), 1397.

Wayne Gould, R. 2012. Open innovation and stakeholder engagement. Journal of Technology Management & Innovation, 7(3): 1-11.

West, J., & Bogers, M. 2014. Leveraging external sources of innovation: A review of research on open innovation. Journal of Product Innovation Management, 31(4): 814-831.

Wright, M. 2014. Academic entrepreneurship, technology transfer and society: where next? The Journal of Technology Transfer, 39: 322-334.

Zhao, H., Seibert, S. E., & Lumpkin, G. T. 2010. The relationship of personality to entrepreneurial intentions and performance: A meta-analytic review. Journal of Management, 36(2), 381-404.

APPENDIX

Table A: Overview of projects, interview partners and quotes

Project A	Culture: Middle Diversity Types of Partners: Research Lab, Start-Up, Industry Discipline: Natural Sciences
Interview Partners	2x Leader A: Male, Engineer Member A1: Female, Chemist Member A2: Female, Biomedicine
Proposition 1	"So both public and private money is in that sense essential to put the technological perspective and the business perspective of the project together. And, we need … private investors to grow faster. Otherwise we don't think we can make the business to success on a time on earth accordingly to the business because the [industry] is pretty fast." (Member)
Proposition 3	"Because we don't, we will not sell the [product] directly to the end users but to manufacturers … So we need to talk to them … I think it's important but on the other side, their answers are always the same: OK. What can I see sometimes? Otherwise it's like, OK, yes, I'm interested but come back when you have something to show me." (Member)
Proposition 4	"Let's say sometimes raw materials that are difficult to extract and they really have a very large footprint. So we are aware of all these factors and, we want to provide solutions for as many as we can. So sustainability is always in the back of our minds, apart from sustainability, I think also to be ethical in the research to make ethical products, I think it's also very relevant. Yeah, that's what I would say and let's say we want to have materials that don't make a large environmental impact. So to try to, to select materials with the lowest impact." (Member)
Project B	Culture: Middle Diversity Type of Partners: Incubator, University, Industry Discipline: Engineering
Interview Partners	2x Leader B: Male, Physicist Member B1: Female, Physicist Member B2: Male, Physicist
Proposition 1	"The role of [the industry partner] … is associated with looking at how much … you would save if you implemented this [technology] as end user. So in order to model that, you need to know the details of the end users … So we need [the industry partner] to collaborate with that modelling and costing process." (Leader)
Proposition 2	"So at the moment, it's very much just listening to what [the industry partner] is saying, thinking about the requirements that we would have; thinking about how much impact things could have and just sort of feeding that type of information into the project so that whatever they do is grounded in … what people are going to need at the end of the day because it's very easy, I know I've been in research for a long time, it's very easy: You find something really exciting and you forget something that from an outside perspective is, like, really obvious." (Member)
Proposition 4	"It's kind of a scientific curiosity to begin with. And then once you start thinking of applications, it's always enjoyable to think that the work you're doing is actually potentially going to have a big impact. … [The commercial side of things is] not something that I'm as interested in because then it starts to become about the money and collaborating and all that sort of stuff with it." (Member)
Proposition 5	"Previously we had a Phd student who then went to do a postdoc who built up a lot of knowledge and then went off somewhere else [to private industry]." (Member)

Project C	Culture: Low Diversity Type of Partners: Research Lab, University Discipline: Life Sciences
Interview Partners	2x Leader C: Male, Physicist Member C1: Male, Physicist Member C2: Male, Engineer
Proposition 1	"They are not pushing us to make exactly money, but they had this technology in their hand, but they do not manage to push it through while we are the ones that are now pushing it through." (Leader) "So that's why we [discussed] with the [end users] and asked them, what would you like? What are the things that for you matters more? And this was also important because now, for example, in the beginning, our idea was that I can provide you a very precise information and a very precise localization of things. ... That's something which we never thought. And now, for example, we are struggling to find if we have a way to define better this [location]." (Leader)
Proposition 2	"It's also always good to have the [end user] point of view. And, yeah, the success was … the fact that it was in [their] application view advantages because of the reduced … complexity but … it can be used in a lot of application if you want because of this simplicity and this gave the hint for the project." (Member) "It was exactly much more in the following direction: Do you have an idea how this product could look like? And for me, it was interesting because it was extremely challenging because I was completely out of my usual way of trying to present the project idea. And this was also useful for my personal background. Say yes, you understand, it's interesting. Are you able to make it clear to the other? Can you communicate correctly to some of the tests to provide you money for these kind of things? … I think this is a was extremely interesting in this respect for the background I came from. I find it challenging and interesting myself." (Leader)
Proposition 3	"So [the partners] are very interested but they say, OK, but please, so we want to see the [prototype] before we invest more money and then this is the difficult part. We need money to create those prototypes. But they don't want to invest until this is ready." (Member)
Proposition 4	"I tell you if this object could be used anywhere in the world, I would not even go to a product, but I would produce an open-source device that everybody can build in any part of the world. The trick here is that you need a … technology not available everywhere. It's a pity for me. It's really a big regret because for me producing the thing can be produced in India and Africa or wherever." (Leader) "We have improved the technology because of this project and we have done this let's say if you want more enthusiastically because it have a real life saving application." (Member)
Proposition 5	"In the USA you sell an idea and then they give you money here. In [Europe], you are much more scared until you have something solid. You don't even go and ask for money." (Leader) "And [the scientists] are actually a little scared because they understood that it was something real, something that will be produced for real, and it's something that can help people. So they were a little scared in the beginning because they said okay, but if we failed, if we don't produce something useful, what happened?" (Member)
Project D	Culture: Medium Diversity Type of Partners: Research Lab, University, Start-Up, Industry Discipline: Engineering
Interview Partners	2x Leader D: Male, Physicist

	Member D1: Male, Engineer Member D2: Male, Economist Member D3: Male, Engineer Member D4: Male, Engineer Member D5: Female, Law
Proposition 1	"So if I get a clue about a use case by a VC, I know it has to be weighted by the fact that this person is very likely not to understand anything about technology but is possibly extremely good in the market analysis and the financial behind the exploitation. So this is his weight. If I'm speaking to a [scientist], it may go the other way around. He can be a top [researcher], he can be a person that beside the exploitation knows a lot. Maybe he is going to propose a solution that has no market." (Leader) "I created and founded some start-ups. … [In this project], I am the president of the … start-up. I'm not contributing to the development of the technology because I don't know anything about this stuff. … I contribute as far as the financial side is concerned." (Member)
Proposition 2	"We have to be open and transparent and contracting complementary … areas on the way. … So interacting with the complementary communities, it supports me to try correcting what at least to identify what we physicists call systematic errors … or biasing. … This is why I'm dedicating a fraction of my time to speak to people that are not part of the consortium but belong to different communities." (Leader) Everybody is bringing something in. … X is a top company in [the respective field]. … X is bringing in what we are missing. They are bringing in their intellectual property and sharing the intellectual property related to cryptographic applications. Look at the second one. [The second industry partner] is a listed company. They are the guys who are in charge of designing the [product] because they are strong in production, they will be producing the [product]. But it was not only bringing in the knowledge in production, it was bringing in the contact at such a high level where you little boy cannot imagine to have access and this is applicable in different ways to any other partners at the level of knowledge, skills, technology, or development of applications at a later stage. So of course, there is always a price to pay again. That is to say our IP is made available and used and exploited together with the other IPs. So the foreground knowledge will be co-owned, which is something that is not making, for instance, the venture capitalist particularly happy because they see a danger and me myself, I see a danger." (Leader)
Proposition 3	"So we don't have the end users, but we have to be aware of what the end users expect because if you provide a product that just is the like baseball to in which you have to create all of this, the system and the logic and everything, then no one will buy it because no one have the time and resources to and invest in something that is not tried and tested." (Member)
Project E	Culture: High Diversity Type of Partners: Research Lab, University, Industry Discipline: Natural Sciences
Interview Partners	2x Leader E: Male, Physicist
Proposition 1	"It is very important because [the partners] are bringing different points of view. I mean, from the background point of view. Each one is exporting one field, and they can bring a different perspective to the project which I think is, is fundamental." (Leader)
Proposition 2	"At the start of our project, [the project team] just came together into a conference and they start thinking, OK, how can we collaborate? Do you need this? We are able to build this … [Is this] useful for you? … And by just talking together, they came up with this proposal." (Leader)

	"If it has the end user within the consortium, I think there is a lot of information that you gain and that you just go into the right direction from the beginning and you don't get lost with all the technological troubles that we always have and just get to what is important." (Leader) "Another factor that is very important as well is the connectivity, the networking, so being able to find, I mean to meet with people that has a need for the applications. So people that have certain problems they want to solve with the developers of the technologies that they know how to work the technology and everything, but they don't know about the application." (Leader)

Note: The disclosure of the countries of the projects would enable the identification of the projects. To preserve participants' anonymity, we report the cultural diversity as assessed by Kaasa et al. (2016) and Shulgin et al. (2017). Moreover, we refrain from disclosing which statement was made by which project team member to avoid potential identifications of any members within their project teams.