



# The Role of Higher Education Institutions (HEI) in Academic Spin-off Creation: A Cooperation Perspective

Ana Pacheco<sup>1</sup> · Mário Franco<sup>2</sup>

Received: 21 January 2022 / Accepted: 4 April 2023  
© The Author(s) 2023

## Abstract

Cooperation between Higher Education Institutions and Enterprises (HEI-E-C) is extremely relevant in regional economic development. Therefore, this study aims to understand the role of HEI in academic spin-off creation. To achieve this objective, we adopted the qualitative approach (case study method) and focused on a cooperation relation involving a Portuguese HEI and two academic spin-offs. For data collecting, several interviews with key informants and direct observation were used. Content analysis of the interviews with founders of these academic spin-offs and lecturers teaching the curricular unit of entrepreneurship in the HEI studied, the results identified some essential aspects to understand this type of cooperation (HEI-E): (1) the role of academic entrepreneurship and its importance in the growth of spin-offs for regional economic growth, (2) the influence of academic entrepreneurs' characteristics in the process of creating a spin-off, and (3) academic motivations to create spin-offs and the benefits of cooperation with HEIs. This study also presents implications for theory and educational and business practice.

**Keywords** University-enterprise cooperation · Academic spin-offs · Knowledge transfer · Academic entrepreneurship · Cooperation perspective

---

✉ Mário Franco  
mfranco@ubi.pt

Ana Pacheco  
ana.ipacheco@hotmail.com

<sup>1</sup> Department of Management and Economics, University of Beira Interior, Estrada Do Sineiro, 6200-209 Covilhã, Portugal

<sup>2</sup> Department of Management and Economics, University of Beira Interior, CEFAGE-UBI Research Center, Estrada Do Sineiro, 6200-209 Covilhã, Portugal

## Introduction

Knowledge is one of the most important strategic resources in Higher Education Institutions (HEI), as their mission is to create it intangible resource intensively (Grant & Baden-Fuller, 2004; Greiner et al., 2007; Etkowitz, 2013; Fromhold - Eisebith & Werker, 2013; Jiang et al., 2013). However, a great amount of the knowledge generated in HEIs by their researchers is not applied in practice, remaining in publications when it often contains the solution to “real life” problems (Kessels & Kwakman, 2006). Therefore, knowledge creators and users are recognized as the knowledge created by HEIs is an important resource to be used in business context (Becheikh, 2010).

HEIs are being seen as employers and creating job opportunities. In addition, they provide a highly qualified workforce and technological know-how, in the form of human capital, products, services and even new undertakings. As consumers, HEIs require resources and services to perform the main activities effectively (Vilalta et al., 2018). Therefore, the importance of exchanging knowledge between HEIs and enterprises (HEI-E), through cooperation relations, has been long been recognised (Grundel & Dahlström, 2016; Mascarenhas et al., 2018). In this connection, Agata (2018) defines cooperation as a coherent set of activities and processes occurring in inter-organizational networks, and for Franco (2011), a cooperative relation is defined as a strategic decision (formalized or not), adopted by two or more independent organizations, with the aim of exchanging or sharing resources to seek market opportunities and achieve mutual benefits.

In this context, cooperation between HEIs and enterprises (HEI-E-C) can facilitate knowledge transfer and stimulate the production of new knowledge and technology (Leydesdorff & Meyer, 2006; Enkel et al., 2009; Freitas & Rossi, 2013; Grundel & Dahlström, 2016). For Liyanage et al. (2009), knowledge transfer consists of identifying existing (accessible) knowledge and then applying it to develop new ideas or improving existing ideas to make a process/action quicker, better or more secure than it would be otherwise. Basically, knowledge transfer is not only exploiting accessible resources (knowledge), but also how to acquire and absorb it to make activities more efficient and effective.

The connection between academia and the business world is developed through different knowledge transfer mechanisms (Bercovitz & Feldmann, 2006; Grundel & Dahlström, 2016; Jevnakera & Misganaw, 2022). Indeed, some authors even consider the creation of academic spin-offs as the main mechanism of that transaction (e.g., Bercovitz & Feldmann, 2006; Karnani, 2012). Academic spin-offs are created in HEIs to profit from the results of research carried out in this type of institution and are considered important for economic growth, due to their positive impact on the process of technological change and economic development (Kingma, 2011; Ramaciotti et al., 2011). In this study, we define an academic or university spin-off when the enterprise was established within a HEI, putting into practice the knowledge generated in these centres through the research and development (R&D) activity of academics (Miranda et al., 2018).

The creation of academic spin-offs allows exploitation of intellectual property generated through research carried out in HEIs (Poponi et al., 2020). The criterion for classifying a spin-off created from an HEI is the “transfer effect”, which corresponds to exploiting the knowledge created in these HEIs (Karnani, 2012). Therefore, regarding HEI-E-C, there is a positive bilateral connection between the intensity of relations and the level of tangible results generated (Santoro, 2000).

The growing relevance of academic spin-offs for economic and social development in their regions has been widely recognized through the development of research in the field of entrepreneurship, and consequently, the literature examining academic spin-offs is expanding rapidly (Dorner et al., 2017; Miranda et al., 2018; Poponi et al., 2020; Prokop et al., 2019). However, this study intends to fill a gap identified in the literature, due to not finding studies on this topic in the context of Portuguese HEIs, an added contribution to its originality. It also aims to trigger greater interest in the creation of academic spin-offs and greater, continuing cooperation with HEIs to achieve this goal. Therefore, this study aims to answer the following research question: *What is the role of HEIs in creating academic spin-offs, from an HEI-E-C perspective?* This study contributes to the academic entrepreneurship literature by providing new insights into how HEIs have an important role in academic spin-off creation. By establishing cooperation bonds with academic spin-offs, HEIs can make a more solid contribution to regional and even national socio-economic development. At the same time, this type of cooperation between the educational and business spheres can identify the best procedures for management and implementation of more efficient policies.

## Literature Review

### The Change in the Role of HEIs

HEIs’ third mission has rapidly gained prominence. With this mission, the aim is to identify how to apply science through knowledge transfer to the enterprises and society in general. In this context, entrepreneurial universities emerge, as institutions characterized by greater involvement in economic and social development, more intensive commercialization of the results of research, patenting and licensing activities, in institutionalizing spin-offs and changes in management, as well as in academics’ attitudes towards collaborative projects with firms (Van Looy et al., 2011). Universities are forced to operate more like businesses, commercializing the results of their research and creating new knowledge-based firms (Kirby, 2006).

Currently, HEIs are under political pressure to stimulate and support entrepreneurship. Growing public concern about integrating academic institutions and enterprises and its general impact on society has led to establishing the model of an entrepreneurial university (Clark, 1998; Etzkowitz et al., 2000). As universities have taken on the mission of research and technological development, the role they play in this process is essential. Scientific knowledge is seen as an important contribution to technological progress (Etzkowitz, 1998; Feldman, 1999), and in this context, universities are considered the main up-to-date sources

of knowledge and technology. Particularly at the regional level, they have become important drivers of development and economic growth (Bleaney et al., 1992; Etzkowitz, 2001; Jevnakera & Misganaw, 2022).

HEIs have changed greatly in recent decades, with academics leaving the traditional “ivory towers.” This change is largely due to the political will of various governments (Henkel, 2007). From the 1980s, there has been growing concern about economies’ competitiveness and commercial exploitation of the research carried out in universities has become central in reflection about these HEIs’ role (Etzkowitz, 1998; Vallas & Kleinman, 2007). Many countries have tried to strengthen economic growth through linking HEIs to the business sector, thereby allowing an exchange of knowledge (Acworth, 2008; Henkel, 2007). The studies by Etzkowitz and Leydesdorff (2000) and Etzkowitz (2001) describe this development as the “second academic revolution.”

Before the 1990s, government policy had changed the system of exploiting research, from one in which universities published their research results and industry managed the subsequent intellectual ownership and innovation, to one in which universities were encouraged to increase their “technological impulse,” developing their own methods of intellectual ownership through patenting, licensing and spin-offs (Lockett et al., 2015; Wilson, 2012). Consequently, both academics and businesspeople-managers are unanimous in believing that knowledge transfer should be encouraged, to create value not only for society (Becheikh, 2010; Etzkowitz, 2013; Fromhold - Eisebith & Werker, 2013), but also for HEIs’ sustainability (Laukkanen, 2003).

In the current context of knowledge-based innovation and the associated role played by knowledge-based networks, the model of universities focused on functioning as a vehicle for technology transfer has become more complex organizationally and institutionally. However, universities function essentially as a channel through which the exchange and exploitation of knowledge become more effective (Doloreux & Mattson, 2008; Estrada et al., 2016). Consequently, universities’ institutional framework has witnessed some important changes to facilitate U-E-C. These initiatives are found at the global level, including mainly the introduction of laws that stipulate knowledge and technology transfer, attributing intellectual ownership to the university and permission of public sector employees to collaborate with private firms (Geuna, 2001; Guenther & Wagner, 2008; Looy et al., 2003; Wright et al., 2004).

## **HEIs-Enterprises Cooperation and Academic Spin-offs**

Enterprises are also under constant pressure to change, which makes regional innovation systems important for economies and national competitiveness (Anderson et al., 2011; Carayannis & Campbell, 2014; Grundel & Dahlström, 2016; Malik et al., 2021; Jevnakera & Misganaw, 2022). The effectiveness of investment in R&D depends on interactions between firms and local institutions in the scientific and technological system. When that interaction becomes progressively more active, investment in R&D by firms, universities and research institutes has a stronger effect on building regional innovation systems (Etzkowitz & Klofsten, 2005; Carayannis & Campbell, 2014; Jiao et al., 2016; Malik et al., 2021; Jevnakera & Misganaw, 2022).

To obtain external knowledge, enterprises seek to create different partnerships and strategies to govern and contextualize (Muscio et al., 2013; Santoro & Chakrabarti, 2002). One way to acquire knowledge is by resorting to HEIs, which provide a wide variety of channels through which knowledge and technology can be transferred to firms. This is reflected in cooperation perspective, where HEI-E can occur. According to Rebocho (2010), cooperation networks favour firms' competitiveness and provide them with a set of resources and information about the market and clients, increasing the chances of survival and success. The contacts obtained in a cooperation network give firms access to resources they do not have and could not acquire otherwise (Lobo & Guedes, 2014). Consequently, research is considered the essence of economic growth.

Therefore, one way to generate that knowledge transfer is through academic spin-offs (Miranda et al., 2018). The term spin-off refers to the process by which a firm is created from an existing entity. The resulting new firm is also known as a spin-off. The term serves to define the process itself and its result. At the university level, an academic or university spin-off is referred to when the firm is established within an HEI, putting into practice the knowledge generated there through academics' R&D activity (Miranda et al., 2018).

Academic spin-offs are characterized by their activity being based on exploiting new processes, products or services arising from the knowledge acquired and the results obtained in the HEIs itself. The basic premise behind academic entrepreneurship is that a wide range of scientific research takes place in universities, and some of the results of that research can have commercial applications able to generate income for these HEIs (Wood, 2011).

Students can be in a better position than teaching staff to overcome the obstacles to creating academic spin-offs. Unlike lecturers, as highlighted by Colombo and Piva (2012), students do not need "genetic mutation" to become entrepreneurs, and are often well positioned to gain access to business competences. Here, entrepreneurship can be a viable employment option for students who seek to exploit the knowledge and skills acquired through learning. Students have direct access to business ideas, with intensive use of the knowledge they acquire while learning, and they can exploit this to initiate spin-off creation. In this way, the intensity of interaction and cooperation processes among the creators, users and suppliers of knowledge has a great influence on a region's competitive and technological development (Debackere et al., 2005; Grundel & Dahlström, 2016; Guerrero et al., 2012).

HEIs have also taken on a more entrepreneurial role through their departments and faculties (Wright et al., 2004), with collaborative experiences between academic scientists and firms (López Jiménez et al., 2021). Researchers are encouraged to produce applicable knowledge and code the result of their research through publications and patents (Becheikh, 2010). Karnani (2012) states that economic agents in general, and spin-offs in particular, perform the tertiarization of economically relevant knowledge generated in HEIs and there is growing evidence that academic spin-offs are important for economic development (Vincett, 2010), as they are one way to translate academic research into social and economic impacts. Consequently, in the last two decades, scholars have made significant efforts to improve understanding

of how to increase the efficiency of this installation process to form more academic spin-offs (Fini et al., 2017; Miranda et al., 2018).

Academic spin-offs are mostly created and administered by academics from HEIs, where the knowledge and technology available serve as a basis for the emergence of a new firm (Diáñez-González et al., 2020). The management teams of academic spin-offs generally reveal inherent homogeneity in functional and educational contexts and include a majority of members with prominent knowledge, skills, networks and experience related to the technological and scientific context but lacking entrepreneurial skills and attitudes (Ben-Hafaïedh et al., 2018). Consequently, to create academic spin-offs, the existing literature mentions determinants at the individual and team level (demographic characteristics, entrepreneur engagement, team development and human capital), determinants at the firm level (technological characteristics, firm development process and networks) and determinants regarding the ecosystem and institutions (support policies and programs, university relations and the regional context) (Bigliardi et al., 2013; Jevnakera & Misganaw, 2022; Mathisen & Rasmussen, 2019; Migliori et al., 2019).

The literature also states that academic spin-offs, by their specific nature, may also require the development of an entrepreneurial orientation for effective management of the intersection between the research activity carried out in the academic context and commercialization of its innovations in enterprises (Diáñez-González & Camelo-Ordaz, 2019; Migliori et al., 2019). This is because the role of entrepreneurial orientation is especially important for firms that compete in hostile, extremely competitive and/or technologically sophisticated environments, where they constantly need to seek new opportunities (Rauch et al., 2009).

Academic spin-offs are currently considered as an important instrument, due to their contribution to business generation, job-creation and maintaining balance in the economic system, as well as their positive influence on innovative processes (Miranda et al., 2017). These authors contradict the studies by Guerrero et al. (2015) and Iacobucci and Micozzi (2015), who analysed the impact of academic/education entrepreneurship on the local/regional economy and on the reputation and results of the university itself, finding no conclusive results. According to Prokop et al. (2019), the survival of academic spin-offs depends on three main actors in the university network: investors, external entrepreneurs and technology transfer offices. In addition, academic spin-offs created in less industrially diversified regions are more likely to survive.

Summarizing, in the last decade, academic spin-offs have become one of the most useful mechanisms for the transfer of R&D knowledge from HEIs to firms (Miranda et al., 2017). Regarding the impact on the quality of teaching, all the studies by Holmen and Ljungberg (2015) show a positive effect, since the teaching staff involved in academic spin-off creation understand that their teaching performance improves significantly, through being able to share their business experience with their students, enhancing their teaching. Finally, the results obtained by academic spin-offs, after the first years of their life, depend on various factors, such as the strength of their bond with the HEI in which they originate (Cardamone et al., 2015; Fernandez-Perez et al., 2015; Soetanto & van Geenhuizen, 2015), the composition of the promotion team (De Cleyn et al., 2015), the promoters' previous experience (Nielsen, 2015) and the involvement of risk capital firms (Fernandez-Perez et al., 2015).

## Research Methodology

### Type of Study and Case Study Selection

To achieve the aim defined for this study, i.e., to understand the role of HEIs in creating academic spin-offs, from a cooperation perspective, a qualitative approach was adopted, and within this, the case study method (Yin, 2015; Fassinger & Morrow, 2013). According to Yin (2015), the qualitative research method aims to identify relations and is more efficient when the intention is to examine in depth a contemporary phenomenon in its real context. Therefore, the choice of a qualitative method is justified as this method describes processes that are not accessible from experience and also by allowing more detailed analysis of the answers obtained (Cheuk, 2010). This approach should be adopted when little is known about the phenomenon under study, and when dealing with entities that cannot be quantified (Fassinger & Morrow, 2013).

In the field of qualitative research, Yin (2015) considers the case study an appropriate research methodology when aiming to understand and explore in depth complex events and contexts such as the one presented here. In this study a case is defined as: a cooperation relationship established between a public Portuguese HEI and two spin-offs (SO and SD)—whose anonymity were ensured -, one in the area of management and the other in health, situated in a nearby local authority. The choice of this cooperation relation took the following criteria into consideration: (1) previous knowledge of informal cooperation between the HEI and the spin-offs created; (2) the fact that the creators of these spin-offs had been students at the HEI here studied; and (3) geographical proximity and the researchers' easy access to information. Therefore, this case study aimed to combine rich, wide-ranging and systematized information to find out more about HEI-E-C.

The HEI studied was founded in 1973 and is formed of two main centers: the School of Management and the School of Technology. The HEI's mission is to train quality professionals, with a strong connection to the labor market, and promote entrepreneurship, innovation and knowledge transfer, emphasizing work and rigor. The institution currently offers 18 degree courses, 15 master courses, 18 TeSP courses, 25 post-graduate, and specialization courses and 2 courses of other academic training. The HEI has around 2000 students.

The academic spin-off SO is a private small and medium-sized enterprise created in December 2011. With relatively recent premises, this firm responds to the health needs of the local authority's population, as well as filling existing gaps in the population's access to healthcare. This SO spin-off offers 28 medical specializations and its mission is to provide quality healthcare through experience and scientific rigor, always with an innovative spirit, promoting ethical values and humanism in health. This information obtained from the website of this spin-off.

The academic spin-off SD was founded in January 2018. This private SME provides several management services: accounting and financial consultancy, training and firm, market studies, marketing services and support in internationalization process. This academic spin-off aims to: provide clients and collaborators with

confidence and satisfaction; be recognized for the excellence of its performance; be recognized as a private firm providing services, with quality and technical rigor, contributing to target clients' satisfaction; and be recognized for the assurance provided to clients concerning their tax obligations. Its values are: the quality and assurance of the services provided; customer satisfaction; respect for ethical and human dignity; innovation and critical spirit to improve the services provided; confidentiality; humility; appreciation of collaborators and partners; and team spirit and entrepreneurship.

## Data Collection and Analysis

To validate the case study selected here, the strategies proposed by Yin (2015) and Abdalla (2013) were used, where in qualitative studies and in the social and human sciences, the interview takes prominence in gathering information. It was decided to hold personal interviews based on a semi-structured script, with related, ordered questions and based on the literature review carried out. The interviews were held with various people involved in the case study: founders of the academic spin-offs created (hereafter referred to as interviewees ESO and ESD); one element representing the HEI, i.e., the director of the Department of Business Sciences (hereafter referred to as EDD), who also teaches subjects related to entrepreneurship; and another lecturer from the same department, also teaching in the area of entrepreneurship (hereafter referred to as EDE). As Patton (1990) states, "key informants" should be people with the right knowledge, whose vision can be particularly useful to help the observer understand the phenomenon analyzed.

Table 1 presents a brief characterization of the interviewees.

Also according to Patton (1990), during the interview, i.e., when collecting information, the aim is to record the interviewee's personal perspective as accurately as possible. Therefore, the interviewee should ask a small number of direct questions, but considering two main focuses, not limiting the interviewee's information and guiding the interview so that they do not stray from the points of interest. Consequently, the interview script (see Appendix) was constructed based on eight main

**Table 1** Characterisation of the interviewees

<i>Characteristics</i>	<i>HEI</i>		<i>Academic spin-off</i>	
<i>Interviewee</i>	EDD	EDE	ESO	ESD
<i>Gender</i>	Male	Male	Male	Male
<i>Age</i>	43	58	42	52
<i>Academic qualifications</i>	Ph.D. in Management	Degree in Management	Master in Health Resource Management	Master in Management
<i>Occupation</i>	Lecturer	Lecturer	Manager	Manager
<i>Position</i>	Director of the Department of Business Sciences	Lecturer	Nurse	Accountant

**Source:** Own elaboration



questions. The interviewees were contacted by e-mail to arrange the day and time of the interview. These were held from 12 to 17 April 2021 and lasted an average of 30 min, each aiming to capture the interviewees' perception of the HEI's role in creating academic spin-offs.

During the interviews, notes were made for subsequent transcription. The information collected was subject to content analysis, a widely used technique in qualitative research (Hsieh & Shannon, 2005). This consists of a set of techniques for systematic analysis of texts (Mayring, 2004), allowing definition and analysis of categories/themes of information (Weber, 1990). Patton (1990) adds that content analysis consists of the process of identifying and categorizing the main topics in the data obtained. In this case study, content analysis was based on the transcription of the interviews or relevant sentences or ideas for the study. Here, the post-interview period was fundamental for reflection and elaboration, and to ensure that the data obtained were useful for the matter in question.

## Results and Discussion

This section presents the results obtained from content analysis of the semi-structured personal interviews held (primary data) and the secondary data obtained from the websites. This gave rise to various topics/themes: (1) HEIs' role in promoting academic entrepreneurship, (2) the impact of academic entrepreneurship, (3) characteristics of academic entrepreneurs, (4) reasons to initiate an academic spin-off, and (5) benefits of the HEI-E cooperation.

### The HEI as the Promoter of Academic Entrepreneurship

Regarding this HEI's role in entrepreneurship, EDD states that "HEIs promote a number of initiatives to stimulate the entrepreneurial spirit, through conferences, post-graduate courses or even through subjects contained in the various study cycles." EDE corroborates this statement, but adds that "HEIs have an increasingly entrepreneurial role, through the various school departments, which encourage the entrepreneurial and innovative spirit," which agrees with the conclusions of Wright et al. (2004).

About this matter, the interviewees from the academic spin-offs, ESO and ESD, mention respectively that "lecturers promote entrepreneurship, through continuously passing on knowledge and incentives that produce the innovative spirit" and that the HEI "in recent years, has concentrated greatly on internal competitions, promoting entrepreneurial and innovative projects, and then supporting students in advancing with those projects, as well as providing them with premises such as incubators." These arguments agree with the view of Muscio et al. (2021), who observed increased spin-off creation by students. In this case, academic institutions are encouraging students to become more entrepreneurial, providing entrepreneurship courses, supporting installations such as firm incubators, business competitions and awards for innovation.

## Impact of Education Entrepreneurship on Academic Spin-off Creation and Regional Development

Interviewee EDD says that “education entrepreneurship has a growing impact on the local economy and the HEI, since the more academic spin-offs it is possible to create, through academic encouragement, the more this will affect the local economy, and consequently, the HEI’s reputation. Vincett (2010) also states that academic spin-offs are important for economic development, contradicting the studies by Guerrero et al. (2015) and Iacobucci and Micozzi (2015) who analysed the impact of university entrepreneurship on the local/regional economy and the results of the university itself. These authors, and Bray and Lee (2000) and Pitsakis et al. (2015), found no conclusive results of that relation. EDD also says that, “this situation is noted more in less developed regions, in that innovative firms in the area can attract a greater target-public, which can help the growth of the spin-offs themselves and regional economic growth.” This was also referred to by Prokop et al. (2019) and Jevnakera and Misganaw (2022), who concluded that academic spin-offs set up in less industrially diversified regions are more likely to survive.

As for the interviewees from the firms studied, EDE and ESO say respectively that, “the greater the impact of academic entrepreneurship on the spin-off creators, the more this will influence their knowledge, their personal research towards innovation,” with a consequent “tendency towards a greater entrepreneurial spirit, and so greater likelihood of spin-off growth, helping the local economy to grow.” Indeed, for Vincett (2010), academic spin-offs are one way to translate academic research into social and economic impacts. In this connection, interviewee ESO also states that “the development of academic spin-offs in a given region will allow local economic development, via the human resources involved and the financial means necessary, but also through the partnership dynamics that can be created with other firms in the area, even creating the possibility of developing clusters linked to the products/services provided.”

For ESD, “the impact of academic entrepreneurship is important for spin-offs’ growth, but over time, what will affect continued growth is the cooperation that can be established with suppliers and other entities.” This idea is reinforced by Debackere et al. (2005), Guerrero et al. (2012) and López Jiménez et al. (2021), who state that the intensity of interaction and cooperation processes between creators, users and suppliers of knowledge has a great influence on a region’s competitive and technological development.

### Characteristics of Academic Entrepreneurs in Spin-off Creation

Concerning the characteristics academic entrepreneurs should have to create spin-offs, interviewee EDD says that “training, as well as family antecedents, are of great relevance. Also when there is already professional experience, we find that will contribute positively to the emergence of entrepreneurs, and consequently, make it easier to create academic spin-offs.” This interviewee’s answer reinforces the conclusions of Bigliardi et al. (2013), Mathisen and Rasmussen (2019) and Migliori et al. (2019), where to create academic spin-offs, individual and team characteristics are determinant. Interviewee EDE says

there is no need for “innate individual characteristics to create spin-offs,” which agrees with Colombo and Piva (2012), who say that students do not need a “genetic mutation” to become entrepreneurs.

In addition, ESO and ESD state respectively that “besides individual characteristics, they knowledge they acquire in HEIs in the different subjects is central” and argue that “academic entrepreneurs have more means and technology available, which will support the creation of academic spin-offs.” These statements show that most academic spin-offs are founded and administered by academics originating in an academic institution, where the available knowledge and technology serve as the basis for the emergence of a new firm (Diáñez-González et al., 2020). Interviewee ESO adds that “however, academic entrepreneurs will also need characteristics such as resilience, objectivity, creativity, entrepreneurial experience and solid individual and social responsibility” to become entrepreneurs.

### **Reasons for Academics Initiating a Spin-off**

On this topic, interviewee EDD says that “the great motivation behind creating a spin-off results from the impetus of active demonstration of the knowledge learned.” The literature also mentions that students seek to exploit the knowledge and skills acquired from their learning (Colombo & Piva, 2012). “Students are often encouraged to take up this initiative influenced by the HEI they belong to,” adds EDD. This agrees with the literature, which mentions that academic spin-offs are mostly created and administered by academics from an academic institution, where the available knowledge and technology serve as the basis for the emergence of the new firm (Diáñez-González et al., 2020).

For EDE and ESD, the reasons for academics starting up an academic spin-offs have to do with the fact of spin-offs being an employment opportunity, applying much of the knowledge learned during the time spent in the HEI. This argument is also presented by Colombo and Piva (2012). Interviewee ESO answered that one of the reasons for academics creating spin-offs “is that they contribute to regional economic growth, by creating more employment,” agreeing with the study by Miranda et al. (2017) and Jevnakera and Misganaw (2022). In that study, the authors mention spin-offs’ contribution in generating business, creating employment and maintaining the balance of the economic system. This interviewee also says that “the motivations at the root of beginning an academic spin-off go beyond profit. Developing in the real economy the assumptions developed in scientific research will be a motivation behind creating an academic spin-off.”

### **Benefits of HEI-E Cooperation**

For EDD “a cooperative relation is very beneficial for both HEIs and the spin-offs created, since they are one of the best means for students to put the knowledge acquired into practice” and regarding lecturers, “they also manage to improve their professional competences, in that by sharing much of their knowledge in this field, they will encourage students to create their own spin-offs, with lecturers also gaining a greater incentive for their future research, for subsequent knowledge transmission”

**Table 2** Summary presentation of the empirical results

<b>Topics identified</b>	<b>Evidence from the HEI</b>	<b>Evidence from the academic spin-offs</b>
<b>HEIs' role in promoting academic entrepreneurship</b>	<ul style="list-style-type: none"> <li>- Initiatives to stimulate the entrepreneurial and innovative spirit;</li> <li>- Promoting conferences, post-graduate courses, subjects of innovation and entrepreneurship</li> <li>- Growth for the local economy and the HEI;</li> <li>- May be noted more in less developed regions</li> <li>- Training and family antecedents;</li> <li>- Professional experience;</li> <li>- No innate characteristics necessary</li> </ul>	<ul style="list-style-type: none"> <li>- Continuous transmission of knowledge and incentives;</li> <li>- Support for students to advance in creating spin-offs, providing premises such as incubators</li> </ul>
<b>The impact of education entrepreneurship</b>	<ul style="list-style-type: none"> <li>- Growth for the local economy and the HEI;</li> <li>- May be noted more in less developed regions</li> </ul>	<ul style="list-style-type: none"> <li>- Partnership dynamics;</li> <li>- Cooperation with suppliers and other entities</li> </ul>
<b>Characteristics of academic entrepreneurs</b>	<ul style="list-style-type: none"> <li>- Training and family antecedents;</li> <li>- Professional experience;</li> <li>- No innate characteristics necessary</li> </ul>	<ul style="list-style-type: none"> <li>- Resilience, objectivity, creativity, entrepreneurial experience and solid individual and social responsibility</li> </ul>
<b>Reasons to initiate an academic spin-off</b>	<ul style="list-style-type: none"> <li>- Impetus to demonstrate knowledge learned;</li> <li>- Influence of the HEI</li> </ul>	<ul style="list-style-type: none"> <li>- Employment opportunity;</li> <li>- Regional economic growth, through creating more jobs</li> </ul>
<b>Benefits of the HEI-E cooperation</b>	<ul style="list-style-type: none"> <li>- Means for students to put into practice the knowledge acquired;</li> <li>- Lecturers are able to improve their professional competences</li> </ul>	<ul style="list-style-type: none"> <li>- Knowledge transmission;</li> <li>- Being up-to-date with recent research and development</li> </ul>

**Source:** Own elaboration

(EDE). These statements agree with Holmen and Ljungberg (2015), who found a positive effect when the teaching staff involved in academic spin-off creation perceive that their performance improved significantly through being able to share their business experience with students, thereby enhancing their teaching.

Furthermore, ESO and ESD mention that “the benefit of a cooperative relationship is great, since the spin-offs are always gaining from that cooperation, as they are an excellent means to transmit the knowledge coming from HEIs, being up-to-date with recent research and development.” In fact, academic spin-offs have become one of the most useful mechanisms to transfer R&D knowledge from HEIs to firms, as concluded by Miranda et al. (2017).

## Summary of Results

Table 2 presents a summary of the empirical evidence obtained in this case study about the role of HEIs in academic spin-off creation. It highlights the essential points of the answers provided by those in charge of the HEI and the entrepreneurs in the academic spin-offs created.

## Conclusions and Implications

The main aim of this study was to understand the role that HEIs can have in academic spin-off creation, and how this type of HEI-E-C relation can facilitate this business creation process. Study of a relation between an HEI and two academic spin-offs allowed the conclusion that HEIs promote education entrepreneurship, and thereby can also motivate academics to create a spin-off. Through their mission of cooperating with the business community, HEIs are no longer considered as isolated islands of knowledge, but rather institutions increasingly involved with a number of external partners through business activities (Zhang et al., 2016). Here, knowledge transfer will only be successful if an organisation has the capacity to acquire knowledge and the capacity to absorb it.

The HEI-E-C studied here reflects the effort and entrepreneurship of all parties involved: HEI and spin-offs created. Moreover, a cooperative relation of this type is essential for knowledge acquisition, as it stimulates its creation and strengthens the absorption capacity of the firms involved (Grekova et al., 2016). The case study carried out also leads to the conclusion that the HEI studied had a central role in the education entrepreneurship and that this phenomenon has great relevance in the growth of the academic spin-offs created, and consequently, the latter will have an important role in regional economic growth.

The results obtained also allow the conclusion that the characteristics of academic entrepreneurs, such as training, family antecedents and individual characteristics, among others, are crucial determinants in the process of creating a spin-off. Indeed, what motivates academics to initiate an academic spin-off is the opportunity to work, and show and apply the knowledge acquired in the HEI.

The benefits of this type of cooperation, both for HEIs and the academic spin-offs, are found to be connected with the transmission of up-to-date knowledge, allowing lecturers and entrepreneurs to improve their professional competences.

This study also presents implications for theory and practice, as well as educational institutions. Regarding theory, this study maps the main topics to consider in the role HEIs can play in creating academic spin-offs and determines the perspective of HEI-E-C. In addition, the study shows how HEIs that promote education entrepreneurship can motivate academics to create a spin-off.

In the practical domain, this investigation can trigger greater interest in academic spin-off creation, especially in less favored regions, as well as showing the need for greater, continuous cooperation between HEIs and enterprises. Bringing HEIs closer to the creators of academic spin-offs can provide solutions for the needs of both parties and find answers to their existing shortcomings. HEIs, as sources transmitting updated knowledge, can promote synergies with the business world, namely with spin-offs, by sharing resources and knowledge mainly in the area of entrepreneurship and innovation. By establishing cooperation bonds with academic spin-offs, HEIs can make a more solid contribution to regional and even national socio-economic development. At the same time, this type of cooperation between the educational and business spheres can identify the best procedures for management and implementation of more efficient policies.

This study is not without limitations. One of these is the fact of studying only one case, and as the HEI universe is vast, the empirical evidence obtained here cannot be generalized. It is therefore suggested that more cooperation relationships (multiple cases) of this type could be studied in other regions and different countries, with different cultures and social and economic situations. Another limitation concerns the fact of studying only two academic spin-offs in two very specific areas of operation: management and health. Another suggestion is to carry out more studies, with another type of methodology, and covering a wider sample of academic spin-offs in different sectors of activity and of different sizes.

Finally, we believe that this study has improved knowledge of HEIs' role in creating academic spin-offs and provides new ideas for a future research agenda in this area. From a perspective of HEI-E-C, some of the future lines of research, considered particularly critical for this field of knowledge, could be followed for each of the limitations found in this study.

## Appendix

### Interview Script

1. Gender.  
Male... Female....
2. Please indicate your year of birth
3. What is your function in the Higher Education Institution (HEI) and/or industry?
4. What is the role of HEIs as promoters of academic entrepreneurship?

5. What is the impact of academic entrepreneurship on the growth of academic spin-offs and consequently on regional economic growth?
6. What are the characteristics of academic entrepreneurs?
7. What motivates academics to initiate an academic spin-off?
8. What are the benefits for HEIs of establishing a cooperation relationship? Or what are the benefits for academic spin-offs of establishing that cooperation relationship?

The interview ends here. Thank you very much for your collaboration. If you are interested in receiving information about the results of this study, indicate your name and e-mail address. When available, we will send you this information.

Name: E-mail:

**Acknowledgements** The authors are grateful to the anonymous referees of the journal for their extremely useful suggestions to improve the quality of the paper. The authors gratefully acknowledge financial support from National Funds of the FCT – Portuguese Foundation for Science and Technology within the project «UIDB/04007/2020».

**Funding** Open access funding provided by FCTIFCCN (b-on).

**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons licence, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons licence, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons licence and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this licence, visit <http://creativecommons.org/licenses/by/4.0/>.

## References

- Abdalla, M. M. (2013). A estratégia de triangulação: objetivos, possibilidades, limitações e proximidades com o pragmatismo. *IV Encontro de Ensino e Pesquisa em Administração e Contabilidade*.
- Acworth, E. B. (2008). University–industry engagement: The formation of the Knowledge Integration Community (KIC) model at the Cambridge-MIT Institute. *Research Policy*, 37(8), 1241–1254.
- Agata, A. (2018). In search of network sustainability: A multi-level perspective on the paradox of cooperation and competition in networks. *Sustainability*, 10, 2466.
- Anderson, A. R., Benavides-Espinosa, M., & Mohedano-Suanes, A. (2011). Innovation in Services through Learning in a Joint Venture. *Services Industries Journal*, 31(12), 2019–2032.
- Becheikh, N. (2010). How to improve knowledge transfer strategies and practices in education? Answers from a systematic literature review. *Research in Higher Education Journal*, 7, 1–21.
- Ben-Hafaïedh, C., Micozzi, A., & Pattitoni, P. (2018). Academic spin-offs' entrepreneurial teams and performance: A subgroups approach. *The Journal of Technology Transfer*, 43(3), 714–733.
- Bercovitz, J., & Feldmann, M. (2006). Entrepreneurial universities and technology transfer: A conceptual framework for understanding knowledge-based economic development. *Journal of Technology Transfer*, 31, 175–188.
- Bigliardi, B., Galati, F., & Verbano, C. (2013). Evaluating performance of university spin-off companies: Lessons from Italy. *Journal of Technology Management & Innovation*, 8(2), 178–188.
- Bleaney, M. F., Binks, M. R., Greenaway, D., Reed, G. V., & Whynes, D. K. (1992). What does a university add to its local economy? *Applied Economics*, 24(3), 305–311.

- Bray, M. J., & Lee, J. N. (2000). University revenues from technology transfer: Licensing fees vs. equity positions. *Journal of Business Venturing*, 15(5–6), 385–392. [https://doi.org/10.1016/S0883-9026\(98\)00034-2](https://doi.org/10.1016/S0883-9026(98)00034-2).
- Carayannis, E., & Campbell, D. (2014). Democracies versus emerging autocracies: Arts, democracy, and innovation in quadruple helix innovation systems. *Journal of Innovation and Entrepreneurship*, 3, 1–23. <https://doi.org/10.1186/s13731-014-0012-2>
- Cardamone, P., Pupo, V., & Ricotta, F. (2015). University technology transfer and manufacturing innovation: The case of Italy. *Review of Policy Research*, 32(3), 297–322. <https://doi.org/10.1111/ropr.12125>
- Cheuk, S. (2010). An establishment of the role of private and public sector interests: In the context of tourism transport planning and development: The case of Malaysia. *International Business & Economics Research Journal*, 9(2), 59–68.
- Clark, B. R. (1998). *Creating entrepreneurial universities: Organizational pathways of transformation*. Pergamon.
- Colombo, M. G., & Piva, E. (2012). Firms' genetic characteristics and competence-enlarging strategies: A comparison between academic and non-academic high-tech start-ups. *Research Policy*, 41, 79–92.
- Debackere, K., Leuven, K. U., & Veugelers, R. (2005). The role of academic technology transfer organizations in improving industry science links. *Research Policy*, 34, 321–342. <https://doi.org/10.1016/j.respol.2004.12.003>
- Diáñez-González, J. P., & Camelo-Ordaz, C. (2019). The influence of the structure of social networks on academic spin-offs' entrepreneurial orientation. *Industrial Marketing Management*, 80, 84–98.
- Diáñez-González, J. P., Camelo-Ordaz, C., & Fernández-Alles, M. (2020). Drivers and implications of entrepreneurial orientation for academic spin-offs. *International Entrepreneurship and Management Journal*. <https://doi.org/10.1007/s11365-020-00652-3>
- De Cleyn, S. H., Braet, J., & Klofsten, M. (2015). How human capital interacts with the early development of academic spin-offs. *International Entrepreneurship and Management Journal*, 11(3), 599–621. <https://doi.org/10.1007/s11365-013-0294-z>
- Doloreux, D., & Mattson, H. (2008). To What Extent do Sectors “Socialize” Innovation Differently? Mapping Cooperative Linkages in Knowledge-Intensive Industries in the Ottawa Region. *Industry and Innovation*, 15(4), 351–370.
- Dorner, M., Fryges, H., & Schopen, K. (2017). Wages in high-tech start-ups – do academic spin-offs pay a wage premium? *Research Policy*, 46(1), 1–18.
- Enkel, E., Gassmann, O., & Chesbrough, H. (2009). Open R&D and Open Innovation: Exploring the Phenomenon. *R&D Management*, 39(4), 311–316.
- Estrada, I., Faems, D., Cruz, N. M., & Santana, P. P. (2016). The role of interpartner dissimilarities in Industry-University alliances: Insights from a comparative case study. *Research Policy*, 45(10), 2008–2022.
- Etzkowitz, H. (1998). The norms of entrepreneurial science: Cognitive effects of the new university–industry linkages. *Research Policy*, 27(8), 823–833.
- Etzkowitz, H. (2001). The second academic revolution and the rise of entrepreneurial science. *IEEE Technology and Society Magazine*, 20(2), 18–290.
- Etzkowitz, H. (2013). Silicon Valley at risk? Sustainability of a global innovation icon: An introduction to the Special Issue. *Social Science Information*, 52(4), 515–538.
- Etzkowitz, H., & Leydesdorff, L. (2000). The dynamics of innovation: From National Systems and “Mode 2” to a Triple Helix of university–industry–government relations. *Research Policy*, 29(2), 109–123.
- Etzkowitz, H., Webster, A., Gebhardt, C., & Terra, B. (2000). The future of the university and the university of the future: Evolution of ivory tower to entrepreneurial paradigm. *Research Policy*, 29, 313–330.
- Etzkowitz, H., & Klofsten, M. (2005). The innovating region: Toward a theory of knowledge-based regional development. *R&D Management*, 35(3), 243–255.
- Fassinger, R., & Morrow, S. L. (2013). Toward best practices in quantitative, qualitative, and mixed-method research: A social justice perspective. *Journal for Social Action in Counseling and Psychology*, 5(2), 69–83.
- Feldman, M. (1999). The New economics of innovation, spillovers and agglomeration: A review of empirical studies. *Economics of Innovation and New Technology*, 8(1), 5–25.



- Fernandez-Perez, V., Alonso-Galicia, P. E., Rodriguez-Ariza, L., & Fuentes-Fuentes, M. D. (2015). Professional and personal social networks: A bridge to entrepreneurship for academics? *European Management Journal*, 33(1), 37–47. <https://doi.org/10.1016/j.emj.2014.07.003>
- Fini, R., Fu, K., Mathisen, M. T., Rasmussen, E., & Wright, M. (2017). Institutional determinants of university spin-off quantity and quality: A longitudinal, multilevel, cross-country study. *Small Business Economics*, 48(2), 361–391.
- Franco, M. (2011). Performance in strategic alliances: An analysis of objective and subjective measures. *International Journal of Entrepreneurial Venturing*, 3(1), 84–100.
- Freitas, I. M., & Rossi, F. (2013). Finding the Right Partners: Institutional and Personal Modes of Governance of University-Industry Interactions. *Research Policy*, 42(1), 50–62.
- Fromhold-Eisebith, M., & Werker, C. (2013). Universities' functions in knowledge transfer: A geographical perspective. *The Annals of Regional Science*, 51(3), 621–643. <https://doi.org/10.1007/s00168-013-0559-z>
- Geuna, A. (2001). The changing rationale for European university research funding: Are there negative unintended consequences? *Journal of Economic Issues*, 35(3), 607–632.
- Grant, R. M., & Baden-Fuller, C. (2004). A knowledge accessing theory of strategic alliances. *Journal of Management Studies*, 41(1), 61–84.
- Greiner, M. E., Böhmman, T., & Krčmar, H. (2007). A strategy for knowledge management. *Journal of Knowledge Management*, 11, 3–15. <https://doi.org/10.1108/13673270710832127>
- Grekova, K., Calantone, R. J., Bremmers, H. J., Trienekens, J. H., & Omta, S. W. F. (2016). How environmental collaboration with suppliers and customers influences firm performance: Evidence from Dutch food and beverage processors. *Journal of Cleaner Production*, 112, 1861–1871.
- Grundel, I., & Dahlström, M. (2016). A quadruple and quintuple helix approach to regional innovation systems in the transformation to a forestry-based bioeconomy. *Journal of the Knowledge Economy*, 7, 963–983. <https://doi.org/10.1007/s13132-016-0411-7>
- Guenther, J., & Wagner, K. (2008). Getting out of the ivory tower – new perspectives on the entrepreneurial university. *European Journal of International Management*, 2(4), 400–417.
- Guerrero, M., Urbano, D., Cunningham, J., & Organ, D. (2012). Entrepreneurial universities in two European regions: A case study comparison. *The Journal of Technology Transfer*, 39, 415–434. <https://doi.org/10.1007/s10961-012-9287-2>
- Guerrero, M., Cunningham, J. A., & Urbano, D. (2015). Economic impact of entrepreneurial universities' activities: An exploratory study of the United Kingdom. *Research Policy*, 44(3), 748–764. <https://doi.org/10.1016/j.respol.2014.10.008>
- Henkel, M. (2007). Can academic autonomy survive in the knowledge society? A perspective from Britain. *Higher Education Research & Development*, 26(1), 87–99.
- Holmen, M., & Ljungberg, D. (2015). The teaching and societal services nexus: Academics' experiences in three disciplines. *Teaching in Higher Education*, 20(2), 208–220. <https://doi.org/10.1080/13562517.2014.978751>
- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9), 1277–1288.
- Iacobucci, D., & Micozzi, A. (2015). How to evaluate the impact of academic spin-offs on local development: An empirical analysis of the Italian case. *Journal of Technology Transfer*, 40(3), 434–452. <https://doi.org/10.1007/s10961-014-9357-8>
- Jevnakera, B. H., & Misganaw, B. A. (2022). Technology transfer offices and the formation of academic spin-off entrepreneurial teams. *Entrepreneurship & Regional Development*, 34(9–10), 977–1000. <https://doi.org/10.1080/08985626.2022.2080867>
- Jiang, X., Li, M., Gao, S., Bao, Y., & Jiang, F. (2013). Managing knowledge leakage in strategic alliances: The effects of trust and formal contracts. *Industrial Marketing Management*, 42, 983–991.
- Jiao, H., Zhou, J., Gao, T., et al. (2016). The More Interactions the Better? The Moderating Effect of the Interaction between Local Producers and Users of Knowledge on the Relationship between R&D Investment and Regional Innovation Systems. *Technological Forecasting and Social Change*, 110, 13–20.
- Karmani, F. (2012). The university's unknown knowledge: Tacit knowledge, technology transfer and university spinoffs findings from an empirical study based on the theory of knowledge. *The Journal of Technology Transfer*, 38, 235–250. <https://doi.org/10.1007/s10961-012-9251-1>
- Kessels, J., & Kwakman, K. (2006). Interface: Establishing knowledge networks between higher vocational education and businesses. *Higher Education*, 54(5), 689–703.

- Kingma, B. (2011). *Academic Entrepreneurship and Community Engagement: Scholarship in Action and the Syracuse Miracle*. Cheltenham, UK; Northampton, MA: Edward Elgar Publishing.
- Kirby, D. A. (2006). Creating entrepreneurial universities in the UK: Applying entrepreneurship theory to practice. *The Journal of Technology Transfer*, 31(5), 599–603. <https://doi.org/10.1007/s10961-006-9061-4>
- Laukkanen, M. (2003). Exploring academic entrepreneurship: Drivers and tensions of university-based business. *Journal of Small Business and Enterprise Development*, 10, 372–382. <https://doi.org/10.1108/14626000310504684>
- Leydesdorff, L., & Meyer, M. (2006). Triple Helix Indicators of Knowledge-Based Innovation Systems. Introduction to the Special Issue. *Research Policy*, 35(10), 1441–9.
- Lobo, C. & Guedes, J. (2014). *Networks Theory: enabling environment for the acquisition of strategic resources such as knowledge, for the internationalization of SMEs*. Repositório da Universidade Portucalense.
- Lockett, A., Wright, M., & Wild, A. (2015). The institutionalization of third stream activities in UK higher education: The role of discourse and metrics. *British Journal of Management*, 26, 78–92. <https://doi.org/10.1111/1467-8551.12069>
- Looy, B. V., Debackere, K., & Andries, P. (2003). Policies to stimulate regional innovation capabilities via university–industry collaboration: An analysis and an assessment. *R&D Management*, 33(2), 209–229.
- López Jiménez, D., Dittmar, E., & Vargas Portillo, J. (2021). Cooperation and relationship in the triple helix model of innovation. *International Journal of Knowledge and Learning*, 14(1), 1–9. <https://doi.org/10.1504/IJKL.2021.115025>
- Liyanae, C., Elhag, T., Ballal, T., & Li, Q. (2009). Knowledge communication and translation – a knowledge transfer model. *Journal of Knowledge Management*, 13(3), 118–131. <https://doi.org/10.1108/13673270910962914>
- Malik, A., Sharma, P., Pereira, V., & Temouri, Y. (2021). From regional innovation systems to global innovation hubs: Evidence of a quadruple helix from an emerging economy. *Journal of Business Research*, 128, 587–598. <https://doi.org/10.1016/j.jbusres.2020.12.009>
- Mascarenhas, C., Ferreira, J. J., & Marques, C. (2018). University–industry cooperation: A systematic literature review and research agenda. *Science and Public Policy*, 45(5), 708–718.
- Mathisen, M. T., & Rasmussen, E. (2019). The development, growth, and performance of university spin-offs: A critical review. *The Journal of Technology Transfer*, 44, 1891–1938. <https://doi.org/10.1007/s10961-018-09714-9>
- Mayring, P. (2004). Qualitative content analysis. *A Companion to Qualitative Research*, 1(2), 159–176.
- Migliori, S., Pittino, D., Consorti, A., & Lucianetti, L. (2019). The relationship between entrepreneurial orientation, market orientation and performance in university spin-offs. *International Entrepreneurship and Management Journal*, 15(3), 793–814.
- Miranda, F. J., Chamorro-Mera, A., & Rubio, S. (2017). Academic entrepreneurship in Spanish universities: An analysis of determinants of entrepreneurial intention. *European Research on Management and Business Economics*, 23(2), 113–122. <https://doi.org/10.1016/j.iedeen.2017.01.001>
- Miranda, F. J., Chamorro, A., & Rubio, S. (2018). Re-thinking university spin-off: A critical literature review and a research agenda. *The Journal of Technology Transfer*, 43(4), 1007–1038.
- Muscio, A., Quaglione, D., & Vallanti, G. (2013). Does government funding complement or substitute private research funding to universities? *Research Policy*, 42(1), 63–75.
- Muscio, A., Shibayama, S., & Ramaciotti, L. (2021). Universities and start-up creation by Ph.D. graduates: the role of scientific and social capital of academic laboratories. *Journal of Technology Transfer*. <https://doi.org/10.1007/s10961-020-09841-2>
- Nielsen, K. (2015). Human capital and new venture performance: The industry choice and performance of academic entrepreneurs. *Journal of Technology Transfer*, 40(3), 453–474. <https://doi.org/10.1007/s10961-014-9345-z>
- Patton, M. Q. (1990). *Qualitative Evaluation and Research Methods* (2nd ed.). Sage Publications.
- Pitsakis, K., Souitaris, V., & Nicolaou, N. (2015). The peripheral halo effect: Do academic spinoffs influence universities' research income? *Journal of Management Studies*, 52(3), 321–353. <https://doi.org/10.1111/joms.12119>
- Poconi, S., Arcese, G., Mosconi, E. M., & Trifiletti, M. A. (2020). Entrepreneurial Drivers for the Development of the Circular Business Model: The Role of Academic Spin-Off. *Sustainability*, 12, 423. <https://doi.org/10.3390/su12010423>

- Prokop, D., Huggins, R., & Bristow, G. (2019). The survival of academic spinoff companies: An empirical study of key determinants. *International Small Business Journal*, 37(5), 502–535. <https://doi.org/10.1177/0266242619833540>
- Ramaciotti, L., Consiglio, S., & Massari, S. (2011). *Competenze, Innovazione, Impresa. Dal Concepimento Alla Costituzione di Imprese Innovative: Il Caso Spinner*. Bologna: Il Mulino.
- Rauch, A., Wiklund, J., Lumpkin, G. T., & Frese, M. (2009). Entrepreneurial orientation and business performance: An assessment of past research and suggestions for the future. *Entrepreneurship Theory & Practice*, 33(3), 761–787.
- Rebocho, P. (2010). A Internacionalização das PME no Período 2008/2010. Master Dissertation, Lisbon: Instituto Politécnico de Lisboa; Instituto Superior de Contabilidade e Administração de Lisboa.
- Santoro, M. D. (2000). Success breeds success: The linkage between relationship intensity and tangible outcomes in industry–university collaborative ventures. *The Journal of High Technology Management Research*, 11(2), 255–273.
- Santoro, M. D., & Chakrabarti, A. K. (2002). Firm size and technology centrality in industry–university interactions. *Research Policy*, 31(7), 1163–1180.
- Soetanto, D., & van Geenhuizen, M. (2015). Getting the right balance: University networks' influence on spin-offs' attraction of funding for innovation. *Technovation*, 36–37, 26–38. <https://doi.org/10.1016/j.technovation.2014.10.008>
- Vallas, S., & Kleinman, D. L. (2007). Contradiction, Convergence and the Knowledge Economy: The Confluence of Academic and Commercial Biotechnology. *Socio-Economic Review*, 6(2), 283–311.
- Van Looy, B., Landoni, P., Callaert, J., Van Pottelsberghe, B., Sapsalis, E., & Debackere, K. (2011). Entrepreneurial effectiveness of European universities: An empirical assessment of antecedents and trade-offs. *Research Policy*, 40(4), 553–564.
- Vilalta, J.M. Betts, A. and Gómez, V. (2018). Higher education's role in the 2030 agenda: The why and how of GUNi's commitment to the SDGs, sustainable development goals: Actors and implementation. A Report from the International Conference.
- Vincett, P. S. (2010). The economic impacts of academic spin-off companies, and their implications for public policy. *Research Policy*, 39(6), 736–747.
- Wilson, T. (2012). *A Review of Business – University Collaboration*. Retrieved from [www.nationalarchives.gov.uk/doc/open-government-licence](http://www.nationalarchives.gov.uk/doc/open-government-licence).
- Weber, R. P. (1990). *Basic content analysis* (No. 49). Sage.
- Wood, M. S. (2011). A process model of academic entrepreneurship. *Business Horizons*, 54(2), 153–161. <https://doi.org/10.1016/j.bushor.2010.11.004>
- Wright, M., Birley, S., & Mosey, S. (2004). Entrepreneurship and university technology transfer. *The Journal of Technology Transfer*, 29(3), 235–246.
- Yin, R. K. (2015). *Case study research: Design and methods* (5th ed.). Thousand Oaks, CA: SAGE Publications.
- Zhang, Q., Larkin, C., Lucey, B. M., et al. (2016). The Role of the Entrepreneurial University to Improve Innovation in Region. *Research Policy*, 7(2), 18–25.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.