



**Università
degli Studi
di Palermo**

AREA QUALITÀ, PROGRAMMAZIONE E SUPPORTO STRATEGICO
SETTORE STRATEGIA PER LA RICERCA
U. O. DOTTORATI

Ph.D Program in Model Based Public Planning, Policy Design and Management
Department of Political Sciences and International Relations (DEMS)
SSD SECS-P/07 - Business & Public Management

**The role of system dynamics to unveil the complexity
of academic missions. An integrated approach for
entrepreneurial universities' performance
evaluation and management.**

Ph.D. CANDIDATE
Canio FORLIANO

Ph.D. COORDINATOR
Chiar.mo Prof. Salvatore MANCUSO

SUPERVISOR
Prof. Enzo BIVONA

CO-SUPERVISOR
Prof.ssa Paola De Bernardi

XXXV CYCLE
ACADEMIC YEAR 2022

*For every complex problem there is an answer
that is clear, simple, and wrong.*

– H. L. Mencken

Table of contents

ABSTRACT	1
CHAPTER 1: INTRODUCTION	3
1. RESEARCH BACKGROUND	3
2. RESEARCH GAPS AND PURPOSES	6
3. THESIS OUTLINE: AN OVERVIEW OF THE DIFFERENT RESEARCH PHASES AND METHODS	8
3.1 <i>Offering an overview of the relevant literature on the topic</i>	8
3.2 <i>Investigating institutional logics' multiplicity through a comparative case study</i>	8
3.3 <i>Developing a causal loop diagram</i>	9
3.4 <i>Tracing the study's conclusions through a conceptual DPM chart</i>	11
CHAPTER 2: ESSAY I.....	17
ABSTRACT	18
1. INTRODUCTION	19
2. THEORETICAL BACKGROUND	21
3. METHODOLOGY	23
3.1 <i>Data collection</i>	23
3.2 <i>Data extraction</i>	24
3.3 <i>Bibliometric analysis</i>	25
3.3.1 <i>Performance analysis</i>	25
3.3.2 <i>Science mapping</i>	26
4. RESULTS OF THE BIBLIOMETRIC ANALYSIS.....	27
4.1 <i>Performance analysis</i>	27
4.1.1 <i>Articles' evolution over time</i>	27
4.1.2 <i>Articles' geography</i>	30
4.1.3 <i>Authors</i>	31
4.1.4 <i>Journals</i>	34
4.2 <i>Science mapping</i>	36
4.2.1 <i>Conceptual structure</i>	37
4.2.2 <i>Social and intellectual structure</i>	40
5. CONTENT ANALYSIS.....	43

5.1 <i>Time slice 1: 1983–2009</i>	43
5.2 <i>Time slice 2: 2010–2014</i>	45
5.3 <i>Time slice 3: 2015–2019</i>	46
6. IMPLICATIONS FOR RESEARCH: AVENUES FOR FUTURE STUDIES	47
6.1 <i>The need for systematisation works</i>	47
6.2 <i>Scholars’ engagement</i>	48
6.3 <i>Journals and thematic specialisation</i>	48
6.4 <i>Geography</i>	49
7. CONCLUSION, LIMITATIONS, AND FURTHER DEVELOPMENTS	49
CHAPTER 3: ESSAY II	59
1. INTRODUCTION	61
2. THEORETICAL BACKGROUND	62
2.1 <i>Entrepreneurial Universities and the Third Mission</i>	62
2.2 <i>Logic Multiplicity in Universities</i>	64
3. METHODOLOGY	65
3.1 <i>Cases Selection</i>	65
3.2 <i>Data Collection and Analysis</i>	66
4. RESULTS	67
4.1 <i>Teaching Institutional Logics</i>	67
4.2 <i>Researching Institutional Logics</i>	70
4.3 THIRD MISSION INSTITUTIONAL LOGICS	72
5 DISCUSSION AND CONCLUSION	75
5.1 <i>Discussion</i>	75
5.2 <i>Implications</i>	76
5.3 <i>Limitations and Further Steps</i>	77
CHAPTER 4: ESSAY III.....	83
1. INTRODUCTION	85
2. LITERATURE REVIEW	86
3. MATERIALS AND METHODS	87
4. FINDINGS AND DISCUSSIONS	89
4.1 <i>The interplays between basic and applied research</i>	89
4.2 <i>The interplays between teaching and reputation</i>	92
4.3 <i>The interplays between teaching and regional development</i>	93

5. IMPLICATIONS, LIMITATIONS, AND FURTHER STEPS 95

CHAPTER 5: CONCLUSIONS 101

List of Figures

CHAPTER 1: INTRODUCTION

- Figure 1.** An exemplary representation of a feedback loop..... 11
- Figure 2.** A DPM modelling example..... 12

CHAPTER 2: ESSAY 1

- Figure 1.** The different phases of the data extraction activity 25
- Figure 2.** Distribution of publications over time in all research fields (TP) and in the business and management domain (TP-BM). 28
- Figure 3.** Top authors' production over time. Note that the bigger the circle is, the more articles have been published by the author in that year. The darker the circle is, the more citations have been received per year. 32
- Figure 4.** The conceptual structure of the dataset. 37
- Figure 5.** Thematic evolution of the topic: first time slice (1983–2009)..... 38
- Figure 6.** Thematic evolution of the topic, second time slice (2010–2014). 39
- Figure 7.** Thematic evolution of the topic: third time slice (2015–2018)..... 39
- Figure 8.** The social structure of the dataset. 41
- Figure 9.** The rate of collaboration between countries based on authors' affiliations..... 42
- Figure 10.** The historic evolution of co-citations among the 20 most relevant articles..... 43

CHAPTER 4: ESSAY 3

- Figure 1.** The CLD of the three academic missions and their different institutional logics 90

CHAPTER 5: CONCLUSIONS

- Figure 1.** The DPM chart associated with the three academic missions of entrepreneurial universities. Different coloured areas distinguish resources and end results according to an intellectual capital perspective 102

List of Tables

CHAPTER 1: INTRODUCTION

Table 1. Different definitions of an entrepreneurial university	4
--	---

ESSAY 1

Table 1. Citation analysis of the 10 most relevant documents in the dataset ordered by the total number of citations received (TC).....	29
--	----

Table 2. On the left, the top 10 countries ordered by the total number of publications in the dataset (TP-BM); on the right, the top 10 countries ordered by the ratio of inter-country collaborations (MCP/TP-BM).	30
--	----

Table 3. The top 10 countries ordered by the total number of citations received (TC).....	31
--	----

Table 4. The 20 most relevant authors ordered by the local number of publications (TP-BM).	33
---	----

Table 5. The 20 most relevant journals ordered by the local number of publications (TP-BM).	35
--	----

Table 6. The 20 most relevant journals ordered by different citation thresholds.	36
--	----

ESSAY 2

Table 1. KPIs of the teaching inclusiveness logic	68
--	----

Table 2. KPIs of the teaching vocational logic	69
---	----

Table 3. KPIs of the teaching excellence logic	70
---	----

Table 4. KPIs of the research focalisation logic	71
---	----

Table 5. KPIs of the research materiality logic.....	71
---	----

Table 6. KPIs of the research excellence logic	72
---	----

Table 7. KPIs of the third mission dissemination logic	73
---	----

Table 8. KPIs of the third mission translational logic	74
---	----

Table 9. KPIs of the third mission entrepreneurial logic	75
---	----

ESSAY 3

Table 1. The nine institutional logics associated with each of the three academic missions as identified in Forliano <i>et al.</i> (2022).....	89
---	----

Abstract

The third mission concept implies that universities are expected to perform several diversified activities besides teaching (first mission) and scientific research (second mission). Third mission efforts may include activities such as knowledge dissemination, technological innovation, social innovation, advisory services, or entrepreneurship. Through third mission activities, universities engage in sustainable, inclusive development and/or territorial competitiveness by interacting with a wide range of subjects far beyond their students and reference scientific communities. The third mission's activities vary a lot according to the specific characteristics of each university, the territory in which it is located, and the intricate nature of the relations with the entrepreneurial and innovation ecosystems' actors. Since these missions can be reciprocally complementary or conflicting, they can result in paradoxical tensions and competition around allocating key resources and leveraging specific drivers to enhance universities' performance.

Both the management literature and national and international ranking agencies have made huge efforts to build effective performance measurement systems. However, there are still no shared frameworks that can effectively overcome the above-mentioned difficulties and solve the possible tensions that can exist at various organisational levels. By considering how those organisations respond to logics' multiplicity, this research project primarily aims to advance a conceptual model for evaluating and managing the performance of entrepreneurial universities and the role they can play in contributing to the development of modern complex, dynamic, and knowledge-intensive societies.

To achieve these objectives, the relevant literature regarding entrepreneurial universities' role and impact is analysed in the first phase. To do so, a bibliometric analysis was conducted by applying performance and network analysis techniques. Interestingly, from the conducted analysis, three different thematic clusters have emerged as shaping the current scientific debate: (1) knowledge management and innovation; (2) performance management and economic growth; and (3) technology transfer and knowledge commercialisation. Subsequently, leveraging the institutional logics meta-theory, a cross-country comparative case study was conducted in order to identify the different institutional logics that characterise entrepreneurial universities' activities. In particular, considering entrepreneurial universities as submersed

complex organisational fields, three logics have been identified in association with each of their three academic missions. So, the inclusiveness, vocational, and excellence logics emerged in relation to the first mission. The focalisation, materiality, and excellence logics were identified in relation to the second mission. Third, the dissemination, translational, and entrepreneurial logics were distinguished concerning the third mission.

In the end, those nine different logics have been reconciled to the different key performance indicators used to evaluate entrepreneurial universities' performance in pursuing the three academic missions. Then, leveraging system dynamics principles, those results have been used to build a causal loop diagram to offer a dynamic viewpoint of the intertwined relationships existing between the three different academic missions and how their associated institutional logics can result in mutually complementing or conflicting with each other. Finally, a dynamic performance management chart is leveraged to offer some concluding remarks on the interrelationships existing between the strategic resources, intermediate results (i.e., performance drivers), and short-term (i.e., output) and long-term (i.e., outcomes) end results that are related to entrepreneurial universities' activities. Hence, the proposed model contributes to the literature regarding entrepreneurial universities' management and their performances and impact assessment, with a particular focus on their intangible resources and those organisations' role in contributing to societal and economic developments.

Keywords: entrepreneurial university; institutional logics; system dynamics; performance management system

CHAPTER 1

Introduction

1. Research background

Economic growth and competitiveness are thought to be significantly influenced by innovation, which is currently seen as one of the key sources of sustained economic development in modern knowledge-based economies (Bertello *et al.*, 2022; Chaudhuri *et al.*, 2020; Forliano *et al.*, 2022). However, in its early stages, business research on entrepreneurship has focused its attention mostly on the characteristics of individual entrepreneurs or companies and the linear mechanisms of the innovation process (Autio & Thomas, 2014; Carayannis *et al.*, 2018; Cavallo *et al.*, 2018). Indeed, in order to describe the innovation process, scholars have for a long time proposed a linear sequence of knowledge production and commercialisation (Kline & Rosenberg, 2010), also referred to as Mode 1 (Gibbons *et al.*, 1994); where performing both basic and applied research usually leads to bringing knowledge to the market and diffusing it (i.e., invention-innovation-diffusion).

Later, the Mode 2 perspective (Gibbons, 2000; Nowotny *et al.*, 2003) challenged the approach of Mode 1 by considering knowledge creation and knowledge-based problem-solving in specific contexts of application, where multidisciplinary teams are usually brought together to produce socially distributed innovation and knowledge. Then, scholars started to recognise the chain-link model of innovation, considering a dynamic and systemic process where different stakeholders are thought to be interacting along a non-linear route that is defined by feedback mechanisms. Accordingly, Mode 3 of knowledge production (Carayannis & Campbell, 2012) focuses on higher-order learning processes and dynamics that allow for both top-down and bottom-up knowledge production processes.

Mode 3 resembles the triple helix model introduced by Etzkowitz and Leydesdorff (2000), where governments, industry, and universities are all seen as active advocates of innovation and knowledge. Together with those three helices, a fourth and fifth ones have been increasingly recognised by scholars (Carayannis & Campbell, 2010; Carayannis *et al.*, 2019; Galvao *et al.*, 2019) for including the bottom-up interactions and initiatives promoted by the civil society (i.e., the fourth helix) within the natural environment (i.e., the fifth helix). Indeed, considering that innovation is a dynamic, multifaceted socio-technical phenomenon, engaging

different stakeholders in co-creation processes is crucial in fostering innovation able to create public value for promoting a sustainable future and better lives (Bryson *et al.*, 2017; Corazza & Saluto, 2021). Within the different n-helices models, universities have been referred to be “natural incubators” at the core of innovation, creativity, and economic development (Etzkowitz, 2003, p. 111). Although not all higher education institutions are in this situation, it is becoming more and more apparent that universities need to be entrepreneurial in their activities, orientation, instruction, structures, practices, and culture (Coşkun *et al.*, 2022; Siegel & Wright, 2015). However, it is difficult to genuinely encourage those organisations to think and behave entrepreneurially, especially in light of the absence of a clear definition or general agreement on what an entrepreneurial university is (Fayolle & Redford, 2014; Secundo *et al.*, 2020). Table 1 shows some of the most prominent definitions that have been proposed over the years to define an entrepreneurial university.

Table 1. Different definitions of an entrepreneurial university.

Author(s)	Definition
Etzkowitz (1983)	Universities that are considering new sources of resources such as patents, research by contract and partnerships with private companies.
Chrisman <i>et al.</i> (1995)	The Entrepreneurial University involves the creation of new enterprises by university professors, technicians or students.
Kirby (2002)	Entrepreneurial Universities have the capacity to innovate, recognize and create opportunities, work as a team, take risks and respond to challenges.
Etzkowitz (2003)	The Entrepreneurial University is a natural incubator, providing support structures for professors and students to begin new intellectual and commercial enterprises.
Jacob <i>et al.</i> (2003)	An Entrepreneurial University is based both on the commercialization of personalized education courses, consultancy services and extension activities and on commoditization (patents or startups).
Guerrero <i>et al.</i> (2006)	An Entrepreneurial University is defined as a university that has the capacity to innovate, recognize and create opportunities, as well as working as a team, taking risks and responding to challenges. By itself, it seeks to discover a substantial change in the organizational character to reach a more promising posture for the future.
Salamzadeh <i>et al.</i> (2011)	A dynamic system that includes special contributions (resources, culture, rules and regulations, structure, mission, business capacities and expectations from society, industry, government and the market); processes (teaching, research, management processes, logistical processes, commercialization, selection, financing and financial processes, networking, multilateral interaction and innovation, research and development activities; outputs (entrepreneurial human resources, effective research according to the needs of the market, innovations and inventions, entrepreneurial networks and entrepreneurial centers) and aims to mobilize all its resources, skills and capacities to fulfill its “third mission”.

Kirby <i>et al.</i> (2011)	The Entrepreneurial University is a natural incubator that, by adopting a strategy, coordinated in critical activities (for example, teaching, research and entrepreneurship), tries to provide an adequate environment in which the university community (e.g., academics, students and employees) can investigate, evaluate and explore ideas that could be transformed into social and economic entrepreneurial initiatives.
Guerrero & Urbano (2012)	An Entrepreneurial University can be defined as a survivor of competitive environments with a common strategy, oriented to be the best in all its activities (for example, having good finances, selecting good students and professors, producing quality research).
Audretsch <i>et al.</i> (2012)	The role of universities is more than generating technology transfer (patents, spin-offs and start-ups) and, on the contrary, contributing and providing leadership for the creation of entrepreneurial thinking, actions, institutions and entrepreneurial capital.
Urbano & Guerrero (2013)	The Entrepreneurial University needs to become an entrepreneurial organization, its members need to become entrepreneurs and its interaction with the environment needs to follow an entrepreneurial pattern.
Guerrero <i>et al.</i> (2014)	The nature of an Entrepreneurial University is such that graduates are seen not only as future job applicants, but also as future job creators, and the organization and content of teaching activities reflect this conception.
Trippl <i>et al.</i> (2015)	The business model claims that universities promote the development of their regions, engaging in patents, licensing and academic activities derived from university disciplines such as engineering, information technology and biotechnology in which the knowledge produced overlaps more easily with products and processes that industry and market structures can absorb.
Etzkowitz (2017)	The Entrepreneurial University integrates the economic development at the university as an academic function along with teaching and research. It is this “knowledge capitalization” that is the heart of a new mission for the university, connecting universities with knowledge users more strongly and establishing the university as an economic actor in itself.

Source: adapted from Budyldina (2018), Guerrero *et al.* (2006), and Pereira & Klein (2020).

Hence, in contrast to what Baldini and colleagues (2014) defined as “academic entrepreneurship”, which includes formal and informal mechanisms to commercialize research, entrepreneurial universities can be broadly defined as proactive universities that engage in activities to improve the national or regional economic and social development and seek application for their research while obtaining financial advantages (Etzkowitz *et al.*, 2000). An entrepreneurial university is thus responsible for keeping a close eye on the outside world and responding swiftly to any signal sent by the surrounding, fast-changing environment. In this way, it can better deal with the external environment’s dynamism, unpredictability, and complexity. At the same time, it can produce knowledge with a strong focus on real-world problems, contributing to the economic and societal advancement of the context in which they operate.

2. Research gaps and purposes

A substantial paradigm shift in the definition of universities' missions occurred since the late 1980s, leading to the recognition of a third mission besides teaching (first mission) and research (second mission) activities. The third mission can thus be defined as every activity performed by universities to exploit knowledge and other capabilities outside their boundaries, engaging a broader public than just students or the scientific community (Compagnucci & Spigarelli, 2020; Molas-Gallart *et al.*, 2002). Recent studies have also started to recognize the existence of a fourth mission, explicitly referring to the role of (entrepreneurial) universities in contributing to the development of economies and societies and addressing real-world issues through multi-stakeholder partnerships (Rinaldi *et al.*, 2018; Trencher *et al.*, 2014).

However, mainly due to historical reasons, traditional performance management systems have given great attention to assessing universities' teaching and research activities, missing part of their broader impact on modern complex, dynamic, and knowledge-intensive societies (Cosenz, 2022). Moreover, due to the overwork that typically characterizes the academic's life, a second-order problem comes into play. In fact, once a specific key performance indicator (KPI) is introduced, academics would spend their time on those activities that are more rewarding for their career, leading to unintended consequences and further competition between the various missions and the multifaceted university's role. Thus, it is clear that the three (or four) academic missions can compete with each other and tensions can rise even within the same mission because of the different logic they refer to. As a consequence, despite great efforts have been made by both scholars and practitioners (Cosenz, 2014; Meissner & Shmatko, 2017; Secundo *et al.*, 2017), there are still no shared approaches (and related KPIs) that can effectively assess entrepreneurial universities' impact and performances in a dynamic and systemic way, as well as highlight those tensions.

Furthermore, the relevance of the interplays existing between organizations and the environment in which they operate has gained momentum among scholars, especially in the innovation management field (Autio & Thomas, 2014; Bertello *et al.*, 2022; Scuotto *et al.*, 2017). In this regard, the concepts of clusters, networks, districts, or ecosystems have been explored to describe different ways in which spatiality and inter-organizational relationships influence how organizations orchestrate their resources in national or regional innovation systems, defining their economic activity, building new knowledge, and enhancing their competitive advantages (De Bernardi *et al.*, 2019; Kashani & Roshani, 2019; Leydesdorff &

Porto-Gomez, 2019). Moreover, in today's globalized world, entrepreneurial universities have increasingly emerged as vital players in knowledge and innovation, as well economic development and wealth creation (Fayolle & Redford, 2014; Forliano *et al.*, 2021).

Although the effects of more conventional and tangible university entrepreneurial activities have been fairly well studied to date (Audretsch, 2014; Rose *et al.*, 2012), knowledge of softer organizational and managerial aspects and entrepreneurial universities' broader role within those ecosystems is less developed (Grande *et al.*, 2022; Secundo *et al.*, 2017). Since the majority of a university's assets are made up of intangible resources and intellectual property (Ramirez & Gordillo, 2014; Sánchez *et al.*, 2009; Secundo *et al.*, 2017), according to Castellanos and colleagues "the value of the intellectual capital, or at least a large part of it, at a particular university should be measured in terms of its direct or indirect social value" (Castellanos *et al.*, 2004, p. 480). In this regard, also Etzkowitz (2016) has recommended the creation of criteria and metrics that take entrepreneurial universities' multifaceted activities into account. Hence, this research project first aimed to systematize the current scientific debate investigating entrepreneurial universities. Then, after having investigated what logics characterize those organizations, to adopt a holistic approach for improving the methods and systems used to assess entrepreneurial universities' performance and impact. Universities are indeed under growing pressure from society to re-engineer their performance systems and create a collaborative environment within the quintuple helix model. Thus, this work aims to raise awareness about entrepreneurial universities' role in contributing to social and economic growth and improve the tools that policymakers can adopt to guide their decisions in this direction.

3. Thesis outline: an overview of the different research phases and methods

In order to reach its intended contributions, this thesis has been designed as follows.

3.1 Offering an overview of the relevant literature on the topic

As a result of the first phase of this research project, Chapter 2 offers an overview of the scientific debate about entrepreneurial universities. This phase aims to represent a state of the art of how entrepreneurial universities' role has evolved over the years, with a specific focus on their third (or fourth) mission.

In particular, three different research questions have been advanced and answered: (1) how has evolved the literature investigating the business and management aspects related to entrepreneurial universities; (2) what are the characteristics of the conceptual, social, and intellectual structures that characterize the business and management literature about entrepreneurial universities; and (3) what are the possible future trends for research on entrepreneurial universities within the business and management research fields.

To do so, both performance and network analyses have been performed leveraging bibliometric techniques. Then, the most relevant articles have been qualitatively content analyzed to systematically reconstruct and critically examine the main theories and schools of thought that are considered most important for the theme under investigation. Interestingly, from the analysis of the conceptual structure, the following three thematic clusters emerged as shaping the current scientific debate about the topic: (1) knowledge management and innovation; (2) performance management and economic growth; and (3) technology transfer and knowledge commercialization.

3.2 Investigating institutional logics' multiplicity through a comparative case study

Chapter 3 presents the results of a cross-country comparative case study that is grounded in the institutional logics theory. Indeed, considering the variety of actors and interests that take part in them, the performance of entrepreneurial universities largely depends on the different institutional logics that characterize their activities. In this sense, entrepreneurial universities are seen as immersed in a complex field of social forces that the literature on institutional studies calls the organizational field (Wooten & Hoffman, 2008). Under this perspective,

entrepreneurial universities can be seen as hybrid organizations characterized by different perceived interests and multiple institutional logics that interact in a systemic way and can be mutually complementary or conflicting. Consequently, each entrepreneurial university is immersed in a complex organizational field that influences and is influenced by those logics.

To shed light on those aspects, as a first step of analysis, exploratory semi-structured interviews (Bryman & Bell, 2011) have been carried out to investigate three different entrepreneurial universities: one Continental European (the University of Milano Bicocca), one Anglo-Saxon University (the University of Birmingham), and one Asian University (the University of Hong Kong). This analysis enabled to identify three different institutional logics shaping each of the three academic missions at the organizational field level. For what regards teaching, the inclusiveness, vocational, and excellence logics emerged. Considering the research activity, the focalization, materiality, and excellence logics were identified. Finally, the dissemination, translational, and entrepreneurial logics were distinguished concerning the third mission.

Then, as a second step of analysis, the strategic and/or performance plans of the three selected universities were analyzed and the different KPIs associated with the three academic missions and those nine institutional logics were individuated. In this way, it was possible to answer the two research questions of the study: (1) what are the institutional logics embedded in universities' organizational field?; and (2) how do universities respond to this logic multiplicity by developing specific sets of KPIs?

3.3 Developing a causal loop diagram

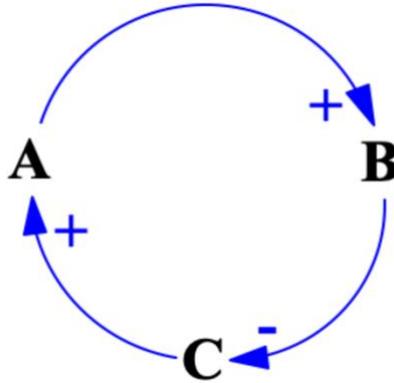
Based on the analysis performed in Chapter 3, Chapter 4 revolves around a conceptual causal loop diagram that has been developed to investigate how entrepreneurial universities respond to logics' multiplicity and show the interplays characterizing the three different academic missions and some of their associated KPIs, as also resulted from triangulating them with the analysis of the rankings developed by some of the most influential international ranking organizations (i.e., the Italian National Agency for the evaluation of universities and research institutes, Shanghai Ranking Consultancy, E3M, QuacquarelliSymonds, Times Higher Education, and U-Multirank). In this way, the strategic resources and the KPIs used to assess the universities' activities, objectives, and performance in pursuing their three academic missions were identified and leveraged to build the causal loop diagram.

In this phase, systems dynamics was considered a particularly relevant methodology since it enables reconstructing the underlying causal logic of a complex system such as that related to entrepreneurial universities' multifaceted activities. According to Mitchell, a complex system can in fact be considered "a system in which large networks of components with no central control and simple rules of operation give rise to complex collective behaviour, sophisticated information processing, and adaptation via learning or evolution" (Mitchell, 2011, p. 13). In other words, systems dynamics can help "to uncover and understand endogenous sources of system behaviour" (Richardson, 2011, p. 241). Indeed, system dynamics, and causal loop diagrams in particular, can offer a great understanding of the multiple feedback loops that characterize complex systems and generate new interesting and often counterintuitive insights (Forrester, 1961; Sterman, 2000).

Hence, through the help of causal loop diagrams, this approach gives visual evidence of the circular causality that characterizes the relationships between different elements constituting systems whose feedback loops are causally closed (Richardson, 2011). Figure 1 offers an example of a causal loop diagram, where A, B, and C represent the system's elements, while the arrows connecting them represent causal relationships. These causal relationships can be positive or negative. Positive links mean that there is a direct causal relationship between two variables. For example, if A increases (decreases), also B will increase (or decrease). Differently, negative links mean that the causal relationship is inverse. So, if B increases (decreases), C decreases (or increases). Feedback loops that include null or an even number of negative links are defined as self-reinforcing (usually labeled with an "R") and associated with exponential growth or decay behaviors (Sterman, 2000). Feedback loops that include an odd number of negative causal links, as in Figure 1, are defined self-balancing (usually labeled with a "B") and associated with a target-seeking behavior.

In the model portrayed in Chapter 4, eight self-reinforcing loops are thus associated with the three researching logics (i.e., focalization, materiality, and excellence) and the third mission's translational and entrepreneurial logics. Four self-reinforcing and four self-balancing loops are identified in relation to academic reputation and the teaching inclusiveness and quality logics. Finally, four self-reinforcing feedback loops are identified in relation to the third mission's logics and the teaching's vocational logic.

Figure 1. An exemplary representation of a feedback loop.

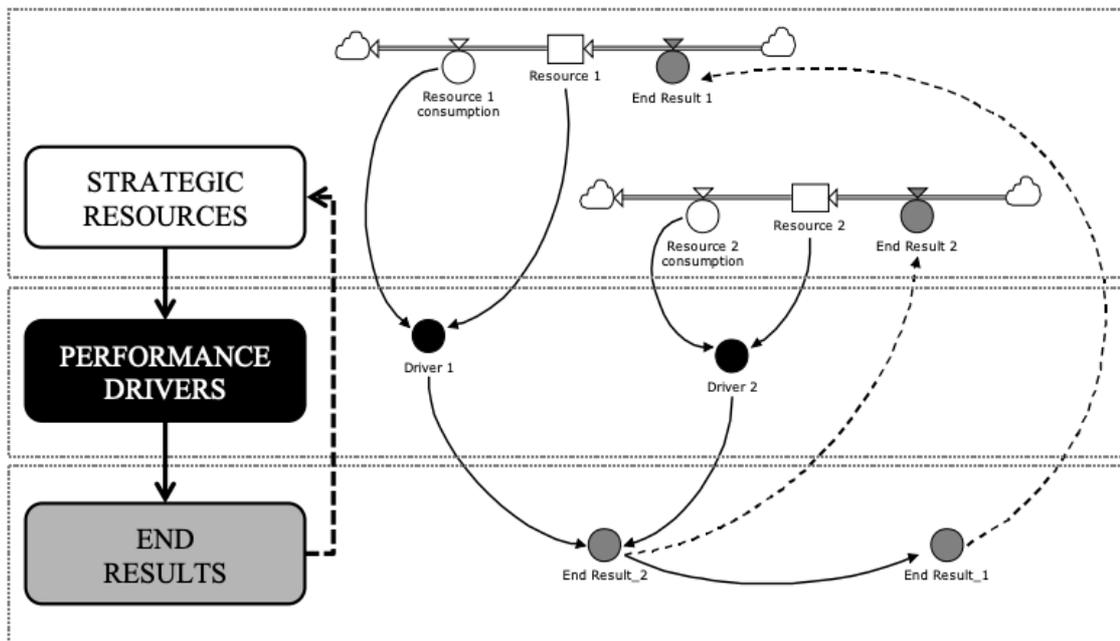


Source: Author's own elaboration

3.4 Tracing the study's conclusions through a conceptual DPM chart

Finally, the last phase of the project sees the application of the DPM approach to the conceptual model portrayed in the previous Chapter. To do so, once the key actors and performance indicators have been identified, it is necessary to recognize the following key variables that influence the model (Bianchi, 2015; Borgonovi *et al.*, 2017): (i) *stocks*, the key strategic resources that are assessed in a given time and should be leveraged for achieving the expected end results; (ii) *flows*, variables that contribute to stocks accumulation or depletion in a certain period of time; (iii) *performance drivers*, i.e. variables that usually represent ratios between a stock amount and its desired level and can be leveraged by decision-makers in the short run; (iv) *end results*, that represent the expected outcome of the model and will close reinforcing or balancing loops in stocks generation. DPM modelling typically result in layer and/or arrow models like the one showed in Figure 2. Given the above, setting up an effective and efficient performance management system is particularly necessary for managing entrepreneurial universities' activities and assessing their performances (Cosenz, 2014). Aim of this research project is thus to develop a pivotal and conceptual DPM chart to guide policymakers assuming decisions and deal with the complexity, dynamicity, and unpredictability of actual societies (Bianchi, 2016).

Figure 2. A DPM modelling example.



Source: Bianchi (2016, p. 73).

Reference list

- Audretsch, D.B., Hülsbeck, M., & Lehmann, E.E. (2012). Regional competitiveness, university spillovers, and entrepreneurial activity. *Small Business Economics*, 39(3), 587-601.
- Autio, E., & Thomas, L. D. W. (2014). *The Oxford Handbook of Innovation Management*. Oxford University Press.
- Baldini, N., Fini, R., Grimaldi, R., & Sobrero, M. (2014). Organisational change and the institutionalisation of university patenting activity in Italy. *Minerva*, 52(1), 27-53.
- Bertello, A., Battisti, E., De Bernardi, P., & Bresciani, S. (2022). An integrative framework of knowledge-intensive and sustainable entrepreneurship in entrepreneurial ecosystems. *Journal of Business Research*, 142, 683–693.
- Bianchi, C. (2016). *Dynamic Performance Management* (Vol. 1). Springer International Publishing. <https://doi.org/10.1007/978-3-319-31845-5>
- Borgonovi, E., Bianchi, C., & Rivenbark, W. C. (2017). Pursuing Community Resilience through Outcome-Based Public Policies: Challenges and Opportunities for the Design of Performance Management Systems. *Public Organization Review*, 1–6. <https://doi.org/10.1007/s11115-017-0395-1>
- Bryman, B., & Bell, E. (2011). *Business research methods* (3rd ed.). Oxford University Press.
- Bryson, J., Sancino, A., Benington, J., & Sørensen, E. (2017). Towards a multi-actor theory of public value co-creation. *Public Management Review*, 19(5), 640–654.

- Budyldina, N. (2018). Entrepreneurial universities and regional contribution. *International Entrepreneurship and Management Journal*, 14(2), 265-277.
- Carayannis, E. G., & Campbell, D. F. J. (2010). Triple Helix, Quadruple Helix and Quintuple Helix and how do knowledge, innovation and the environment relate to each other?: a proposed framework for a trans-disciplinary analysis of sustainable development and social ecology. *International Journal of Social Ecology and Sustainable Development (IJSESD)*, 1(1), 41–69.
- Carayannis, E. G., & Campbell, D. F. J. (2012). *Mode 3 Knowledge Production in Quadruple Helix Innovation Systems*. In *Mode 3 Knowledge Production in Quadruple Helix Innovation Systems* (pp. 1–63). Springer.
- Carayannis, E. G., Goletsis, Y., & Grigoroudis, E. (2018). Composite innovation metrics: MCDA and the Quadruple Innovation Helix framework. *Technological Forecasting and Social Change*, 131, 4–17. <https://doi.org/10.1016/j.techfore.2017.03.008>
- Carayannis, E. G., Grigoroudis, E., Stamati, D., & Valvi, T. (2019). Social business model innovation: A quadruple/quintuple helix-based social innovation ecosystem. *IEEE Transactions on Engineering Management*, 68(1), 235–248.
- Castellanos, A. R., Rodriguez, J. L., & Rangelov, S. Y. (2004). University R&D&T capital: What types of knowledge drive it?. *Journal of Intellectual Capital*, 5(3), 478-499. <https://doi.org/10.1108/14691930410550417>
- Cavallo, A., Ghezzi, A., & Balocco, R. (2018). Entrepreneurial ecosystem research: present debates and future directions. *International Entrepreneurship and Management Journal*, August, 1–31. <https://doi.org/10.1007/s11365-018-0526-3>
- Chaudhuri, R., Chavan, G., Vadalkar, S., Vrontis, D., & Pereira, V. (2020). Two-decade bibliometric overview of publications in the Journal of Knowledge Management. In *Journal of Knowledge Management* 25(6), 1550–1574. Emerald Group Holdings Ltd. <https://doi.org/10.1108/JKM-07-2020-0571>
- Chrisman, J. J., Hynes, T., & Fraser, S. (1995). Faculty entrepreneurship and economic development: The case of the University of Calgary. *Journal of Business Venturing*, 10(4), 267-281.
- Compagnucci, L., & Spigarelli, F. (2020). The Third Mission of the university: A systematic literature review on potentials and constraints. *Technological Forecasting and Social Change*, 161, 120284.
- Corazza, L., & Saluto, P. (2021). Universities and Multistakeholder Engagement for Sustainable Development: A Research and Technology Perspective. *IEEE Transactions on Engineering Management*, 68(4), 1173–1178. <https://doi.org/10.1109/TEM.2020.3020736>
- Cosenz, F. (2014). A Dynamic Viewpoint to Design Performance Management Systems in Academic Institutions: Theory and Practice. *International Journal of Public Administration*, 37(13), 955–969. <https://doi.org/10.1080/01900692.2014.952824>

- Cosenz, F. (2022). Developing Performance Management Systems in Higher Education Institutions. In *Managing Sustainable Performance and Governance in Higher Education Institutions* (pp. 37-84). Springer, Cham.
- Coşkun, H. E., Popescu, C., Şahin Samaraz, D., Tabak, A., & Akkaya, B. (2022). Entrepreneurial University Concept Review from the Perspective of Academicians: A Mixed Method Research Analysis. *Sustainability*, *14*(16), 10110.
- De Bernardi, P., Azucar, D., Forliano, C., Bertello, A. (2020). *Innovation and entrepreneurial ecosystems: structure, boundaries, and dynamics*. In De Bernardi, P., & Azucar, D. (Eds.), *Innovation in Food ecosystems* (pp. 73-104). Springer, Cham.
- Etzkowitz, H. (1983). Entrepreneurial scientists and entrepreneurial universities in American academic science. *Minerva*, *21*(2), 198-233.
- Etzkowitz, H. (2003). Research groups as ‘quasi-firms’: the invention of the entrepreneurial university. *Research Policy*, *32*(1), 109-121.
- Etzkowitz, H. (2016). The entrepreneurial university: vision and metrics. *Industry and Higher Education*, *30*(2), 83-97.
- 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. [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)
- Etzkowitz, H., & Zhou, C. (2017). *The triple helix: University–industry–government innovation and entrepreneurship*. Routledge.
- Forliano, C., De Bernardi, P., & Yahiaoui, D. (2021). Entrepreneurial universities: A bibliometric analysis within the business and management domains. *Technological Forecasting and Social Change*, *165*, 120522.
- Forliano, C., Ferraris, A., Bivona, E., & Couturier, J. (2022). Pouring new wine into old bottles: A dynamic perspective of the interplay among environmental dynamism, capabilities development, and performance. *Journal of Business Research*, *142*, 448-463.
- Forrester, J. W. (1961). *Industrial dynamics*. Cambridge, Mass.: M.I.T. Press.
- Galvao, A., Mascarenhas, C., Marques, C., Ferreira, J., & Ratten, V. (2019). Triple helix and its evolution: a systematic literature review. *Journal of Science and Technology Policy Management*. <https://doi.org/10.1108/JSTPM-10-2018-0103>
- Gibbons, M., Limoges, C., Nowotny, H., Trow, M., Scott, P., & Schwartzman, S. (1994). *The New Production of Knowledge*, London: Sage.
- Gibbons, M. (2000). Mode 2 society and the emergence of context-sensitive science. *Science and Public Policy*, *27*(3), 159–163. <https://doi.org/10.3152/147154300781782011>
- Grande, S., Bertello, A., De Bernardi, P., & Ricciardi, F. (2022). Enablers of explorative and exploitative intellectual capital in entrepreneurial ecosystems. *Journal of Intellectual Capital*, (ahead-of-print). <https://doi.org/10.1108/JIC-07-2021-0197>

- Guerrero, M., & Urbano, D. (2012). The development of an entrepreneurial university. *The Journal of Technology Transfer*, 37(1), 43-74.
- Guerrero, M., Kirby, D., & Urbano, D. (2006). A literature review on entrepreneurial universities: an institutional approach. Presented at the 3rd Conference of Pre-communications to Congresses. *Business Economic Department, Autonomous University of Barcelona*. Barcelona.
- Guerrero, M., Urbano, D., Cunningham, J., & Organ, D. (2014). Entrepreneurial universities in two European regions: A case study comparison. *The Journal of Technology Transfer*, 39(3), 415-434
- Jacob, M., Lundqvist, M., & Hellsmark, H. (2003). Entrepreneurial transformations in the Swedish university system: The case of Chalmers University of Technology. *Research Policy*, 32(9), 1555-1569.
- Kashani, E. S., & Roshani, S. (2019). Evolution of innovation system literature: Intellectual bases and emerging trends. *Technological Forecasting and Social Change*, 146, 68-80.
- Kirby, D. A. (2002) 'Entrepreneurship education: can business schools meet the challenge?', *International Council for Small Business – the 47th World Conference*. San Juan, 16-19 June
- Kirby, D. A., Guerrero, M., & Urbano, D. (2011). The theoretical and empirical side of entrepreneurial universities: An institutional approach. *Canada Journal of Administrative Sciences*, 28(3), 302-316.
- Kline, S. J., & Rosenberg, N. (2010). *An overview of innovation. Studies on Science and the Innovation Process: Selected Works of Nathan Rosenberg*, 173-203.
- Leydesdorff, L., & Porto-Gomez, I. (2019). Measuring the expected synergy in Spanish regional and national systems of innovation. *The Journal of Technology Transfer*, 44(1), 189-209.
- Meissner, D., & Shmatko, N. (2017). "Keep open": The potential of gatekeepers for the aligning universities to the new knowledge triangle. *Technological Forecasting and Social Change*, 123, 191-198.
- Mitchell, M. (2011). *Complexity: A Guided Tour*. Oxford: Oxford University Press.
- Molas-Gallart, J., Salter, A., Patel, P., Scott, A., & Duran, X. (2002). Measuring third stream activities. *Final report to the Russell Group of Universities*. Brighton: SPRU, University of Sussex.
- Nowotny, H., Scott, P., & Gibbons, M. (2003). 'Mode 2' revisited: The new production of knowledge. *Minerva*, 41(3), 179-194.
- Pereira, F. C. M., & Klein, S. B. (2020). Entrepreneurial University: Conceptions and Evolution of Theoretical Models. *Revista Pensamento Contemporâneo em Administração*, 14(4), 20-35.
- Ramirez, Y., & Gordillo, S. (2014). Recognition and measurement of intellectual capital in Spanish universities. *Journal of intellectual capital*, 15(1), 173-188.

- Rinaldi, C., Cavicchi, A., Spigarelli, F., Lacchè, L., & Rubens, A. (2018). Universities and smart specialisation strategy: From third mission to sustainable development co-creation. *International journal of sustainability in higher education*.
- Salamzadeh, A., Salamzadeh, Y., & Daraei, M. (2011). Toward a systematic framework for an entrepreneurial university: a study in Iranian context with an IPOO model. *Global business and management research: an international journal*, 3(1), 31-37.
- Scuotto, V., Santoro, G., Bresciani, S., & Del Giudice, M. (2017). Shifting intra- and inter-organizational innovation processes towards digital business: An empirical analysis of SMEs. *Creativity and Innovation Management*, 26(3), 247–255. <https://doi.org/10.1111/caim.12221>
- Secundo, G., Perez, S.Elena, Martinaitis, Z., Leitner, K.H., (2017). An intellectual capital framework to measure universities' third mission activities. *Technological Forecasting and Social Change* 123, 229–239. <https://doi.org/10.1016/j.techfore.2016.12.013>.
- Secundo, G., Rippa, P., & Cerchione, R. (2020). Digital Academic Entrepreneurship: A structured literature review and avenue for a research agenda. *Technological Forecasting and Social Change*, 157, 120118.
- Siegel, D. S., & Wright, M. (2015). Academic entrepreneurship: time for a rethink?. *British Journal of Management*, 26(4), 582-595.
- Sterman, J. (2000). *Business Dynamics: Systems Thinking and Modeling for a Complex World*. Irwin/McGraw-Hill, Boston, MA.
- Trencher, G., Yarime, M., McCormick, K. B., Doll, C. N., & Kraines, S. B. (2014). Beyond the third mission: Exploring the emerging university function of co-creation for sustainability. *Science and Public Policy*, 41(2), 151-179.
- Trippel, M., Sinozic, T., & Smith, H. L. (2015). The role of universities in regional development: Conceptual models and policy institutions in the UK, Sweden and Austria. *European Planning Studies*, 23(9), 1722-1740.
- Urbano, D., & Guerrero, M. (2013). Entrepreneurial Universities: Socioeconomic Impacts of Academic Entrepreneurship in a European Region. *Economic Development Quarterly*, 27(1), 40-55.
- Wooten, M., & Hoffman, A. J. (2008). *Organizational fields: Past, present and future*. In *The Sage handbook of organizational institutionalism* (Vol. 1, pp. 131–147). Sage.

CHAPTER 2

ESSAY I

Entrepreneurial universities: a bibliometric analysis within the business and management domains

Canio Forliano^{1,2,*}, Paola De Bernardi², Dorra Yahiaoui³

¹ University of Palermo, via Amico Ugo Antonio, 90134 Palermo, Italy

² University of Turin, C.so Unione Sovietica 218/bis, 10134 Turin, Italy

³ Kedge Business School, Domaine de Luminy, Rue Antoine Bourdelle, 13009 Marseille, France

**Corresponding author: canio.forliano@unito.it*

* Earlier version presented at the Academy of Innovation, Entrepreneurship, and Knowledge (ACIEK) Conference 2020 - Challenges and Opportunities: how are technology, information, and marketing affecting the interconnected world?, 23rd-24th June 2020, ESIC Business School, Madrid, Spain

** Status: The article was published in *Technological Forecasting and Social Change*, Elsevier. Full reference: Forliano, C., De Bernardi, P., & Yahiaoui, D. (2021). Entrepreneurial universities: A bibliometric analysis within the business and management domains. *Technological Forecasting and Social Change*, 165, 120522. <https://doi.org/10.1016/j.techfore.2020.120522>

Abstract

This study presents a bibliometric analysis of scientific publications investigating entrepreneurial universities in the business and management fields. The authors collected 511 documents from the Web of Science and analysed them using Bibliometrix, an RStudio package for performance analysis and science mapping. The study aims to provide an overview of the evolution of research about this topic and describe the structures (i.e., conceptual, social, and intellectual) characterising it. It discusses the results to identify the main areas addressed so far and highlight gaps in the literature, offering avenues for possible future research. The results show that publications on entrepreneurial universities started over 30 years ago and show an increasing trend, more than tripling in the last 10 years. Considering authors and documents as a unit of analysis, the US and Europe perform well in terms of productivity and relevance, but the phenomenon is globally relevant. The contribution to socio-economic development, especially in developing countries, is a hot topic for future studies. Despite increasing production rates, research on this topic remains fragmented, justifying the need for more systematisation. Furthermore, the paper offers policy makers and practitioners a useful baseline for developing entrepreneurial universities and considering their technological, managerial, and organisational implications.

Keywords: entrepreneurial universities; academic entrepreneurship; bibliometric analysis; bibliometrix; technology transfer.

1. Introduction

In current knowledge-driven societies, universities are increasingly involved in outreach activities that extend beyond teaching and research (Ardito *et al.*, 2019; Rinaldi *et al.*, 2018; Trencher *et al.*, 2014). In this regard, universities have started to become more open towards societies, performing different kinds of activities (e.g., knowledge dissemination, technological innovation, social innovation, advisory services, or entrepreneurship), with government support or not, at a local, regional, or global level (Guerrero, Urbano, & Fayolle, 2016). This shift started when Etzkowitz (1983) first introduced the “entrepreneurial university” concept. As a consequence, research on entrepreneurial universities has steadily increased over the years, especially in the business and management fields. It has expanded to a variety of interrelated topics, such as technology transfer (Etzkowitz, 2003a; Guerrero and Urbano, 2012; Martinelli *et al.*, 2008), performance management (Audretsch, 2014; Cosenz, 2014; Wong *et al.*, 2007), entrepreneurial education (Fayolle and Redford, 2014; Guerrero *et al.*, 2015; Rasmussen and Sørheim, 2006), regional development (Bramwell & Wolfe, 2008; Cooke, 2005; D A Kirby, 2006), stakeholder engagement (Klofsten & Jones-Evans, 2000; Trencher *et al.*, 2014), and knowledge management (Martinelli *et al.*, 2008; Scuotto *et al.*, 2019; Secundo *et al.*, 2019).

Although several scholars have addressed the issues related to entrepreneurial universities over the years, a shared view regarding this topic is still lacking (Secundo *et al.*, 2020). However, regardless of its public or private nature, scholars seem to agree that, if a university aspires to develop towards an entrepreneurial model, the following five characteristics need to be taken into consideration (Etzkowitz, 1983, 2003b; Guerrero *et al.*, 2016b; OECD, 2012): first, the presence of interconnections with governments, industries, and societies; second, the existence of different revenue streams, which make the university partially or totally independent from public funding; third, students’ and faculties’ involvement in some entrepreneurial activities, such as entrepreneurial education or technology transfer activities; fourth, the creation of academic start-ups or spin-offs, supported by the implementation of ad hoc strategies and the development of specific structures; and fifth, the adaptation of the university’s organisational structure to implement such changes.

Following these common patterns, examples of entrepreneurial universities that can be considered as best practices are present worldwide, with each institution excelling in one or more specific areas. This can also refer to the variety of resources and capabilities that characterise each local context (Guerrero and Urbano, 2012; Siegel and Wright, 2015) or to the

different political scenarios and markets that characterise each environmental setting in which entrepreneurial universities operate (Etzkowitz, 2017; Guerrero *et al.*, 2016b), from the strict embeddedness of Stanford University with Silicon Valley's ecosystem to the links built by the Autonomous University of Madrid to support its regional needs and from the profitable technology transfer activities conducted by the Massachusetts Institute of Technology (MIT) to the creation of spin-offs and science parks performed by the Katholieke Universiteit of Leuven. Adopting this broad perspective and answering different calls for more research on the topic (e.g., Mascarenhas *et al.*, 2017; Siegel and Wright, 2015), this paper aims to systematise the scientific production published to date in the business and management fields. In this way, it offers scholars a holistic overview of the fragmented literature published to date and proposes possible future research streams. Moreover, policy makers and practitioners could find a useful baseline for fostering the development of an entrepreneurial university and considering its technological, managerial, and organisational implications. In this vein, a bibliometric analysis is conducted to answer the following research questions:

RQ1. How has the business and management literature addressing entrepreneurial universities evolved so far?

RQ2. What structures characterise the business and management literature about entrepreneurial universities?

RQ3. What are the possible future trends for research on entrepreneurial universities within the business and management research fields?

Bibliometry represents an appropriate solution to achieve these objectives since it empowers scholars to identify a discipline's most influential studies and relevant scientific activities (Broadus, 1987; Cuccurullo *et al.*, 2016; Merigó *et al.*, 2015). Leveraging performance analysis and science mapping, several indicators were considered to identify the most influential documents, authors, journals, and countries.

The performance analysis shows that publications related to entrepreneurial universities started more than 30 years ago and reveal an increasing trend. Moreover, while the topic is globally relevant, advanced countries (e.g., the US and other European economies) perform better in terms of productivity and relevance, considering authors and documents as a unit of analysis. In this sense, the first implication of this study is that more analyses from developing countries should be encouraged and international collaborations among scholars incentivised. Moreover,

most of the journals are connected to technological aspects, suggesting a different focus of journals on this research topic.

Differently, science mapping enables the identification of the structures (i.e., conceptual, intellectual, and social) that characterise the topic under study. Notably, the conceptual structure was analysed through keywords' co-occurrences, which enabled the identification of three thematic clusters: (i) knowledge management and innovation, (ii) performance management and economic growth, and (iii) technology transfer and knowledge commercialisation. The social structure was analysed through co-authorships and the results highlight that most relevant authors act in restricted circles and broader networks are still lacking. The intellectual structure was investigated through references' co-occurrences to determine which documents have most influenced the research field over the years. Finally, following the content analysis, the evolution of the themes that have been addressed by the most relevant authors over the years is presented and implications for future research are investigated in depth.

The remainder of this work is organised as follows. Section 2 presents the theoretical background. Section 3 systematically describes the adopted methodology. Section 4 presents the results of the bibliometric analysis. More precisely, Section 4.1 reports the results of the performance analysis while Section 4.2 is dedicated to science mapping. Section 5 discusses the results of the content analysis. Section 6 presents the main implications of the work. Finally, Section 7 contains the conclusions, limitations, and further developments.

2. Theoretical background

Since the introduction of the Bayh–Dole Act in the US in the early 1980s, universities have experienced a shift in the missions that they have traditionally been asked to pursue (Etzkowitz, 1998; Grimaldi *et al.*, 2011). Indeed, the political reform incentivised forms of private funding (Etzkowitz *et al.*, 2000; Philpott *et al.*, 2011) and, consequently, universities increased their entrepreneurial activities, especially along the dimension of technological transfer (Etzkowitz, 2003b, 2003c; O'Shea *et al.*, 2005; Rothaermel *et al.*, 2007). Following this trend, some authors have examined the theoretical underpinnings of an entrepreneurial university, criticising the progressive commercialisation of knowledge (D'Este and Perkmann, 2010; Van Looy *et al.*, 2011) in what they defined as academic capitalism (Slaughter and Leslie, 1997) or the “McDonaldisation” of universities (Hayes, 2017). Other scholars have recognised that the contribution of universities to social and economic progress should not be limited to the

capitalisation of knowledge (H Etkowitz, 2004) since universities could act as local agents to stimulate entrepreneurship capital (Audretsch, 2014; Guerrero and Urbano, 2012) by promoting entrepreneurial thinking, actions, and institutions (Guerrero, Urbano, & Fayolle, 2016). Hence, entrepreneurial universities should be considered as transformational agents able to boost entrepreneurial abilities, drive ecosystem change, and catalyse natural or financial resources in a given environment (Klofsten and Jones-Evans, 2000; Siegel and Wright, 2015).

Over the years, efforts from all over the world have been made to foster a shift towards the entrepreneurial university model. As a consequence, according to Etkowitz (2017), two main approaches can be identified. In more laissez-faire economies (e.g., in Anglo-Saxon or Northern European countries), entrepreneurial universities arose following more bottom-up approaches as well as being pushed by reductions in public funding and the consequent necessity to look for new financial sources. In this regard, some archetypal universities, such as MIT, Stanford, Cambridge, and Leuven, progressively built relationships with governments and industries and undertook entrepreneurial activities that were more tangible and related to economic returns (e.g., patenting, licensing, and spin-off creation). Conversely, in “higher-state” societies (e.g., in continental Europe), this transition was mainly induced by political or institutional efforts to close the innovation gap with Anglo-Saxon universities, adopting a more top-down approach.

A famous project aimed at systematising academic entrepreneurial activities was conducted in 2010 in Europe. Third mission activities were grouped into three main categories (E3M, 2010), namely (i) technology transfer and innovation, (ii) continuing education, and (iii) public engagement. Briefly, it could be said that entrepreneurial universities are adaptive institutions that effectively pursue their third mission by adjusting their goals and strategies, seizing new opportunities, and taking risks to adapt themselves to modern dynamic and competitive knowledge-based societies (Clark, 1998; Etkowitz, 2003b; Kirby, 2002; Rasmussen and Wright, 2015; Secundo *et al.*, 2017). Thus, although some misalignment remains regarding performance measurement systems and tensions can arise between the pursuit of the three academic missions (O’Kane *et al.*, 2015), especially in the allocation of scarce resources, such as scholars’ time, the third mission and entrepreneurial activities have the power to build synergies among these missions and push universities’ capability to achieve their full potential.

3. Methodology

In this work, a bibliometric analysis was conducted. Bibliometrics can be defined as a sub-branch of informetrics that aims to measure scientific publications' impact and their related level of knowledge dissemination through statistical techniques (Broadus, 1987; Cuccurullo *et al.*, 2016; Merigó *et al.*, 2015). In this sense, it enables researchers to investigate a larger amount of data than systematic literature reviews, keeping a high level of rigour, scientific soundness, transparency, and replicability (Dada, 2018; Rey-Martí *et al.*, 2016).

This study used bibliometrics to unveil what is known and what is not in the topic of entrepreneurial universities, with a particular focus on the business and management literature. Thus, a quantitative analysis was conducted, applying performance analysis and science mapping using the RStudio software (RStudio Team, 2016), which is one of the most used tools by researchers, data analysts, and analytical practitioners to conduct statistical analysis. R integrates several packages and is updated almost daily, making it very helpful for conducting meta-analyses such as bibliometric ones. To perform this study, the Bibliometrix package developed by Aria and Cuccurullo (2017) was adopted. Bibliometrix has been gaining increasing attention from scholars in a wide range of disciplines (e.g., Addor and Melsen, 2019; Linnenluecke *et al.*, 2019; Secinaro and Calandra, 2020) as it enables them to perform descriptive analysis starting with bibliographic databases.

Moreover, as in other bibliometric studies (e.g., Baima *et al.*, 2020; Martínez-Climent *et al.*, 2018), a content analysis of the most influential articles was performed to investigate the thematic evolution of the discipline and the specialisation of authors. Consequently, the “hidden patterns” characterising the discipline were identified and avenues for future research are proposed (Cappellesso and Thomé, 2019; Daim *et al.*, 2006).

3.1 Data collection

The first step in a bibliometric analysis is to collect raw data from which the necessary metadata (e.g., authors, countries, references, or number of citations) can be obtained (Carvalho *et al.*, 2013). Several bibliometric databases exist. However, the two largest are the Web of Science (WoS) from Clarivate Analytics and Scopus from Elsevier. The WoS covers more than 15,000 journals and over 90 million documents. Scopus indexes more than 20,000 active titles (i.e., peer-reviewed journals, books, and conference proceedings) and contains around 69 million records. In this study, the WoS Core Collection was consulted for conducting the bibliometric

analysis. Scholars have recognised it as having higher quality standards than Scopus (Merigó *et al.*, 2015), leading to fewer false positive results regarding authors and keyword disambiguation thanks to keywords plus. Keywords plus are keywords that are automatically generated from the WoS according to the terms that appear more than once in a document's reference list and do not produce comparison problems (e.g., related to single or plural forms or acronyms). For these reasons, it is the most suitable database for data mining and has become one of the primary databases used by scholars for conducting bibliometric analysis (Thelwall, 2008; Waltman and van Eck, 2012).

3.2. Data extraction

To collect data from the WoS database, the following search string was used within the document topic field:

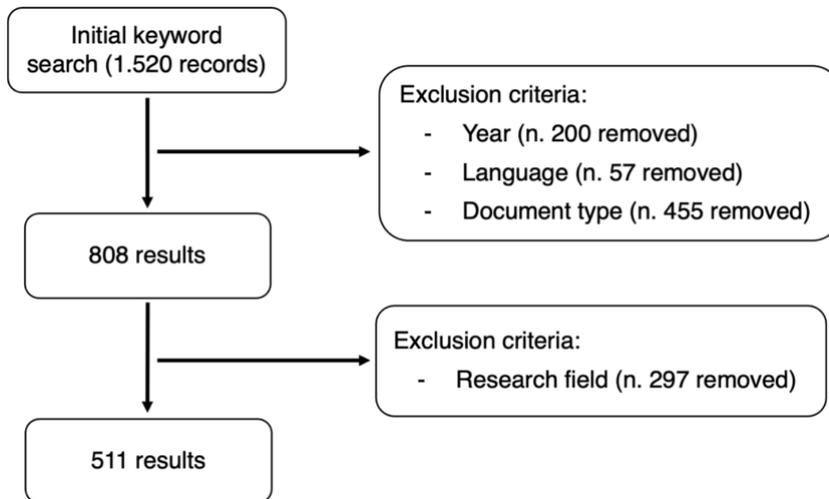
“entrepren universit*” OR “universit* entrepren*” OR “academic entrepren*” OR “entrepren* academic”*

Searching within the document topic field provides results that contain the selected keyword in documents' title, abstract, author keywords, and keywords plus. Following the WoS's syntax, the Boolean operator (OR) and wildcards were adopted to capture documents containing different combinations of the selected keywords and both plural and singular forms. The search was conducted in November 2019 and included all documents released before 2018.

The initial search returned 1,520 records. Then, restrictions on the year (documents published before 2018), document type (articles, reviews, and letters), and language (English only) were applied (Merigó *et al.*, 2016), resulting in 808 records. Restrictions on the year were posed to improve the comparability during the bibliometric analysis since more recent publications had not had the time to receive an adequate number of citations (Massaro *et al.*, 2016). Restrictions on the document type were imposed to include only documents that have been subject to a double-blind review process (Gaviria-Marin *et al.*, 2019). Finally, to answer the research questions of the present study and provide a more accurate comparison among the metrics of scholars, journals, and publications, only the results included in the “management” and “business” fields were considered. The final result was 511 records, representing around 75% of the dataset found in the previous phase and demonstrating the relevance of the topic in the

selected sub-domains. Figure 1 provides graphical evidence of the different phases of the data extraction activity.

Figure 1. The different phases of the data extraction activity.



Source: Authors' own elaboration.

3.3 Bibliometric analysis

The final sample was examined through bibliometric analysis. In this regard, two techniques were primarily used: performance analysis and science mapping (Noyons *et al.*, 1999).

3.3.1 Performance analysis

Performance analysis can adopt several indicators, mainly related to analysing the overall trend of the topic and the number of publications or citations of the documents within the dataset and sorting them by authors, journals, countries, and affiliations (Massaro *et al.*, 2016; Thelwall, 2008). However, evaluating the scientific impact of researchers or journals through other indicators along with those mentioned above is generally accepted. Among them, thanks to its easy interpretability, one of the most popular is the h-index, proposed by Hirsch (2005). The h-index indicates the number of publications that have received at least h citations, and it is considered to be an appropriate and robust indicator to evaluate productivity and the relevance of scientific production at the same time (Vanclay, 2007). However, despite its objectivity, the h-index is not a suitable index when authors from different research fields or authors characterised by different seniority levels are to be compared (Kelly & Jennions, 2006). In this study, only scholars pertaining to the business and management fields were compared. To

overcome the problems related to comparing researchers at diverse stages of their career, the m-index was adopted as another unit of analysis. The m-index is the h-index divided by the number of years that have passed between a scholar's first and his or her latest publication (Hirsch, 2007). It thus enables researchers to weight a scholar's productivity with his or her career length.

3.3.2 Science mapping

Another widely adopted technique in bibliometric analysis is science mapping, which empowers the researcher to capture hidden patterns in the conceptual, social, and intellectual structure of a given body of knowledge and their dynamic evolution over time (Börner *et al.*, 2003; Cobo *et al.*, 2012). The conceptual structure refers to the links that can emerge between different concepts or words. The social structure highlights the connections that occur between different units of analysis, such as authors, institutions, and countries. The intellectual structure concerns relationships between different nodes (e.g., documents, authors, and journals) that can highlight evolutions in a given discipline or body of knowledge. To conduct these kinds of analyses, scholars can adopt several techniques (van Eck and Waltman, 2014), but the most used are co-occurrence analysis and co-citation analysis (Callon *et al.*, 1983; Small, 1973; van Eck and Waltman, 2010).

To capture the conceptual structures related to entrepreneurial universities, in this study, a co-occurrence analysis was conducted using keywords plus as a unit of analysis. Accordingly, 50 nodes were obtained, adopting the association strength normalisation (van Eck and Waltman, 2009) and the Louvain cluster algorithm (Blondel *et al.*, 2008). Moreover, plotting clusters in a bi-dimensional matrix in which the axes are functions of density and centrality, a thematic evolution map is presented. Notably, 250 keywords plus were considered with a minimum cluster frequency of 5 and 2 cut-off points to provide a comprehensive evolution of themes related to entrepreneurial universities over time.

To capture the social structure, a co-authorship analysis was performed on the basis of co-authored documents (Peters and van Raan, 1991), in which 50 authors represented the unit of analysis. In this case as well, the association strength normalisation (van Eck and Waltman, 2009) and the Louvain cluster algorithm (Blondel *et al.*, 2008) were adopted. Isolated nodes were not discarded to provide a more comprehensive view of the level of collaboration existing among scholars in this domain.

Finally, to analyse the intellectual structure of the topic, a historiograph (Garfield, 2004) was drawn, plotting the evolution of the citations of the 20 most influential documents over the years. It was possible to identify 4 thematic groups, thus supporting the results of the analysis of the conceptual structure.

4. Results of the bibliometric analysis

4.1 Performance analysis

In this section, a bibliometric analysis is presented on the basis of different performance indicators. In this way, it is possible to answer the first research question of this study:

RQ1. How has the business and management literature addressing entrepreneurial universities evolved so far?

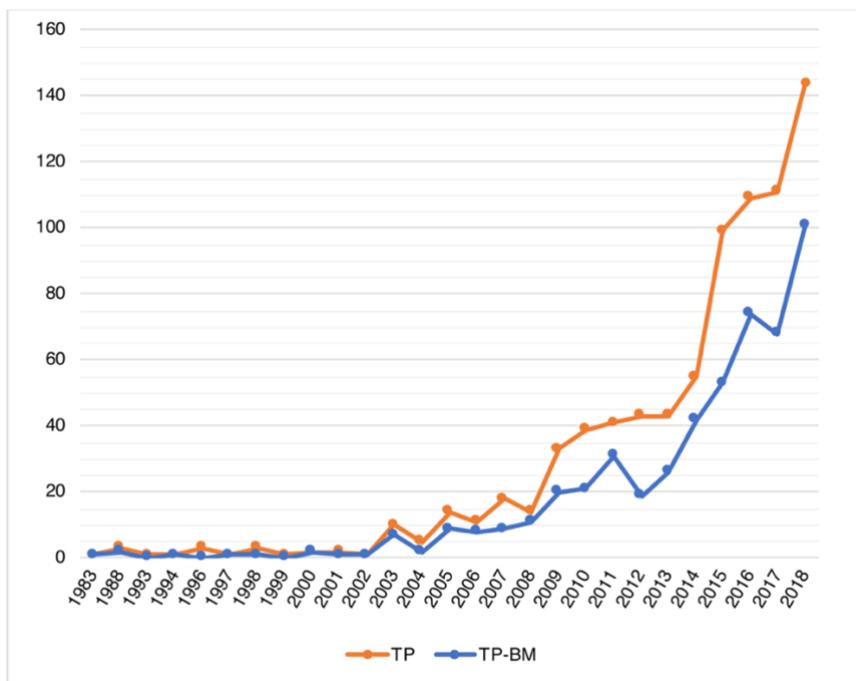
4.1.1 Articles' evolution over time

Studies on entrepreneurial universities started in 1983, when Etzkowitz published his seminal study in which he recognised the emerging need of universities to search for alternative income streams. In this study, he first coined the term “entrepreneurial university” to describe universities that are able to obtain funds from their research activity. Research on this topic has been published for more than 30 years since then, although it received scant attention from the scientific community until 2003 (see Figure 2).

By this year, Etzkowitz had published several other seminal studies. Etzkowitz (1998) theorised about the introduction of the capitalisation of knowledge and economic development as a third mission besides teaching and research. The author conceptualised the “triple-helix” model in which universities, governments, and industries are recognised as intertwined actors that contribute to fostering technological innovation in modern knowledge-based societies (Etzkowitz, 2001, 2003a, 2003b; Etzkowitz *et al.*, 2000; Leydesdorff and Etzkowitz, 2001). Then, the academic life of scientists involved in academic entrepreneurship activities was recognised as similar to that of entrepreneurs engaged in start-ups (Etzkowitz, 2003b). Hence, the total production rate acquired increasing relevance between 2003 and 2008, reaching its first peak in 2009, when the number of documents roughly doubled compared with the number in previous years. While, in Anglo-Saxon contexts, this increase can be explained by increasing restrictions on public funding and the impelling necessity for universities to become

autonomous and seek alternative funding streams, in Europe, the shift towards an entrepreneurial model of universities was pushed more from the top down. The European Commission and the OECD made admirable efforts to promote an entrepreneurial culture in Europe to close the gap with American universities. Indeed, they recognised that most innovative ideas were coming from the academic world (European Commission, 2008). Some of these initiatives were the European Third Mission Project, launched in 2010 (E3M, 2010), and the creation of the European Institute of Innovation and Technology (EIT) and different knowledge and innovation communities (KICs) in 2008 (Didier, 2010). Finally, in 2012, the European Commission and the OECD published a guiding framework for helping European universities to manage this entrepreneurial transition (OECD, 2012). Therefore, different third-mission activities were disciplined to drive universities to manage their novel mission in the economy and society, pushed by those institutional and cultural changes. The production rate developed steadily over the years, with another peak in 2015 and a sound increase in the subsequent years, reaching 144 records in 2018. In the business and management fields, this increase was more gradual but followed a similar trend.

Figure 2. Distribution of publications over time in all research fields (TP) and in the business and management domain (TP-BM).



Source: Authors' own elaboration.

To identify the articles that have most influenced researchers related to entrepreneurial universities in the business and management fields, analysing the number of citations received is considered to be a suitable measure (Merigó *et al.*, 2015). Indeed, citations can synthesise the relevance and influence of a publication among scholars in a single number. The ten most influential documents in the analysed dataset are presented in Table 1. More precisely, the total citations received as retrievable in the WoS (TC) and the average number of citations received each year (TC/Y) are shown. Interestingly, Etzkowitz appears three times on this list and can be considered soundly as one of the seminal authors of the third mission and entrepreneurial university concepts. After Etzkowitz *et al.* (2000), the most cited documents are those by Rothaermel *et al.* (2007), containing a comprehensive literature review on entrepreneurial universities, followed by Perkmann *et al.* (2013), who proposed a taxonomy of the literature to investigate the relationship between universities and industry.

Table 1. Citation analysis of the 10 most relevant documents in the dataset ordered by the total number of citations received (TC).

#	Author(s)	Title	Year	Journal	TC	TC/Y
1	Etzkowitz <i>et al.</i>	The future of the university and the university of the future: evolution of ivory tower to entrepreneurial paradigm	2000	Res. Policy	924	44.00
2	Rothaermel <i>et al.</i>	University entrepreneurship: a taxonomy of the literature	2007	Ind. Corp. Change	632	45.14
3	Perkmann <i>et al.</i>	Academic engagement and commercialisation: a review of the literature on university–industry relations	2013	Res. Policy	608	76.00
4	Etzkowitz	Research groups as “quasi-firms”: the invention of the entrepreneurial university	2003	Res. Policy	606	33.67
5	Etzkowitz	The norms of entrepreneurial science: cognitive effects of the new university–industry linkages	1998	Res. Policy	532	23.13
6	Walter <i>et al.</i>	The impact of network capabilities and entrepreneurial orientation on university spin-off performance	2006	J. Bus. Ventur.	438	29.20
7	O’Shea <i>et al.</i>	Entrepreneurial orientation, technology transfer and spinoff performance of U.S. universities	2005	Res. Policy	416	26.00
8	Bercovitz & Feldman	Academic entrepreneurs: organizational change at the individual level	2008	Organ. Sci.	337	25.92

9	Gulbrandsen & Smeby	Industry funding and university professors' research performance	2005	Res. Policy	325	20.31
10	D'Este & Perkmann	Why do academics engage with industry? The entrepreneurial university and individual motivations	2011	J. Technol. Transf.	298	29.80

Source: Authors' own elaboration.

4.1.2 Articles' geography

A total of 966 authors from 48 countries and 589 different institutions contributed to publishing the 511 articles in the analysed dataset. This means that collaboration is a critical aspect for authors studying entrepreneurial universities as there are only 92 single-authored documents. However, considering the multi-authored publications, it can be observed that the most prolific countries are not necessarily also the most open to international collaborations. This can be observed in Table 2, in which three different metrics are considered: (i) single-country publications (SCPs), (ii) multi-country publications (MCPs), and (iii) the ratio between the MCPs and the total number of publications in the dataset (TP-BM). "SCP" represents the number of publications written by authors from the same country (intra-country collaboration). "MCP" represents the number of publications written by authors from different countries (inter-country collaboration). "MCP_Ratio" provides a relative value that shows the level of openness of each country to international collaborations.

Of the 48 countries involved, only 11 have published only 1 paper, demonstrating a global interest in the topic of entrepreneurial universities. However, in terms of overall productivity, it can easily be noted that all of the most prolific countries are from advanced economies in North America or Europe. Interestingly, the US accounts for around twice as many publications as the UK, which ranks second. However, they do not appear among the top 10 in terms of international collaborations when considering their MCP ratio.

Table 2. On the left, the top 10 countries ordered by the total number of publications in the dataset (TP-BM); on the right, the top 10 countries ordered by the ratio of inter-country collaborations (MCP/TP-BM).

#	Country	TP-BM	SCPs	MCPs	#	Country	MCP_Ratio
1	US	108	71	37	1	Belgium	0.778
2	UK	59	27	32	2	Russia	0.636
3	Italy	44	28	16	3	Netherlands	0.600

4	Germany	38	20	18	4	Ireland	0.600
5	Spain	35	24	11	5	Denmark	0.571
6	Sweden	25	17	8	6	UK	0.542
7	Netherlands	15	6	9	7	Canada	0.500
8	Canada	12	6	6	8	Brazil	0.500
9	Norway	12	8	4	9	Switzerland	0.500
10	Russia	11	4	7	10	Germany	0.474

Source: Authors' own elaboration.

Differently, Table 3 reports the top 10 countries in the total number of citations received. As in Table 2, the US proves to be a leader for both productivity and relevance concerning entrepreneurial universities, followed by the UK, Italy, and Germany. Other countries, such as Belgium and Ireland, rise in relation to the total citations received, while still others, like the Netherlands and Russia, no longer rank among the top ten.

Table 3. The top 10 countries ordered by the total number of citations received (TC).

#	Country	TC
1	US	6,977
2	UK	3,592
3	Italy	1,206
4	Germany	1,017
5	Norway	834
6	Sweden	828
7	Spain	772
8	Belgium	604
9	Ireland	530
10	Canada	437

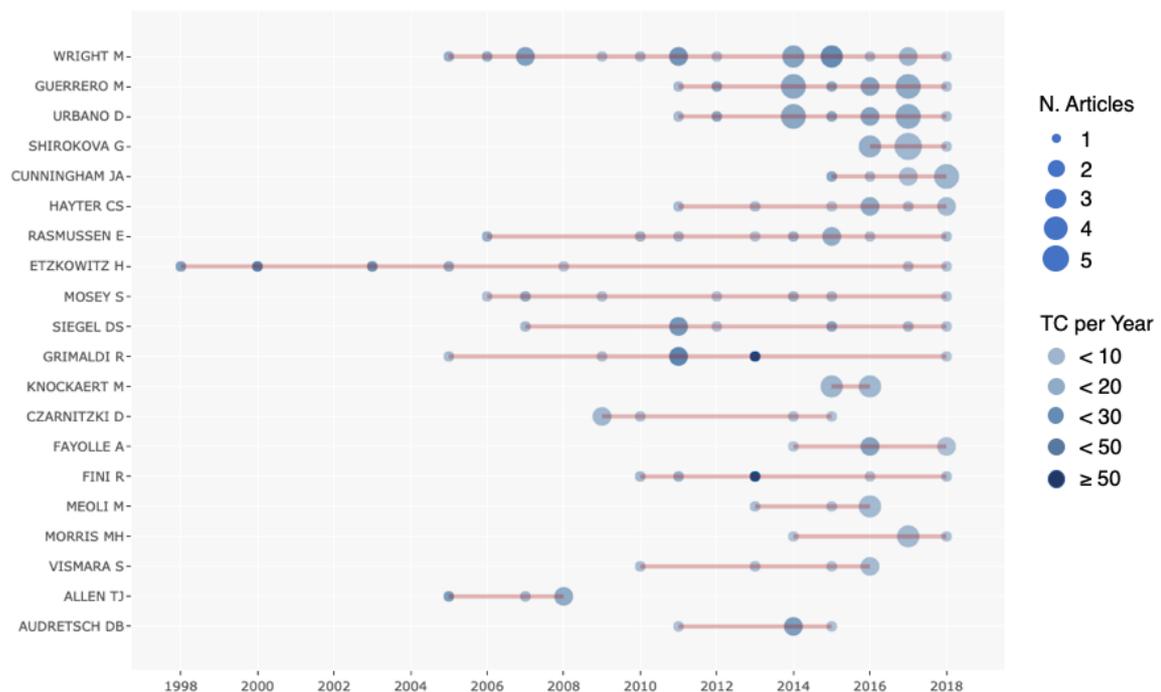
Source: Authors' own elaboration.

4.1.3 Authors

Two relevant aspects should be considered when evaluating an author's relevance within a specific field: the productivity and the impact. In Figure 3, both these measures are considered to provide an overview of the top 20 most productive authors in the last 20 years. The

productivity was evaluated through the number of articles published by an author in the given period of time. Conversely, the impact was evaluated by considering the number of citations received each year. It can be noted that Wright, Guerrero, and Urbano are the most productive authors, while Grimaldi and Fini received the highest number of citations per year. Moreover, it can easily be observed that Etzkowitz is a seminal author on the topic, with an unbroken series of publications from 1998 to 2018.

Figure 3. Top authors' production over time. Note that the bigger the circle is, the more articles have been published by the author in that year. The darker the circle is, the more citations have been received per year.



Source: Biblioshiny, based on the WoS dataset.

However, productivity per se is not representative of the overall quality of researchers' production, and scholars have generally used other indicators apart from the total citations for assessing their relevance to the scientific community. Therefore, in Table 4, three measures are provided concerning the local dataset and the top 20 most productive authors: the total citation number (TC-BM), the h-index (h-BM), and the m-index (m-BM). The most cited authors in the dataset are Etzkowitz (2,332 citations) and Wright (1,695 citations), followed by Grimaldi (1,136 citations) and Perkmann (1,063 citations). Interestingly, these 4 authors are the only ones to exceed the threshold of 1,000 citations in the results. However, Wright has the best combination of productivity and impact (Hirsch, 2005), with 19 local publications (TP-BM)

and an h-BM of 15, which means that he has published 15 articles that have received at least 15 citations. Guerrero and Urbano have performed admirably as well, with 14 publications each and a local h-index of 10. Interestingly, the 3 best-performing authors have addressed the entrepreneurial university topic under the primary lens of regional development and societal impact, analysing technology transfer, universities' spin-offs, and academic start-ups.

To avoid penalising younger scholars, the m-index was also calculated. The m-index is defined as the h-index weighted for the activity period of an author (Hirsch, 2007). Hence, apart from established scholars, such as Wright, Guerrero, and Urbano, among the others, Shirokova, Cunningham, and Knockaert, who started to publish in 2015–2016 and can be counted among the most influential authors on the topic, are worthy of mention.

To offer a more comprehensive overview of the authors, in Table 4, their country based on their current affiliation, total citations received (TC), and h-index (h) as retrievable from the WoS at the time of the analysis are also shown.

Table 4. The 20 most relevant authors ordered by the local number of publications (TP-BM).

#	Author	Country	TC	h	TP-BM	TC-BM	h-BM	PY_start	m-BM
1	Wright, M.	UK	10,783	61	19	1,695	15	2005	0.938
2	Guerrero, M.	UK	9,700	45	14	675	10	2011	1
3	Urbano, D.	SPA	2,598	28	14	675	10	2011	1
4	Shirokova, G.	RUS	238	9	9	119	5	2016	1
5	Cunningham, J.A.	IRL	8,851	45	8	190	6	2015	1
6	Hayter, C.S.	US	366	10	8	228	7	2011	0.700
7	Rasmussen, E.	NOR	846	15	8	386	8	2010	0.727
8	Etzkowitz, H.	US	6,460	23	7	2,332	7	1998	0.304
9	Mosey, S.	UK	786	11	7	472	7	2006	0.467
10	Siegel, D.S.	US	13,456	53	7	567	6	2007	0.429
11	Grimaldi, R.	ITA	4,978	36	6	1,136	5	2005	0.313
12	Knockaert, M.	BEL	3,422	24	6	103	5	2015	0.833
13	Czarnitzki, D.	BEL	2,238	27	5	181	5	2009	0.417
14	Fayolle, A.	FRA	2,581	26	5	121	4	2014	0.571
15	Fini, R.	ITA	1,108	10	5	836	5	2010	0.455
16	Meoli, M.	ITA	505	14	5	89	5	2013	0.625

17	Morris, M.H.	US	2,713	26	5	53	5	2014	0.714
18	Vismara, S.	ITA	1,244	19	5	147	5	2010	0.455
19	Allen, T.J.	US	9,952	56	4	759	4	2005	0.250
20	Audretsch, D.B.	US	16,203	63	4	224	4	2011	0.400

Source: Authors' own elaboration.

4.1.4 Journals

Articles on entrepreneurial universities in the business and management fields have been published in a great variety of journals. Over the years, this topic has made steady advancements. To describe journals' impact, in Table 5, the 20 most relevant journals are presented.

In terms of productivity, the Journal of Technology Transfer and Research Policy resulted as the best ranked. Interestingly, the former also performed well in relative terms since around 15% of the total publications released by the same journal addressed the topic of entrepreneurial universities. Conversely, this does not happen for Research Policy. Hence, the topic appears to be more representative of journal publications in the International Entrepreneurship and Management Journal and the Journal of Enterprising Communities, in which it was addressed by around 7% of their total publications. However, including some seminal works published by Etzkowitz, the h-index of Research Policy's publications is almost double that of the second journal on the list, the Journal of Technology Transfer. These results are confirmed by the m-index, which also considers how many years have passed since each journal published its first publication present in the dataset.

Concerning the citations received by each journal from other authors in the collection (TC-BM), apart from Research Policy, which collects four times the citations of the second-best one (i.e., the Journal of Technology Transfer), the Journal of Business Venturing should be mentioned. This can probably be explained by the presence of some seminal articles regarding the topic among the journal's publications (e.g., Powers and McDougall, 2005; Shane, 2004; Vesper and Gartner, 1997; Walter *et al.*, 2006). This can be confirmed further by Table 6, in which a synthesis of the number of citations that the articles in the dataset have received, per journal, is provided according to different thresholds. It is interesting to notice that Research Policy is the only journal in which some articles have received more than 500 citations.

Furthermore, more than 250 citations have been received by articles published in the Journal of Technology Transfer, the Journal of Business Venturing, and Small Business Economics.

Table 5. The 20 most relevant journals ordered by the local number of publications (TP-BM).

#	Journal	TP*	TP-BM	% TP-BM	TC-BM	h-BM	PY_start	m-BM
1	J. Technol. Transf.	604	89	14.74%	2,743	24	2007	1.714
2	Res. Policy	3,146	59	1.88%	7,903	42	1998	1.826
3	Small Bus. Econ.	1,725	20	1.16%	856	15	2000	0.714
4	Technovation	1,974	18	0.91%	1,065	12	1994	0.444
5	Int. J. Technol. Manag.	2,091	17	0.81%	68	4	2003	0.222
6	Sci. Publ. Policy	782	15	1.92%	76	5	2013	0.625
7	J. Bus. Venturing	1,127	11	0.98%	1,481	11	1987	0.324
8	R&D Manag.	1,733	10	0.58%	617	10	1988	0.303
9	Technol. Forecast. Soc. Change	3,969	10	0.25%	162	6	2006	0.400
10	Entrep. Reg. Dev.	570	9	1.58%	210	6	2006	0.400
11	Technol. Anal. Strateg. Manag.	1,314	9	0.68%	165	7	2006	0.467
12	J. Manag. Dev.	312	8	2.56%	17	3	2014	0.429
13	Int. Entrep. Manag. J.	394	7	1.78%	31	3	2016	0.600
14	J. Int. Entrep.	95	7	7.37%	117	4	2010	0.364
15	Acad. Manag. Perspect.	527	6	1.14%	28	3	2016	0.600
16	Entrep. Theory Pract.	791	6	0.76%	81	6	2010	0.545
17	Int. J. Innov. Technol. Manag.	187	6	3.21%	426	5	2007	0.357
18	J. Enterp. Communities	90	6	6.67%	7	2	2015	0.333
19	Entrep. Res. J.	150	5	3.33%	19	3	2017	0.750
20	Ind. Corp. Change	865	5	0.58%	33	3	2014	0.429

*Total number of publications published by each journal at the time of the analysis that are retrievable in the WoS.

Source: Authors' own elaboration.

Table 6. The 20 most relevant journals ordered by different citation thresholds.

#	Journal	TP-BM	≤ 50	≤ 100	≤ 250	≤ 500	> 500
1	Res. Policy	59	19	10	19	7	4
2	J. Technol. Transf.	89	74	9	5	1	-
3	J. Bus. Venturing	11	5	2	3	1	-
4	Small Bus. Econ.	20	17	1	1	1	-
5	Technovation	18	9	6	3	-	-
6	R&D Manag.	10	7	-	3	-	-
7	Entrep. Theory Pract.	6	4	1	1	-	-
8	Entrep. Reg. Dev.	9	7	2	-	-	-
9	Technol. Forecast. Soc. Change	10	9	1	-	-	-
10	Int. J. Technol. Manag.	17	17	-	-	-	-
11	Sci. Publ. Policy	15	15	-	-	-	-
12	Technol. Anal. Strateg. Manag.	9	9	-	-	-	-
13	J. Manag. Dev.	8	8	-	-	-	-
14	Int. Entrep. Manag. J.	7	7	-	-	-	-
15	J. Int. Entrep.	7	7	-	-	-	-
16	Acad. Manag. Perspect.	6	6	-	-	-	-
17	Int. J. Innov. Technol. Manag.	17	4	-	-	-	-
18	J. Enterp. Communities	6	6	-	-	-	-
19	Entrep. Res. J.	5	5	-	-	-	-
20	Ind. Corp. Change	5	5	-	-	-	-

Source: Authors' own elaboration.

4.2 Science mapping

To complete the analysis of entrepreneurial university issues, in this section, the results of science mapping are provided, identifying the conceptual, intellectual, and social structures of the topic under investigation. Hence, it will be possible to answer the second research question of this study:

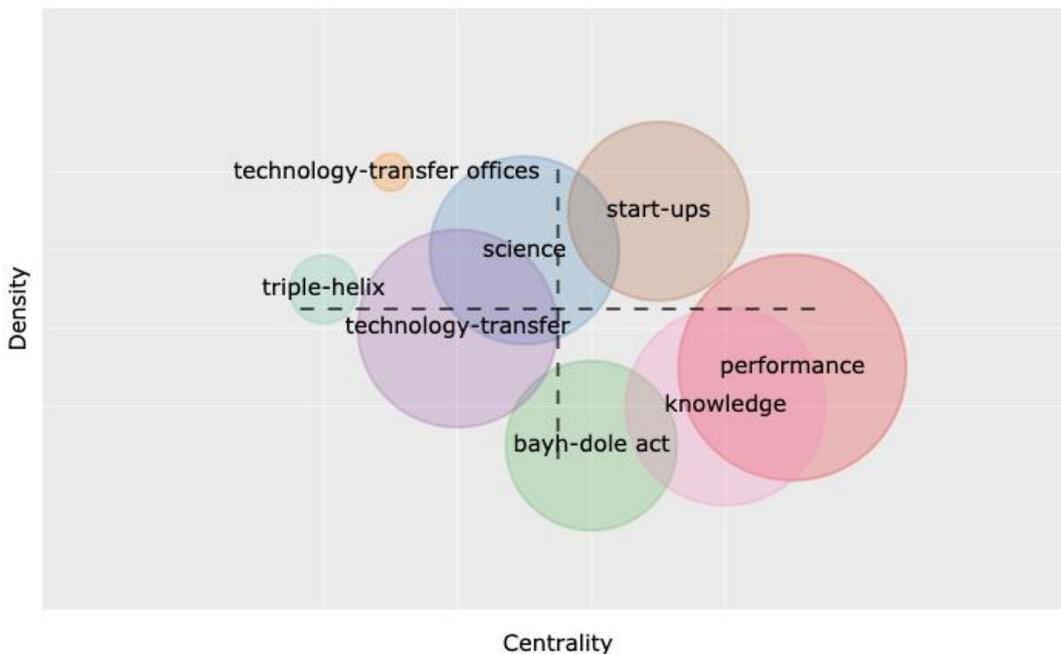
RQ2: What structures characterise the business and management literature about entrepreneurial universities?

the bigger is its bubble. Different colours define each cluster. In this case, three clusters can be distinguished:

- i) knowledge management and innovation (red bubbles);
- ii) performance management and economic growth (green bubbles);
- iii) technology transfer and knowledge commercialisation (blue bubbles).

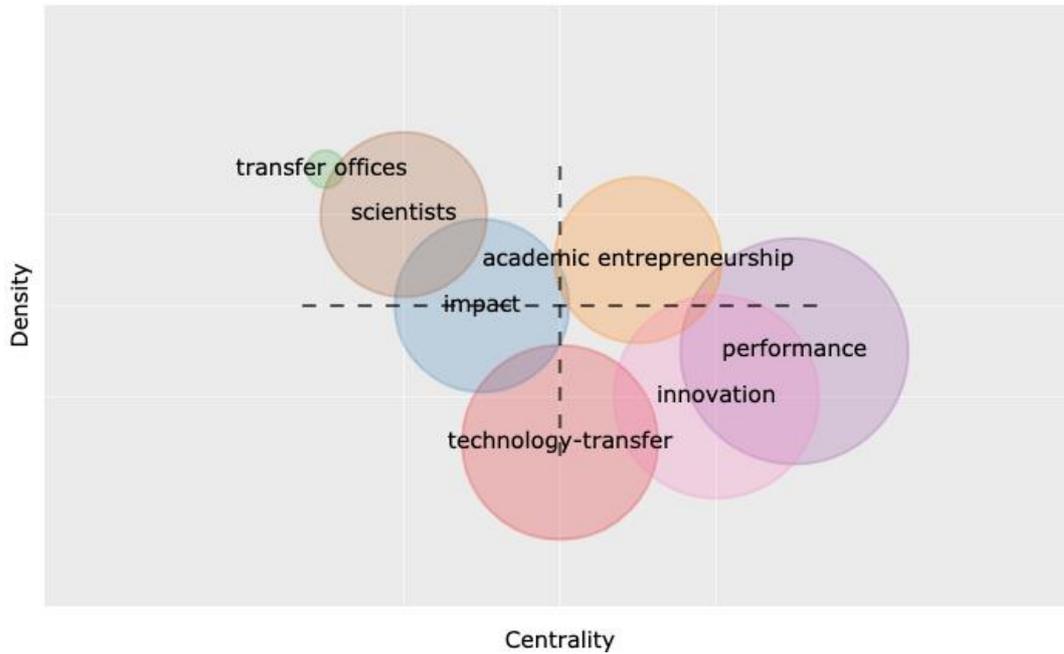
To provide more comprehensive information about the different sub-topics addressed by the authors over the years, a thematic evolution of the topic is also provided (Figures 5–7). Notably, the co-occurrence of 250 keywords plus was considered and 2 cut-off points were identified in 2009 and 2015, according to significant variations in production trends, as explained in Paragraph 4.1.1 (also see Figure 2).

Figure 5. Thematic evolution of the topic: first time slice (1983–2009).



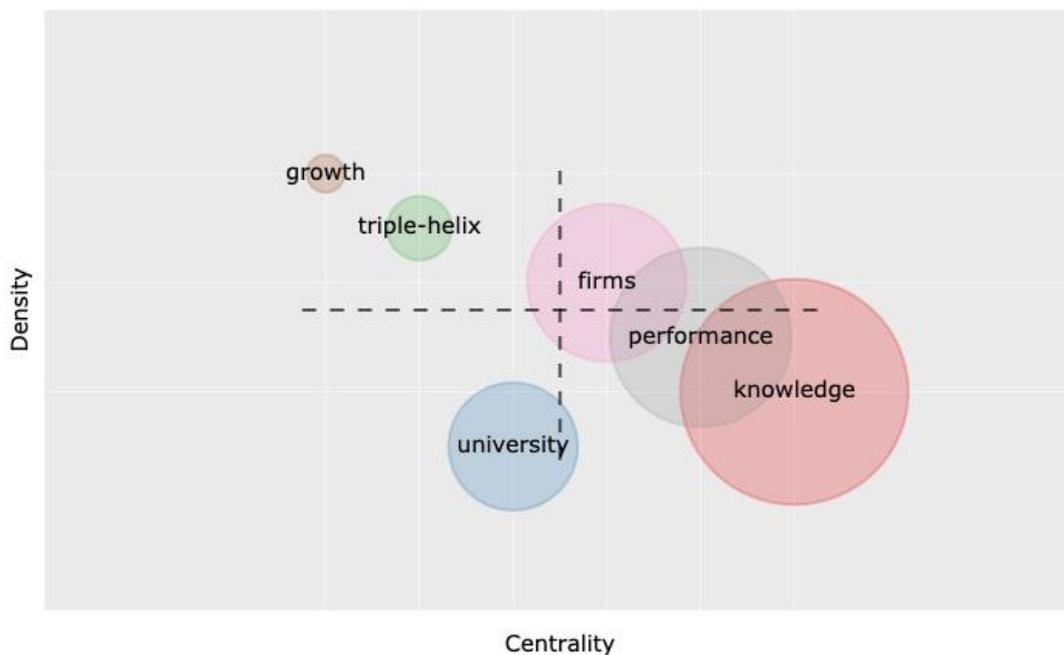
Source: Biblioshiny, based on the WoS dataset.

Figure 6. Thematic evolution of the topic, second time slice (2010–2014).



Source: Biblioshiny, based on the WoS dataset.

Figure 7. Thematic evolution of the topic: third time slice (2015–2018).



Source: Biblioshiny, based on the WoS dataset.

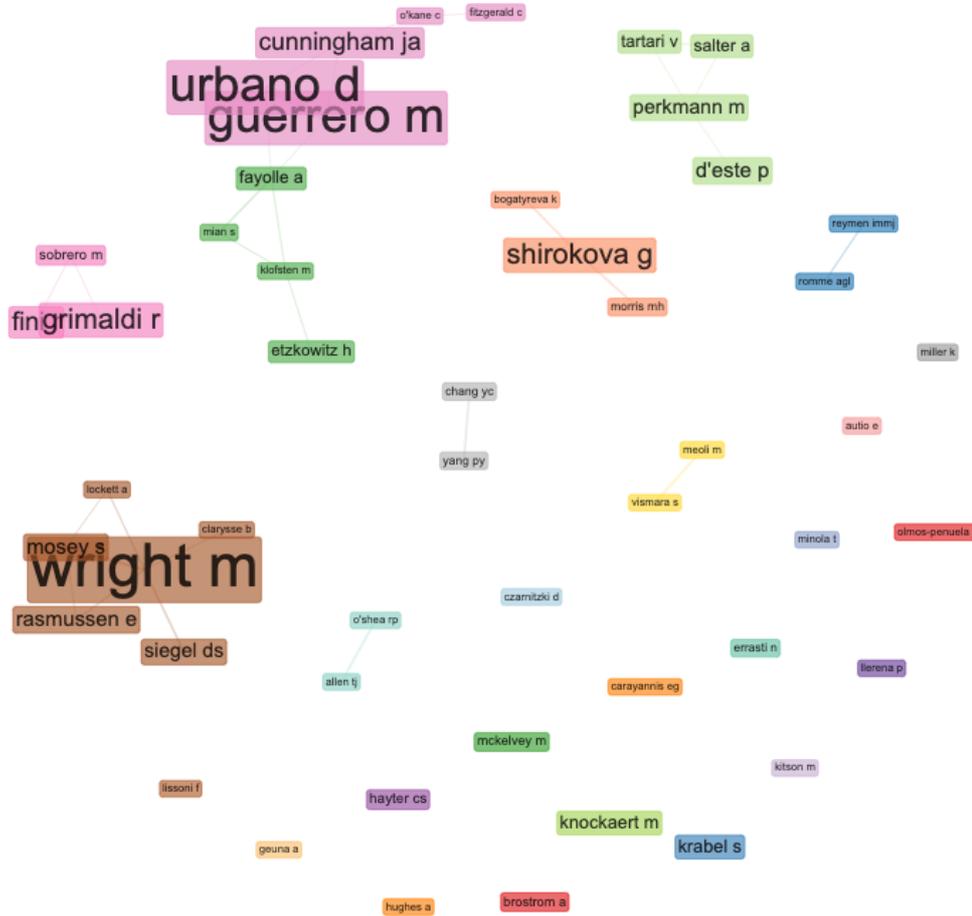
Thematic maps are very intuitive and enable researchers to analyse the evolution of topics in the four different quadrants (Cobo *et al.*, 2011), identified on the basis of their centrality (plotted on the X-axis) and density (plotted on the Y-axis). More precisely, the centrality measures the

level of inter-cluster interactions, namely the extent to which a topic is connected to other topics and, in turn, significant in a specific domain. On the other hand, the density measures the level of intra-cluster cohesion, specifically the extent to which the keywords in a given cluster are connected and thus a theme is developed. In this sense, the upper-right quadrant contains themes with high centrality and density: themes that are both able to influence the research field and well developed. The lower-right quadrant shows themes that are transversal for a discipline, being able to influence other topics (i.e., they have high centrality) but being weakly internally established (i.e., they have low density). The lower-left quadrant highlights topics that are emerging or disappearing since they have low centrality and density. Finally, the upper-left quadrant includes niche themes among scholars, which are internally well developed (high density) but not able to influence other themes (low centrality). It can therefore be observed that the keywords from the first two clusters (i.e., knowledge management and innovation and performance) have remained seminal and transversal during the three periods identified. Indeed, they are characterised by high centrality but low density, meaning that they are able to influence other themes but are not fully developed and present gaps for future research. Conversely, technology transfer has attracted increasing attention, becoming a core theme in the second time slice of publications analysed but leaving technology transfer offices to very focused ones.

4.2.2 Social and intellectual structure

Through the co-occurrence technique, it is possible to determine not only the conceptual structure of a specific field but also its social and intellectual structure. Thus, by analysing groups of co-authors (Peters and van Raan, 1991), the connection degree among business and management scholars studying entrepreneurial universities was determined. Similar to Figure 4, the more documents were authored by a scholar, the bigger is the node. The more documents were co-authored by scholars, the closer the bubbles appear and the thicker are the links connecting them. Interestingly, adopting the Louvain cluster algorithm again (Blondel *et al.*, 2008), Figure 8 shows that 10 clusters (each defined by a different colour) exist among the 50 most influential authors, while many of them still act as isolated nodes. However, this does not mean that those authors did not collaborate at all. Indeed, as observed in Paragraph 3.1.2, only 77 out of 511 publications were single authored.

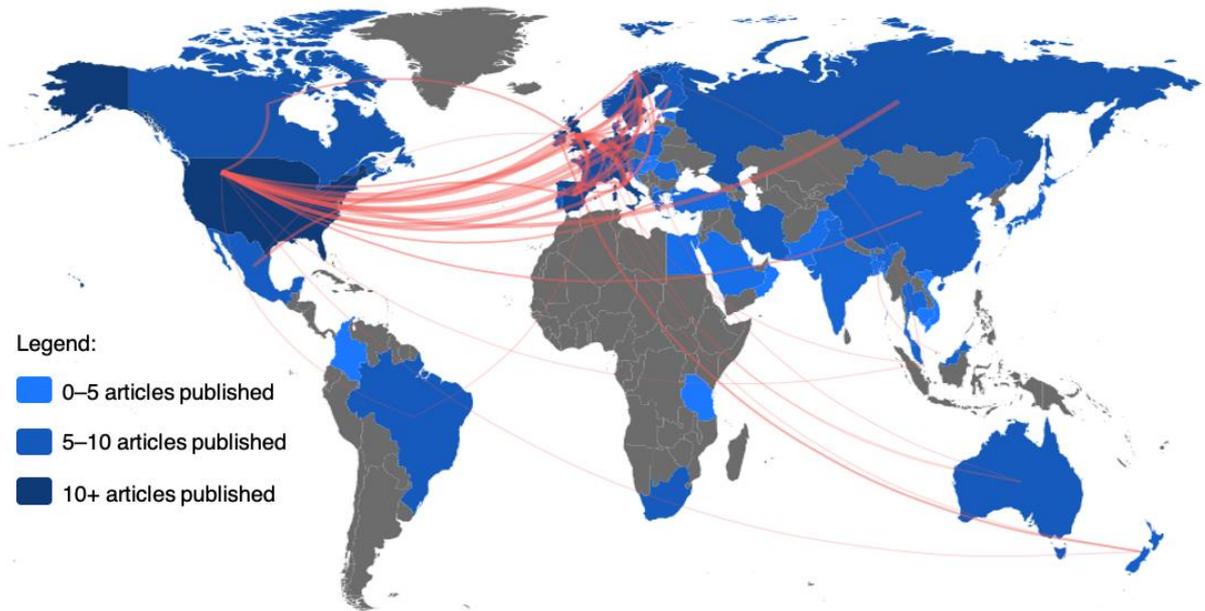
Figure 8. The social structure of the dataset.



Source: Biblioshiny, based on the WoS dataset.

Moreover, considering authors' affiliations, it can be noted that there is a high level of engagement between authors from advanced economies, such as European countries (e.g., Italy, Spain, Germany, and Sweden), the UK, and the USA. This collaboration rate is represented by more robust lines in Figure 9, while the darker the country is, the more productive it was. However, there is still a paucity of engagement from authors from developing or emerging countries. This suggests that investigating entrepreneurial universities in such contexts represents a topic that authors should consider for further research.

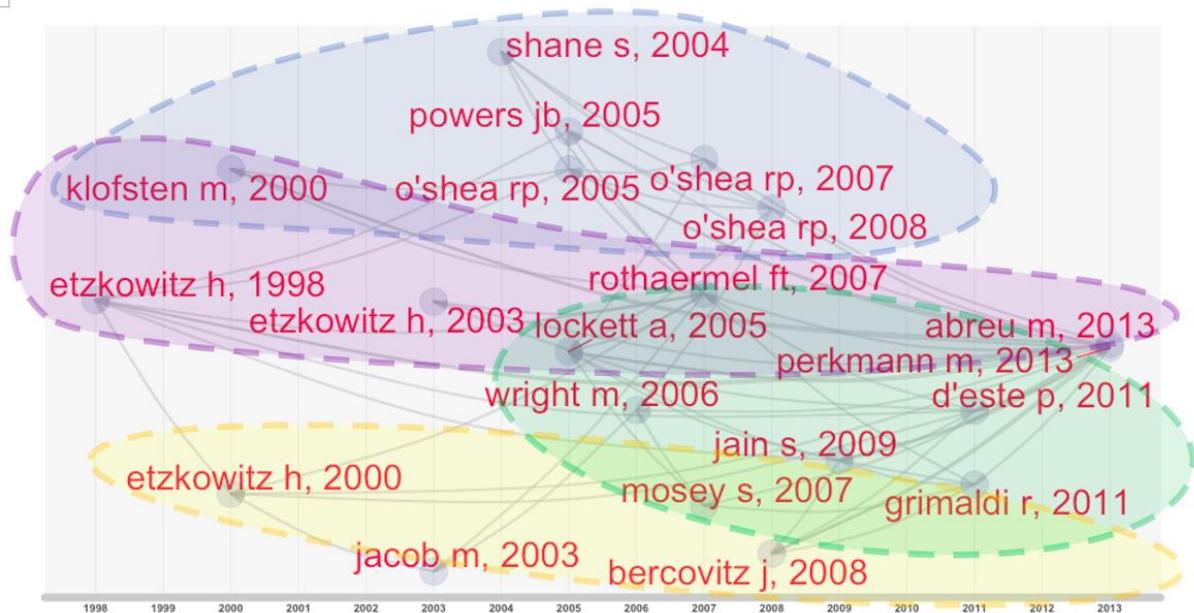
Figure 9. The rate of collaboration between countries based on authors' affiliations.



Source: Biblioshiny, based on the WoS dataset.

Finally, to reconstruct the intellectual structure of publications related to entrepreneurial universities, a historiograph was developed and is presented in Figure 10 (Garfield, 2004). To achieve this, the number of times that articles have been cited together by other documents present in the dataset (i.e., co-citation analysis) was considered as a unit of analysis and the historical network map of the most relevant publications could be reconstructed. On this map, documents that are close to each other addressed similar topics. Thus, four thematic clusters could be identified as follows: (i) conceptualisations of the entrepreneurial university model (purple group), (ii) technology transfer and university–industry collaborations (blue group), (iii) academic entrepreneurship and research commercialisation (green group), and (iv) organisational changes and knowledge dynamics (yellow group). However, it must be noted that these clusters are not perfectly distinguishable and partially overlap with each other but support the thematic analysis conducted through keywords' co-occurrences. Moreover, no recent articles appear in the group of the most influential in the definition of the intellectual structure of this research field since the most recent one was published in 2013. However, a more comprehensive picture of the evolution of this research field will be provided in the next paragraph.

Figure 10. The historic evolution of co-citations among the 20 most relevant articles.



Source: Biblioshiny, based on the WoS dataset.

5. Content analysis

This section provides the results of a content analysis of the 10 most influential articles in each of the time slices identified in Paragraph 4.1.1 and Paragraph 4.2.1. The most influential articles were selected based on the total citations received at the moment of the study. Consistently with other bibliometric studies (e.g., Martínez-Climent *et al.*, 2018), this analysis was performed to provide a more comprehensive picture of the different themes addressed by scholars over the years and to identify avenues for future studies. The results were divided into three sections that represent the different turning points of studies addressing entrepreneurial universities.

5.1 Time slice 1: 1983–2009

The articles in this first time slice were mainly devoted to conceptualising an entrepreneurial university as the logical step of universities reaching beyond their traditional mandate of teaching and researching (Rothaermel *et al.*, 2007). Etzkowitz (1998) introduced the concept of the “second academic revolution” to capture the emerging phenomenon of universities involved in economic and societal development. Indeed, recognising the crucial role played by knowledge in modern societies, companies no longer see universities as providers of human capital more than knowledge. Thus, the interconnections between academics and practitioners

become stricter, leading to the conceptualisation of the triple-helix model in which universities, industries, and government collaborate (Etzkowitz *et al.*, 2000). Hence, with an isomorphic development path all over the world, universities incorporate industrial research goals and work practices into their business models, capitalising the outputs of this form of applied research and fostering technological innovation through reciprocal knowledge flows (Etzkowitz, 1998; Etzkowitz *et al.*, 2000). In this scenario, innovation is interactive rather than linear and knowledge sharing increases according to companies' technological requirements (Etzkowitz, 2003c). Governments partially leave their regulatory role to act increasingly as public entrepreneurs and venture capitalists. These changes lead to improved results in terms of research performance (e.g., productivity or collaboration among scholars) (Gulbrandsen and Smeby, 2005) and higher network capabilities, and thus competitiveness, of academic spin-offs (Walter *et al.*, 2006).

Hence, the propensity to invest in technology transfer activities has antecedents not only in the action of policy makers but also in the internal resources of each institution. Following this idea, the resource-based view (RBV) or the knowledge-based view (KBV) has been adopted by different authors to explain the success of diverse universities' initiatives (O'Shea *et al.*, 2005; Powers and McDougall, 2005). Moreover, Bercovitz and Feldman (2008) found that the intention of scholars to engage in technology transfer activities is linked with their localised social learning environment and with previous entrepreneurship training at the institution, even if only for symbolic reasons.

However, in recent years, most of the authors concentrated more on investigating technology transfer activities. In fact, they are easier to observe and quantify, especially regarding their economic returns. A rare example of the application of a broader perspective, besides the taxonomy of the literature performed by Rothaermel *et al.* (2007), is the study by Klofsten and Jones-Evans (2000). The authors distinguished between formal and informal academic entrepreneurial activities. The former study was connected to technological aspects (e.g., patenting, licensing, and spin-off venture creation), while the latter study was related to public engagement initiatives or sponsored activities (e.g., public lectures, sponsored research, and consulting). Starting from this point, they concluded that universities play an active role in converting scientific knowledge into technological innovation and generating economic returns. Hence, they helped European economies, which have traditionally struggled in this, to convert research into industrial and commercial successes.

5.2 Time slice 2: 2010–2014

With the increasing institutionalisation of the third mission in the business model of universities, several articles speculated on the different heterogeneous activities that an entrepreneurial university can conduct. According to Audretsch (2014), economies are no longer driven by physical capital or knowledge but by entrepreneurship. Hence, universities have a crucial role in providing entrepreneurial capital that can contribute to advancing the society. Therefore, the approach became more comprehensive than the one adopted in the articles in the previous group and mainly focused on technology transfer. However, several articles, using a critical lens, investigated the effects of the transition towards the entrepreneurial university and its relationship with basic research (D'Este and Perkmann, 2010; Van Looy *et al.*, 2011).

Given the above, the most influential article in this group was published by Perkmann *et al.* (2013), who investigated the engagement of academics in entrepreneurial and knowledge commercialisation activities through a literature review. The authors concluded that investing in formal technology transfer activities (e.g., patenting and licensing) is less effective in academic engagement, which is not always beneficial as well. Indeed, it can result in detrimental results for the other traditional academic missions. As a consequence, academic engagement should be incentivised when it can lead to improvements in the research activity. D'Este and Perkmann (2010) reached a similar conclusion, stating that the primary intent of patenting and spin-off creation is commercial, while research motivations are linked to joint research, sponsored research, and consulting. Conversely, Van Looy *et al.* (2011) found a positive relationship between entrepreneurial effectiveness and scientific productivity.

Following 30 years of the Bayh–Dole Act in the US, authors also started paying attention to the European context, in which similar shifts were occurring (Grimaldi *et al.*, 2011). They asserted that European policy makers should adopt a more harmonic push towards entrepreneurship, involving regional stakeholders and not adopting a one-size-fits-all model (Grimaldi *et al.*, 2011). Indeed, not considering institutional and geographic factors could hinder advancements in this transition (Philpott *et al.*, 2011).

Shifting to an individual perspective, on which there has been a call for more research (Bozeman *et al.*, 2013), according to Guerrero and Urbano (2012), the uniqueness of each community can explain the above-mentioned difference. Consequently, the critical factor for successfully implementing an entrepreneurial shift is the attitude towards entrepreneurship of

academics and students. Thus, factors such as entrepreneurship education, teaching methodologies, role models, and reward systems become critical. An analysis on the individual level was also conducted by Clarysse *et al.* (2011), who found a positive relationship between spin-offs' performance and academics' capacity to identify and exploit opportunities. Lam (2011) proposed a structured framework that links academics' value orientations with commercial engagement. In her study, the author leveraged the self-determination theory to speculate that scholars who are more interested in reputational or career rewards will use commercial activities to obtain resources to support their scientific interests, being extrinsically motivated. Differently, applied research will be used to achieve autonomy and economic returns by scholars who are intrinsically motivated towards commercial engagement. Thus, policy makers should leverage reputational returns and intrinsic motivations rather than economic ones.

5.3 Time slice 3: 2015–2019

In the last time slice, several articles recognised that academic entrepreneurship has changed dramatically. Entrepreneurial activities need to become an integral part of universities' strategy (Guerrero *et al.*, 2016b; Rasmussen and Wright, 2015). For example, using technology transfer offices from the US, New Zealand, and Ireland as a unit of analysis, O'Kane *et al.* (2015) showed that the dichotomic existence of a commercial and a scientific sphere results in diminished legitimacy and competitiveness. Thus, strategies aimed at clearly defining an identity need to be incorporated as much in a technology transfer office as in a university. Building a strong identity is critical for the acquisition of resources and the success of the organisation. This identity must be shaped according to different audiences and expectations (Fisher *et al.*, 2016). Moreover, a strong entrepreneurial orientation of a university's department leads to a stronger orientation towards entrepreneurial activities of academics, with technology and knowledge transfer perceived as being less harmful (Kalar and Antoncic, 2015).

Furthermore, several stakeholders different from students and scholars are affected by entrepreneurial universities, which are critical drivers of the development of a given territory (Siegel and Wright, 2015). In this sense, entrepreneurial universities can be viewed as spillovers of knowledge and entrepreneurial capital that contribute to economic and social development (Guerrero *et al.*, 2015). In this novel scenario, such universities should contribute to generating both knowledge and leadership for the development of entrepreneurial thinking, actions, and

institutions (Guerrero *et al.*, 2016a). According to Shirokova *et al.* (2016), entrepreneurship education is one of the critical factors that can nurture the entrepreneurial intentions of individuals, together with other personal and institutional factors. In the Taiwanese context, the presence of human capital was demonstrated to be a critical factor for the success of technology transfer activities (e.g., the creation of start-ups and patenting) and other “informal” entrepreneurial activities (e.g., collaborative or sponsored research, consulting, and entrepreneurship education) (Hsu *et al.*, 2015). Moreover, a fundamental role is played by financial resources that can be used to enhance direct technology transfer activities (e.g., the university’s intellectual property) or the network capabilities of the university and its members. For these reasons, implementing policies that enhance innovative or entrepreneurship initiatives would result in benefits that can be spread widely over the region (Guerrero *et al.*, 2016a). Moreover, homogeneous performance management systems should be implemented and legitimised, like some initiatives implemented in the US and the UK (Guerrero *et al.*, 2016b). Indeed, such implementation would lead scholars to invest more time and effort in performing entrepreneurial activities.

6. Implications for research: avenues for future studies

Based on the results of the bibliometric and content analysis, in this paragraph, the implications for research will be provided. It was possible to answer the third research question of this study:

RQ3. What are the possible future trends for the research on entrepreneurial universities within the business and management research fields?

6.1 The need for systematisation works

It has been observed that 966 authors addressed the entrepreneurial university topic in the business and management fields within a time span of more than 30 years (with the first publication being released in 1983). Although the topic has boomed in recent years, spurred by different special issues and calls for papers, publications are still fragmented. This justifies the need for systematisation works such as the one proposed in this paper, and more of them should be encouraged in the future (Secundo *et al.*, 2019; Siegel and Wright, 2015).

6.2 Scholars' engagement

According to the results of the social network analysis, only 10 clusters of co-authors could be identified among the most influential scholars, meaning that they mostly represent elective circles. However, single-authored publications (92 records) account for around 18% of the total records in the dataset. This implies that the topic presents low barriers to entry and a few specialised authors have addressed it (Massaro *et al.*, 2016). Thus, these results should encourage more scholars to consider contributing to the present debate.

6.3 Journals and thematic specialisation

Regarding journals, great attention was paid to the topic of entrepreneurial universities by journals focused on technology-related issues. This explains why considerable attention has been devoted to the technology and knowledge transfer aspects, such as those linked to knowledge exploitation and its related activities (e.g., spin-off creation, patenting, research commercialisation, and new technology development). This means that authors have no significant communities to refer to and the debate has remained slightly focused on several themes related to the topic. Hence, journals can be encouraged to consider thematic specialisation on the topic, which can represent a proper source for acquiring high relevance since many of them ranked among the most influential ones with a relatively low number of publications.

Considering the clusters that emerged from the analysis of the conceptual structure and content analysis of the most influential papers in each time slice, the following examples can be considered:

- Cluster 1: performance management and economic growth. What relationships exist between governance models and performance dimensions? How can stakeholders be involved in model performance management systems and improve their performance? How can universities' outcomes be monitored to foster the generation of public value?
- Cluster 2: knowledge management and innovation. How is digital transformation shaping knowledge flows between universities and other relevant stakeholders? How can entrepreneurship education be leveraged through knowledge management practices? What are the theoretical foundations and empirical evidence that demonstrate the role of entrepreneurial universities as promoters of innovation?

- Cluster 3: technology transfer and knowledge commercialisation. This is the most investigated cluster, but different questions should be addressed further. For example, what are the motivations that foster academics to act like entrepreneurs? What are the organisational implications of universities dealing with entrepreneurial activities? How is digital transformation affecting knowledge transfer and technology transfer activities?

6.4 Geography

Not only most of the articles addressing entrepreneurial universities were published in technology-related or different non-focused journals, but they also received no such relevant average citations ($AC_Y = 37.51$). In line with Nomaler *et al.* (2013), this can be attributed to relatively low levels of international collaborations between scholars. In Table 2, it was demonstrated that the most productive countries are not always the most open in terms of inter-country collaboration between scholars. Moreover, according to the world collaboration map, it could be noted that there is still low engagement of scholars from developing and emerging countries. Therefore, collecting more empirical evidence from such countries would be highly relevant to advancing the knowledge about the development of entrepreneurial universities and their impact on local growth.

Moreover, entrepreneurial universities play a potentially important role in modern economies, acting as focal actors of entrepreneurial ecosystems (De Bernardi *et al.*, 2020; Scuotto *et al.*, 2019). An important issue that needs further study concerns whether and how this momentum is sustained as well as stakeholders' engagement in promoting economic advancements (Klofsten and Jones-Evans, 2000; Trencher *et al.*, 2014). Furthermore, universities' impact on societies and local growth should be taken into consideration since it has been shown to be an emerging topic with great potentialities (Rinaldi *et al.*, 2018; Trencher *et al.*, 2017).

7. Conclusion, limitations, and further developments

In conclusion, this study has offered an overview of the business and management literature addressing entrepreneurial universities. Several bibliometric analysis techniques were adopted to evaluate the scientific production's performances and map its related conceptual, social, and intellectual structures. Performance analysis was conducted using different bibliometric indicators to capture the productivity ratio (e.g., total publication) and relevance (e.g., total citations, citations per year, h-index, and m-index) of authors, journals, and countries.

Answering RQ1, it was shown that the topic has attracted increasing attention from scholars but remains fragmented. Moreover, some scholars are very influential in the topic, even with a low number of published papers. In this sense, future studies and systematisation works should be encouraged. Moreover, except for technology-related journals, journals do not excel in terms of productivity, so thematic specialisation could be a strategic choice. Science mapping complemented the results of the performance analysis through the co-occurrence of keywords, co-authorship analysis, thematic mapping, and historical co-citation analysis of relevant documents within the field under investigation. These analyses were conducted using Bibliometrix, an RStudio package (Aria & Cuccurullo, 2017), and enabled the conceptual, social, and intellectual structures of the research field to be presented, answering RQ2. With particular regard to the conceptual structure, through the analysis of keywords' co-occurrences, three different thematic clusters were identified as follows: (i) knowledge management and innovation; (ii) performance management and economic growth; and (iii) technology transfer and knowledge commercialisation. Finally, the bibliometric analysis was complemented with a content analysis of the most influential articles and avenues for future research were traced in response to RQ3.

The present study can help both scholars and practitioners who are approaching this topic and want to have a comprehensive overview of the scientific literature produced so far. Moreover, scholars can leverage the results of this study to address future studies better, considering the proposed avenues for future research. At the same time, policy makers and practitioners could find a useful baseline to foster the development of an entrepreneurial university and consider its technological, managerial, and organisational implications.

However, this study is not free from limitations. First, the dataset was collected through the WoS to obtain higher-quality results. However, this limited the number of analysable publications. In addition, some exclusion criteria were imposed to improve the performance analysis (i.e., publication year, document type, language, and research fields). Second, as stated in the Methodology section, some indicators can lead to inconsistencies when used to compare different publications or authors. Hence, each indicator should be read together with the other ones, for example in the case of the h-index. Finally, to provide better comparability and align with the research questions of this study, only the business and management fields were chosen as a unit of analysis. Each of those limitations thereby provides opportunities for future work

for academics and practitioners who are interested in the advancement of such encouraging future research streams.

Reference list

- Addor, N., Melsen, L.A., (2019). Legacy, rather than adequacy, drives the selection of hydrological models. *Water Resour. Res.* 55(1), 378–390. <https://doi.org/10.1029/2018WR022958>.
- Ardito, L., Ferraris, A., Petruzzelli, A.M., Bresciani, S., Del Giudice, M., (2019). The role of universities in the knowledge management of smart city projects. *Technol. Forecast. Soc. Change* 142, 312–321. <https://doi.org/10.1016/j.techfore.2018.07.030>.
- Aria, M., Cuccurullo, C., (2017). bibliometrix: an R-tool for comprehensive science mapping analysis. *J. Informetr.* 11(4), 959–975. <https://doi.org/10.1016/j.joi.2017.08.007>.
- Audretsch, D.B., (2014). From the entrepreneurial university to the university for the entrepreneurial society. *J. Technol. Transf.* 39, 313–321. <https://doi.org/10.1007/s10961-012-9288-1>.
- Baima, G., Forliano, C., Santoro, G., Vrontis, D., (2020). Intellectual capital and business model: a systematic literature review to explore their linkages. *J. Intellect. Cap.* 22(3), 653–679. <https://doi.org/10.1108/JIC-02-2020-0055>.
- Bercovitz, J., Feldman, M., (2008). Academic entrepreneurs: organizational change at the individual level. *Organ. Sci.* 19(1), 69–89. <https://doi.org/10.1287/orsc.1070.0295>.
- Blondel, V.D., Guillaume, J.L., Lambiotte, R., Lefebvre, E., (2008). Fast unfolding of communities in large networks. *J. Stat. Mech. Theory Exp.* 10, P10008. <https://doi.org/10.1088/1742-5468/2008/10/P10008>.
- Borner, K., Chen, C., Boyack, K.W., (2003). Visualizing knowledge domains. *Annu. Rev. Inf. Sci. Technol.* 37(1), 179–255. <https://doi.org/10.1002/aris.1440370106>.
- Boyack, K.W., Klavans, R., (2010). Co-citation analysis, bibliographic coupling, and direct citation: which citation approach represents the research front most accurately? *J. Am. Soc. Inf. Sci. Technol.* 61(12), 2389–2404. <https://doi.org/10.1002/asi.21419>.
- Bozeman, B., Fay, D., Slade, C.P., (2013). Research collaboration in universities and academic entrepreneurship: the-state-of-the-art. *J. Technol. Transf.* 38, 1–67. <https://doi.org/10.1007/s10961-012-9281-8>.
- Bramwell, A., Wolfe, D.A., (2008). Universities and regional economic development: the entrepreneurial University of Waterloo. *Res. Policy* 37(8), 1175–1187. <https://doi.org/10.1016/j.respol.2008.04.016>.
- Broadus, R.N., (1987). Toward a definition of “bibliometrics. *Scientometrics* 12, 373–379. <https://doi.org/10.1007/BF02016680>.

- Callon, M., Courtial, J.P., Turner, W.A., Bauin, S., (1983). From translations to problematic networks: an introduction to co-word analysis. *Soc. Sci. Inf.* 22(2), 191–235. <https://doi.org/10.1177/053901883022002003>.
- Cappellesso, G., Thomé, K.M., (2019). Technological innovation in food supply chains: systematic literature review. *Br. Food J.* 121(10), 2413–2428. <https://doi.org/10.1108/BFJ-03-2019-0160>.
- Carvalho, M.M., Fleury, A., Lopes, A.P., (2013). An overview of the literature on technology roadmapping (TRM): contributions and trends. *Technol. Forecast. Soc. Change* 80(7), 1418–1437. <https://doi.org/10.1016/j.techfore.2012.11.008>.
- Clark, B.R., (1998). The entrepreneurial university: demand and response. *Tert. Educ. Manag.* 4(1), 5–16. <https://doi.org/10.1080/13583883.1998.9966941>.
- Clarysse, B., Tartari, V., Salter, A., (2011). The impact of entrepreneurial capacity, experience and organizational support on academic entrepreneurship. *Res. Policy* 40(8), 1084–1093. <https://doi.org/10.1016/j.respol.2011.05.010>.
- Cobo, M.J., Lopez-Herrera, A.G., Herrera-Viedma, E., Herrera, F., (2011). An approach for detecting, quantifying, and visualizing the evolution of a research field: a practical application to the fuzzy sets theory field. *J. Informetr.* 5(1), 146–166. <https://doi.org/10.1016/j.joi.2010.10.002>.
- Cobo, M.J., Lopez-Herrera, A.G., Herrera-Viedma, E., Herrera, F., (2012). SciMAT: a new science mapping analysis software tool. *J. Am. Soc. Inf. Sci. Technol.* 63(8), 1609–1630. <https://doi.org/10.1002/asi.22688>.
- Cooke, P., (2005). Regionally asymmetric knowledge capabilities and open innovation: exploring “Globalisation 2” – A new model of industry organisation. *Res. Policy* 34(8), 1128–1149. <https://doi.org/10.1016/j.respol.2004.12.005>.
- Cosenz, F., (2014). A dynamic viewpoint to design performance management systems in academic institutions: theory and practice. *Int. J. Publ. Admin.* 37(13), 955–969. <https://doi.org/10.1080/01900692.2014.952824>.
- Cuccurullo, C., Aria, M., Sarto, F., (2016). Foundations and trends in performance management. A twenty-five years bibliometric analysis in business and public administration domains. *Scientometrics* 108, 595–611. <https://doi.org/10.1007/s11192-016-1948-8>.
- Dada, O., (2018). A model of entrepreneurial autonomy in franchised outlets: a systematic review of the empirical evidence. *Int. J. Manag. Rev.* 20(2), 206–226. <https://doi.org/10.1111/ijmr.12123>.
- Daim, T.U., Rueda, G., Martin, H., Gerdtsri, P., (2006). Forecasting emerging technologies: use of bibliometrics and patent analysis. *Technol. Forecast. Soc. Change* 73(8), 981–1012. <https://doi.org/10.1016/j.techfore.2006.04.004>.

- De Bernardi, P., Azucar, D., Forliano, C., Bertello, A., (2020). *Innovation and entrepreneurial ecosystems: structure, boundaries, and dynamics*. In: De Bernardi, P., Azucar, D. (Eds.), *Innovation in Food Ecosystems*. Springer, Cham, pp. 73–104.
- D’Este, P., Perkmann, M., (2010). Why do academics engage with industry? The entrepreneurial university and individual motivations. *J. Technol. Transf.* 36, 316–339. <https://doi.org/10.1007/s10961-010-9153-z>.
- Didier, A.C., (2010). *The European Institute of Innovation and Technology (EIT): a new way for promoting innovation in Europe?* Bruges Political Research Papers No 13. Retrieved from. http://aei.pitt.edu/14449/1/wp13_Didier.pdf.
- E3M, (2010). *Needs and Constraints Analysis of the Three Dimensions of Third Mission Activities. E3M: European Indicators and Ranking Methodology For University Third Mission*. European Commission, Brussels, Belgium. Retrieved from. www.e3mproject.eu/docs/Three-dim-third-mission-act.pdf.
- Etzkowitz, H., (1983). Entrepreneurial scientists and entrepreneurial universities in American academic science, *Minerva* 21, 198–233. <https://doi.org/10.1007/BF01097964>.
- Etzkowitz, H., (1998). The norms of entrepreneurial science: cognitive effects of the new university–industry linkages. *Res. Policy* 27(8), 823–833. [https://doi.org/10.1016/S0048-7333\(98\)00093-6](https://doi.org/10.1016/S0048-7333(98)00093-6).
- Etzkowitz, H., (2001). The second academic revolution and the rise of entrepreneurial science. *IEEE Technol. Soc. Mag.* 20(2), 18–29. <https://doi.org/10.1109/44.948843>.
- Etzkowitz, H., (2003a). Innovation in innovation: the triple helix of university–industry–government relations. *Soc. Sci. Inf.* 42(3), 293–337. <https://doi.org/10.1177/05390184030423002>.
- Etzkowitz, H., (2003b). Research groups as “quasi-firms”: the invention of the entrepreneurial university. *Res. Policy* 32(1), 109–121. [https://doi.org/10.1016/S0048-7333\(02\)00009-4](https://doi.org/10.1016/S0048-7333(02)00009-4).
- Etzkowitz, H., (2003c). The European entrepreneurial university: an alternative to the US model. *Ind. High. Educ.* 17(5), 325–335. <https://doi.org/10.5367/000000003773007256>.
- Etzkowitz, H., (2004). The evolution of the entrepreneurial university. *Int. J. Technol. Glob. I*(1), 64–77. <https://doi.org/10.1504/IJTG.2004.004551>.
- Etzkowitz, H., (2017). Innovation lodestar: the entrepreneurial university in a stellar knowledge firmament. *Technol. Forecast. Soc. Change* 123, 122–129. <https://doi.org/10.1016/j.techfore.2016.04.026>.
- Etzkowitz, H., Webster, A., Gebhardt, C., Terra, B.R.C., (2000). The future of the university and the university of the future: evolution of Ivory tower to entrepreneurial paradigm. *Res. Policy* 29(2), 313–330. [https://doi.org/10.1016/S0048-7333\(99\)00069-4](https://doi.org/10.1016/S0048-7333(99)00069-4).

- European Commission, (2008). *Entrepreneurship in Higher Education, Especially within Non-Business Studies: Final Report of the Expert Group*. European Commission Directorate-General for Enterprise and Industry, Brussels, Belgium. Retrieved from. <https://ec.europa.eu/docsroom/documents/2214/attachments/1/translations/en/renditions/native>.
- Fayolle, A., Redford, D.T., (2014). *Handbook On the Entrepreneurial University*. Edward Elgar Publishing, Cheltenham, UK. <https://doi.org/10.4337/9781781007020>.
- Fisher, G., Kotha, S., Lahiri, A., (2016). Changing with the times: an integrated view of identity, legitimacy, and new venture life cycles, *Acad. Manag. Rev.* 41(3), 383–409. <https://doi.org/10.5465/amr.2013.0496>.
- Garfield, E., (2004). Historiographic mapping of knowledge domains literature. *J. Inf. Sci.* 30(2), 119–145. <https://doi.org/10.1177/0165551504042802>.
- Gaviria-Marin, M., Merigó, J.M., Baier-Fuentes, H., (2019). Knowledge management: a global examination based on bibliometric analysis. *Technol. Forecast. Soc. Change* 140, 194–220. <https://doi.org/10.1016/j.techfore.2018.07.006>.
- Grimaldi, R., Kenney, M., Siegel, D.S., Wright, M., (2011). 30 years after Bayh–Dole: reassessing academic entrepreneurship. *Res. Policy* 40(8), 1045–1057. <https://doi.org/10.1016/j.respol.2011.04.005>.
- Guerrero, M., Cunningham, J.A., Urbano, D., (2015). Economic impact of entrepreneurial universities' activities: an exploratory study of the United Kingdom. *Res. Policy* 44(3), 748–764. <https://doi.org/10.1016/j.respol.2014.10.008>.
- Guerrero, M., Urbano, D., (2012). The development of an entrepreneurial university. *J. Technol. Transf.* 37, 43–74. <https://doi.org/10.1007/s10961-010-9171-x>.
- Guerrero, M., Urbano, D., Fayolle, A., (2016a). Entrepreneurial activity and regional competitiveness: evidence from European entrepreneurial universities. *J. Technol. Transf.* 41, 105–131. <https://doi.org/10.1007/s10961-014-9377-4>.
- Guerrero, M., Urbano, D., Fayolle, A., Klofsten, M., Mian, S., (2016b). Entrepreneurial universities: emerging models in the new social and economic landscape. *Small Bus. Econ.* 47, 551–563. <https://doi.org/10.1007/s11187-016-9755-4>.
- Gulbrandsen, M., Smeby, J.C., (2005). Industry funding and university professors' research performance. *Res. Policy* 34(6), 932–950. <https://doi.org/10.1016/j.respol.2005.05.004>.
- Hayes, D., (2017). *Beyond the McDonaldization of higher education*. In: Hayes, D. (Ed.), *Beyond the McDonaldization of Higher education: Visions of Higher Education*. Routledge, London, pp. 1–18. <https://doi.org/10.4324/9781315270654-1>.
- Hirsch, J.E., (2005). *An index to quantify an individual's scientific research output*. In: *Proceedings of the National Academy of Sciences of the U.S.A*, 103, pp. 16569–16572. <https://doi.org/10.1073/pnas.0507655102>.

- Hirsch, J.E., (2007). *Does the h index have predictive power?*. In: Proceedings of the National Academy of Sciences of the U.S.A, 104, pp. 19193–19198. <https://doi.org/10.1073/pnas.0707962104>.
- Hsu, D.W., Shen, Y.C., Yuan, B.J., Chou, C.J., (2015). Toward successful commercialization of university technology: performance drivers of university technology transfer in Taiwan. *Technol. Forecast. Soc. Change* 92, 25–39. <https://doi.org/10.1016/j.techfore.2014.11.002>.
- Kalar, B., Antoncic, B., B., (2015). The entrepreneurial university, academic activities and technology and knowledge transfer in four European countries. *Technovation* 36-37, 1–11. <https://doi.org/10.1016/j.technovation.2014.11.002>.
- Kelly, C.D., Jennions, M.D., (2006). The h index and career assessment by numbers. *Trends Ecol. Evol* 21(4), 167–170. <https://doi.org/10.1016/j.tree.2006.01.005>.
- Kirby, D.A., (2002). *Entrepreneurship*. McGraw-Hill Education, Maidenhead.
- Kirby, D.A., (2006). Creating entrepreneurial universities in the UK: applying entrepreneurship theory to practice. *J. Technol. Transf.* 31, 599–603. <https://doi.org/10.1007/s10961-006-9061-4>.
- Klofsten, M., Jones-Evans, D., (2000). Comparing academic entrepreneurship in Europe – the case of Sweden and Ireland. *Small Bus. Econ.* 14, 299–309. <https://doi.org/10.1023/A:1008184601282>.
- Lam, A., (2011). What motivates academic scientists to engage in research commercialization: “gold”, “ribbon” or “puzzle”? *Res. Policy* 40(10), 1354–1368. <https://doi.org/10.1023/A:1008184601282>.
- Leydesdorff, L., Etzkowitz, H., (2001). The transformation of university–industry–government relations, *Electron. J. Sociol.* 5(4), 338–344.
- Linnenluecke, M.K., Marrone, M., Singh, A.K., (2019). Conducting systematic literature reviews and bibliometric analyses. *Aust. J. Manag.* 45(2), 175–194. <https://doi.org/10.1177/0312896219877678>.
- Martinelli, A., Meyer, M., Tunzelmann, N., (2008). Becoming an entrepreneurial university? A case study of knowledge exchange relationships and faculty attitudes in a medium-sized, research-oriented university. *J. Technol. Transf.* 33, 259–283. <https://doi.org/10.1007/s10961-007-9031-5>.
- Martínez-Climent, C., Zorio-Grima, A., Ribeiro-Soriano, D., (2018). Financial return crowdfunding: literature review and bibliometric analysis. *Int. Entrep. Manag. J.* 14, 527–553. <https://doi.org/10.1007/s11365-018-0511-x>.
- Mascarenhas, C., Marques, C., Galvao, A., Santos, G., (2017). Entrepreneurial university: towards a better understanding of past trends and future directions. *J. Enterprising Communities People Places Glob. Econ.* 11(3), 316–338. <https://doi.org/10.1108/JEC-02-2017-0019>.

- Massaro, M., Dumay, J., Guthrie, J., (2016). On the shoulders of giants: undertaking a structured literature review in accounting. *Account., Audit. Account. J.* 29(5), 767–801. <https://doi.org/10.1108/AAAJ-01-2015-1939>.
- Merigo, J.M., Cancino, C.A., Coronado, F., Urbano, D., (2016). Academic research in innovation: a country analysis. *Scientometrics* 108, 559–593. <https://doi.org/10.1007/s11192-016-1984-4>.
- Merigo, J.M., Mas-Tur, A., Roig-Tierno, N., Ribeiro-Soriano, D., (2015). A bibliometric overview of the Journal of Business Research between 1973 and 2014. *J. Bus. Res.* 68(12), 2645–2653. <https://doi.org/10.1016/j.jbusres.2015.04.006>.
- Nomaler, O., Frenken, K., Heimeriks, G., (2013). Do more distant collaborations have more citation impact? *J. Informetr.* 7(4), 966–971. <https://doi.org/10.1016/j.joi.2013.10.001>.
- Noyons, E.C.M, Moed, H.F., Luwel, M., (1999). Combining mapping and citation analysis for evaluative bibliometric purposes: a bibliometric study. *J. Am. Soc. Inf. Sci.* 50(2), 115–131. [https://doi.org/10.1002/\(SICI\)1097-4571\(1999\)50:23.0.CO;2-J](https://doi.org/10.1002/(SICI)1097-4571(1999)50:23.0.CO;2-J).
- OECD, (2012). *A Guiding Framework For Entrepreneurial Universities. OECD and the European Commission, Paris*. Retrieved from. <https://www.oecd.org/site/cfecpr/EC-OECD%20Entrepreneurial%20Universities%20Framework.pdf>.
- O’Kane, C., Mangematin, V., Geoghegan, W., Fitzgerald, C., (2015). University technology transfer offices: the search for identity to build legitimacy. *Res. Policy* 44(2), 421–437. <https://doi.org/10.1016/j.respol.2014.08.003>.
- O’Shea, R.P., Allen, T.J., Chevalier, A., Roche, F., (2005). Entrepreneurial orientation, technology transfer and spinoff performance of U.S. universities. *Res. Policy* 34(7), 994–1009. <https://doi.org/10.1016/j.respol.2005.05.011>.
- Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D’Este, P., Sobrero, M., (2013). Academic engagement and commercialisation: a review of the literature on university–industry relations. *Res. Policy* 42(2), 423–442. <https://doi.org/10.1016/j.respol.2012.09.007>.
- Peters, H.P.F., Van Raan, A.F.J., (1991). Structuring scientific activities by co-author analysis – an exercise on a university faculty level. *Scientometrics* 20, 235–255. <https://doi.org/10.1007/BF02018157>.
- Philpott, K., Dooley, L., O’Reilly, C., Lupton, G., (2011). The entrepreneurial university: examining the underlying academic tensions. *Technovation* 31(4), 161–170. <https://doi.org/10.1016/j.technovation.2010.12.003>.
- Powers, J.B., McDougall, P.P., (2005). University start-up formation and technology licensing with firms that go public: a resource-based view of academic entrepreneurship. *J. Bus. Ventur.* 20(3), 291–311. <https://doi.org/10.1016/j.jbusvent.2003.12.008>.
- Rasmussen, E.A., Sørheim, R., (2006). Action-based entrepreneurship education. *Technovation* 26(2), 185–194. <https://doi.org/10.1016/j.technovation.2005.06.012>.

- Rasmussen, E.A., Wright, M., (2015). How can universities facilitate academic spin-offs? An entrepreneurial competency perspective. *J. Technol. Transf.* 40, 782–799. <https://doi.org/10.1007/s10961-014-9386-3>.
- Rey-Martí, A., Ribeiro-Soriano, D., Palacios-Marqu´es, D., (2016). A bibliometric analysis of social entrepreneurship. *J. Bus. Res.* 69(5), 1651–1655. <https://doi.org/10.1016/j.jbusres.2015.10.033>.
- Rinaldi, C., Cavicchi, A., Spigarelli, F., Lacch`e, L., Rubens, A., (2018). Universities and smart specialisation strategy. *Int. J. Sustain. High. Educ.* 19(1), 67–84. <https://doi.org/10.1108/IJSHE-04-2016-0070>.
- Rothaermel, F.T., Agung, S.D., Jiang, L., (2007). University entrepreneurship: a taxonomy of the literature. *Ind. Corp. Chang.* 16(4), 691–791. <https://doi.org/10.1093/icc/dtm023>.
- RStudio Team, (2020). *RStudio server: Integrated Development For R*. RStudio, Inc., Boston, MA.
- Scuotto, V., Del Giudice, M., Garcia-Perez, A., Orlando, B., Ciampi, F., (2019). A spillover effect of entrepreneurial orientation on technological innovativeness: an outlook of universities and research based spin offs. *J. Technol. Transf.* 45, 1634–1654. <https://doi.org/10.1007/s10961-019-09760-x>.
- Secinaro, S., Calandra, D., (2020). Halal food: structured literature review and research agenda. *Br. Food J.* vol. InPress <https://doi.org/10.1108/BFJ-03-2020-0234>.
- Secundo, G., Perez, S.Elena, Martinaitis, Z., Leitner, K.H., (2017). An intellectual capital framework to measure universities' third mission activities. *Technol. Forecast. Soc. Change* 123, 229–239. <https://doi.org/10.1016/j.techfore.2016.12.013>.
- Secundo, G., Ndou, V., Del Vecchio, P., De Pascale, G., (2019). Knowledge management in entrepreneurial universities: a structured literature review and avenue for future research agenda. *Manag. Decis.* 57(12), 3226–3257. <https://doi.org/10.1108/MD-11-2018-1266>.
- Secundo, G., Rippa, P., Cerchione, R., (2020). Digital academic entrepreneurship: a structured literature review and avenue for a research agenda. *Technol. Forecast. Soc. Change*, 157. Article 120118. <https://doi.org/10.1016/j.techfore.2020.120118>.
- Shane, S., (2004). Encouraging university entrepreneurship? The effect of the Bayh–Dole Act on university patenting in the United States. *J. Bus. Ventur.* 19(1), 127–151. [https://doi.org/10.1016/S0883-9026\(02\)00114-3](https://doi.org/10.1016/S0883-9026(02)00114-3).
- Shirokova, G., Osiyevskyy, O., Bogatyreva, K., (2016). Exploring the intention–behavior link in student entrepreneurship: moderating effects of individual and environmental characteristics. *Eur. Manag. J.* 34(4), 386–399. <https://doi.org/10.1016/j.emj.2015.12.007>.
- Siegel, D.S., Wright, M., (2015). Academic entrepreneurship: time for a rethink? *Br. J. Manag.* 26(4), 582–595. <https://doi.org/10.1111/1467-8551.12116>.
- Slaughter, S., Leslie, L.L., (1997). *Academic capitalism: politics, policies, and the Entrepreneurial University*. Johns Hopkins University Press, London.

- Small, H., (1973). Co-citation in the scientific literature: a new measure of the relationship between two documents. *J. Am. Soc. Inf. Sci.* 24(4), 265–269. <https://doi.org/10.1002/asi.4630240406>.
- Thelwall, M., (2008). Social networks, gender, and friending: an analysis of mySpace member profiles. *J. Am. Soc. Inf. Sci. Technol.* 59(8), 1321–1330. <https://doi.org/10.1002/asi.20835>.
- Trencher, G., Masafumi, N., Chen, C., Ichiki, K., Sadayoshi, T., Kinai, M., Yarime, M., (2017). Implementing sustainability co-creation between universities and society: a typology-based understanding. *Sustain.* 9(4). Article 594. <https://doi.org/10.3390/su9040594>.
- Trencher, G., Yarime, M., McCormick, K.B., Doll, C.N.H., Kraines, S.B., (2014). Beyond the third mission: exploring the emerging university function of co-creation for sustainability. *Sci. Public Policy* 41(2), 151–179. <https://doi.org/10.1093/scipol/sct044>.
- Van Eck, N.J., Waltman, L., (2009). How to normalize cooccurrence data? An analysis of some well-known similarity measures. *J. Am. Soc. Inf. Sci. Technol.* 60(8), 1635–1651. <https://doi.org/10.1002/asi.21075>.
- Van Eck, N.J., Waltman, L., (2010). Software survey: vOSviewer, a computer program for bibliometric mapping. *Scientometrics* 84, 523–538. <https://doi.org/10.1007/s11192-009-0146-3>.
- Van Eck, N.J., Waltman, L., (2014). *Visualizing bibliometric networks*. In: Ding, Y., Rousseau, R., Wolfram, D. (Eds.), *Measuring Scholarly Impact*. Springer, Cham, pp. 285–320. https://doi.org/10.1007/978-3-319-10377-8_13.
- 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. *Res. Policy* 40(4), 553–564. <https://doi.org/10.1016/j.respol.2011.02.001>.
- Vanclay, J.K., (2007). On the robustness of the h-index. *J. Am. Soc. Inf. Sci. Technol.* 58(10), 1547–1550. <https://doi.org/10.1002/asi.20616>.
- Vesper, K.H., Gartner, W.B., (1997). Measuring progress in entrepreneurship education. *J. Bus. Ventur.* 12(5), 403–421. [https://doi.org/10.1016/S0883-9026\(97\)00009-8](https://doi.org/10.1016/S0883-9026(97)00009-8).
- Walter, A., Auer, M., Ritter, T., (2006). The impact of network capabilities and entrepreneurial orientation on university spin-off performance. *J. Bus. Ventur.* 21(4), 541–567. <https://doi.org/10.1016/j.jbusvent.2005.02.005>.
- Waltman, L., Van Eck, N.J., (2012). A new methodology for constructing a publication level classification system of science. *J. Am. Soc. Inf. Sci. Technol.* 63(12), 2378–2392. <https://doi.org/10.1002/asi.22748>.
- Wong, P.K., Ho, Y.P., Singh, A., (2007). Towards an “entrepreneurial university” model to support knowledge-based economic development: the case of the National University of Singapore. *World Dev* 35(6), 941–958. <https://doi.org/10.1016/j.worlddev.2006.05.007>.

CHAPTER 3

ESSAY II

Institutional Logics to Unveil Entrepreneurial Universities’ Performances: A Cross-Country Comparative Study

Canio Forliano^{1,2}, Paola De Bernardi², Alberto Bertello², Francesca Ricciardi²

¹ University of Palermo, via Amico Ugo Antonio, 90134 Palermo, Italy

² University of Turin, C.so Unione Sovietica 218/bis, 10134 Turin, Italy

Corresponding author: canio.forliano@unito.it

* Status: The article was published in 2022 as Part of the SIDREA Series in Accounting and Business Administration, Springer. Full reference: Forliano, C., De Bernardi, P., Bertello, A., Ricciardi, F. (2022). Institutional Logics to Unveil Entrepreneurial Universities’ Performances: A Cross-Country Comparative Study. In: Caperchione, E., Bianchi, C. (Eds.) Governance and Performance Management in Public Universities. SIDREA Series in Accounting and Business Administration. Springer, Cham. https://doi.org/10.1007/978-3-030-85698-4_9

Abstract

The success of entrepreneurial universities depends to a large extent on the system of beliefs, relationships, and rules that shape their research and innovation projects. In this light, entrepreneurial universities can be seen as focal actors of hybrid networks in which heterogeneous subjects, characterized by different perceived interests and multiple institutional logics, interact in a systemic way. Consequently, each entrepreneurial university is immersed in a complex organizational field that influences and is influenced by their actions. This paper draws on the institutional logics perspective to investigate how entrepreneurial universities respond to logic multiplicity. With this purpose, we analyze the case studies of one Continental European, one Anglo-Saxon, and one Asian entrepreneurial university. Then, we develop a framework that relates their key performance indicators to the nine institutional logics individuated at the organizational field-level. Theoretical and managerial contributions will be discussed along the article.

Keywords: entrepreneurial university; third mission; performance management; institutional logics; organizational field.

1. Introduction

Universities are adaptive and dynamic organisms that accomplish three different missions. The first mission regards teaching activities and implies knowledge preservation and transmission. The second mission includes the research activity and, consequently, knowledge production and advancement. The third mission consists of every activity that universities are asked to perform besides teaching and research, in order to contribute to economic and societal developments (Battaglia *et al.*, 2017; Chau *et al.*, 2017). These three missions are the result of two different academic revolutions that have brought universities to open their doors to a multiple set of stakeholders while increasing, at the same time, the complexity of the organizational field wherein they operate and interact (Geuna & Muscio, 2009; Philpott *et al.*, 2011; Ardito *et al.*, 2019).

Adopting the institutional logics perspective, we could say that universities operate in organizational fields that shape and are shaped by multiple actors (e.g., governments, private companies, and civil society) and where different institutional logics coexist. Institutional logics provide actors with socially shared, deeply held rules of the game, assumptions, and values that shape cognitions and behaviors and form the basis for legitimacy (Pierce *et al.*, 2017). The literature has provided several examples of the different logics embedded in organizational fields, and, more recently, the reflection has moved to how organizations respond to institutional complexity when conflicting logics are at stake (Ocasio *et al.*, 2017). Most of these studies have focused on the combination of two conflicting logics such as commercial logic versus social logic in social enterprises (Pache & Santos, 2013), market logic versus academic science logic in biotechnological companies (Murray, 2010), financial logic versus community logic in community banks (Almandoz, 2012), and market logic versus public value logic in debt collection companies (Forliano *et al.*, 2020). However, there is still a paucity of studies analyzing logic multiplicity when more than two logics are at stake. The purpose of this study is to tackle this challenge by examining the set of institutional logics underlying the universities' missions. Hence, this chapter aims to answer the following two research questions:

RQ1. “What are the institutional logics embedded in universities' organizational field?”

RQ2. “How do universities respond to this logic multiplicity by developing specific sets of key performance indicators (KPIs)?”

To answer these questions, we developed an exploratory research based on qualitative data from a Continental European university, an Anglo-Saxon university, and an Asian university. As a first step, we individuated nine logics (three for each mission) by developing semi-structured interviews with the universities under analysis. The logics individuated are inclusiveness, vocational, and excellence logic as regards the first mission; focalization, materiality, and excellence as regards the second mission; dissemination, translational, and entrepreneurial as regards the third mission. As a second step, we conducted a document analysis to develop a framework that identifies which institutional logics are covered and which ones are overlooked by the current indicators.

In this way, this study aims at providing two main theoretical contributions. First, this research contributes to the literature on institutional logics, considering a complex context in which several logics are at stake. Indeed, scholars have mainly ignored logics multiplicity to date. Second, this chapter contributes also to studies that address universities' performance management by providing a comprehensive mapping of the KPIs used to assess such performances in the three different academic missions. Practitioners and decision makers can find useful implications and insights as well.

The remainder of this chapter is structured as follows. Section 2 provides the theoretical background of the work. Section 2 systematically describes the adopted methodology. Section 3 presents the results. Finally, Sect. 4 discusses the results and the implications, limitations, and further developments of this study.

2. Theoretical Background

2.1 Entrepreneurial Universities and the Third Mission

Over the last decades, the role and the mission of universities have undergone several transitions requiring changes in content, structure, governance, and strategies (Guerrero *et al.*, 2016). More specifically, universities have gradually turned themselves from ivory towers to entrepreneurial agents (Etzkowitz *et al.*, 2000; Forliano *et al.*, 2021) that are expected to develop a wide range of relationships with multiple stakeholders in order to continually adapt the university model (Miller *et al.*, 2014). With the advent of the knowledge-based economy (Secundo *et al.*, 2019),

therefore, universities are called to play different interconnected roles that respond to three different missions, namely teaching, research, and the third mission (Etzkowitz *et al.*, 2000).

For a while, the teaching mission has been the traditional key reputation factor (Maassen, 2017). It consists of an education offer that mainly comprises courses at all levels, postgraduate courses, masters, and refresher and professional training courses (Marginson & Van der Wende, 2007). Then, institutional pressures (as a consequence of governmental initiatives and reforms) have led universities to draw greater attention to research activities that have become increasingly important for either overall or individual assessments. The research mission, usually characterized by a cross-disciplinary nature, has been thus fostered by both research centers and labs (Etzkowitz *et al.*, 2000) and the participation in specific projects (Secundo *et al.*, 2017). Moreover, in the 1980s, these two missions were considered not enough and the so-called third mission started emerging (Etzkowitz & Leydesdorff, 2000). Although the third mission comprehends several different activities, these can be grouped into three main categories (E3M, 2010), namely (i) technology transfer and innovation, (ii) continuing education, and (iii) public engagement. Despite the third mission encompasses any activity oriented to foster the development of economies and societies, universities have adopted the label entrepreneurship as a crucial concept to explain this revolutionary road (Etzkowitz *et al.*, 2000). In this sense, the entrepreneurial university concept was coined first to indicate that universities should consider “the possibilities of new sources of funds to come from patenting the discoveries made by scientists holding academic appointments, from the sale of knowledge gained by research done under contract with commercial firms, and from entry into partnership with private business enterprises” (Etzkowitz, 1983, p. 198). A couple of decades later, another definition from Etzkowitz *et al.* (2000, p. 313) defined entrepreneurial universities as any university undertaking entrepreneurial activities with the objective of “improving regional or national economic performance as well as the university’s financial advantage and that of its faculty.” Over the years other definitions have been provided, also considering the capacity of entrepreneurial universities to support the creation of new ventures or perform other technology transfer activities (Etzkowitz, 2003), to contribute to the economic and social development of a given territory (Guerrero *et al.*, 2015), to promote the entrepreneurial orientation of students and align their curricula to new employability demands (Grimaldi & Fernandez, 2017), to disseminate knowledge through public engagement activities (Rinaldi *et al.*, 2018), or promoting a sustainability transition of modern economies (Trencher *et al.*, 2014). In short terms, it could be said that entrepreneurial universities are adaptive institutions that complement

the missions of knowledge preservation and transmission through education and knowledge production and advancement through basic research with the third mission of widely contributing to the economic development of societies (Geuna & Muscio, 2009; Philpott *et al.*, 2011).

2.2 Logic Multiplicity in Universities

Recent developments in the neo-institutional theory have argued that society is made up of inter-institutional systems in which multiple institutional orders coexist simultaneously (Qiu *et al.*, 2019) and each of these institutional orders may influence in a different way individuals and organizations' behaviors. This theoretical underpinning resulted in the development of the concept of institutional logics, defined by Thornton and Ocasio (1999, p. 804) as “the socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality.” According to the institutional logics perspective, the interaction between the society and a social organization is intermediated by the organizational field wherein an organization is immersed (Greenwood & Suddaby, 2006; Wooten & Hoffman, 2008; Zietsma & Lawrence, 2010). Strictly speaking, an organizational field is “a community of organizations that partakes of a common meaning system and whose participants interact more frequently and fatefully with one another than with actors outside the field” (Scott, 1995, p. 56). It includes any constituent that may have an influence on the organization such as public bodies, professional and trade associations, critical exchange partners, sources of funding, special interest groups, and the general public (Powell & DiMaggio, 2012; Scott, 1991). Subsequently, studying these fields is fundamental for recognizing, understanding, and abstracting what expectations and practices characterize a given organization (Pierce *et al.*, 2017; De Bernardi *et al.*, 2019).

According to the advancements in the institutional logics perspective, organizational fields may be characterized by the presence of multiple logics. These logics can be more or less complementary (i.e., institutional pluralism, see Kraatz & Block, 2008, 2017) or conflicting and competing (i.e., institutional complexity, see Greenwood *et al.*, 2011). Logic multiplicity has been investigated in education fields (Ezzamel *et al.*, 2012), as well as in universities, as a result of the increasing number of stakeholders and the transition from the teaching mission to research and third mission (Guerrero *et al.*, 2016). The aim of this study is, therefore, to extend

the knowledge of how universities respond to organizational field-level multiple logics, shedding light on how this logic multiplicity is reflected in their KPIs.

3. Methodology

In our study, we aim at investigating what are the institutional logics that are embedded in a university's organizational field and how such institutions monitor their performances in response to these logics. Previous research on how universities and educational fields deal with different and often contradictory institutional logics suggested more empirical analysis on the topic (Dumay *et al.*, 2017; Fini *et al.*, 2019). In this sense, after having selected three cases to be investigated, we performed a two-step inductive qualitative analysis (Eisenhardt, 1989; Yin, 2017). First, we conducted semi-structured interviews for identifying what institutional logics shape the purse of the three academic missions. Second, we analyzed secondary sources of data for mapping the KPIs used for monitoring universities' performances in such activities.

3.1 Cases Selection

In line with McGrath *et al.* (1982), we decided to have a closer view of the three cases. These cases have been purposefully selected (Patton, 1990; Siggelkow, 2007) as considered to be good representatives of the entrepreneurial model in different institutional contexts and cultures. In doing so, we decided to provide results that can be generalized regardless of the geographical locations of entrepreneurial universities, rather than offering a nuanced overview that is a common characteristic of case studies.

So, the selected cases are one university from Continental Europe, one Anglo- Saxon university, and one Asian university that are globally considered to be particularly relevant in the field of entrepreneurship and technology transfer. The European university (University of Milano Bicocca, U.MIB) is one of the largest generalist and multidisciplinary universities in Italy. In the last national evaluation of the research activity and results, 8 out of 14 departments were considered excellent at the national level, resulting in 60 Million Euros financed over 5 years (University of Milan-Bicocca, 2020). Moreover, based on the Italian network for the valorization of public research, it includes 1.1% of Italian academic spin-offs (Netval, 2018). It has also largely redesigned its courses through an experience-oriented approach, able to foster the entrepreneurial competences of its students significantly, besides providing them with

technical competencies. Then, the Anglo-Saxon university (University of Birmingham, U.BIRM) is considered one of the most impacting universities for what regards the regional advancement and economic growth of the Midlands. Indeed, a recent report from Oxford Economics estimated that this university contributes around 1 Billion Pounds to the region's economy and considered it as one of the most proficient job providers of the region (Jelfs, 2016). Moreover, it is part of the Russell Group, which includes the top universities for what regards research activities in the UK. Finally, the Asian university (University of Hong Kong, U.HK) was chosen since it is considered one of the most internationalized universities in the world, able to foster its regional innovation system through the research activity and thanks to several connections with world-class scientific and scholarly communities (Tang, 2018; Wang, 2018).

To ensure comparability, all these universities are public universities with deep historical roots and considered medium-large universities (i.e., they have around 30–40 thousand enrolled students). Moreover, all of them are recognized as leading in terms of performances in their home countries according to the Quacquarelli Symonds' World University ranking (QS ranking, 2020), which is one of the leading international agencies involved in universities' evaluation and activities monitoring.

3.2 Data Collection and Analysis

After having selected the cases to be investigated, as the first step of our analysis, we conducted ten in-depth semi-structured interviews (Bryman & Bell, 2011). The protocol was based on semi-structured interviews aimed at gaining insights on values, beliefs, and normative expectations behind the three university missions as well as how these missions were accomplished within the context of the university. The objective of this phase was explorative, for identifying what are the institutional logics that underlie the investigated organizations in the pursuit of the three academic missions. The interviews involved at least two people from each of the selected universities, working there as scholars or heads of the research and third mission activities. On average, they lasted 60 min each and were conducted both face-to-face and through Skype meetings. In order to identify the interviewees' point of view, ensuring naturalness, we made interviewees aware only of the general aim of the research and not of specific questions in advance (Easton, 2010). Moreover, using the list of questions as a tool for supporting the interview but not hindering a spontaneous conversation, we could discuss any

new issue that emerged during the dialogue (Gillham, 2005) and analyze the investigated topic on the basis of the opinions, experiences, and perspectives of each interviewee (Silverman, 2013).

Then, as the second step of our analysis, we transcribed the interviews and triangulated them with secondary data sources (Eisenhardt, 1989). So, we revised the strategic and/or performance plans of the three selected universities. These plans, usually covering 3–5 years, were preferred to short-term operative plans since they are less likely to be changed. On average, in our case they covered a period going from 2015 to 2020. This analysis enabled us to identify what KPIs are used for evaluating the activities related to the three different academic missions at both organizational and individual levels. Thus, at least two authors independently coded each document for ensuring the accuracy and reproducibility of the analysis (Strauss & Corbin, 1990). At first, we adopted an open coding technique for discovering, labeling, and categorizing the topic under investigation. Then, after having achieved a shared interpretation of data, we used an axial coding technique (Bryman & Bell, 2011). In this way, any link existing between categories and subcategories could be established and data reorganized, enabling us to outline three institutional logics for each mission, resulting in nine total institutional logics.

4. Results

Triangulating the results of the interviews with the analysis of relevant literature and secondary sources of data, we could identify nine different institutional logics. So, we found that three different institutional logics shape each of the three academic missions and their related KPIs as follows.

4.1 Teaching Institutional Logics

Several scholars criticized the shift toward the entrepreneurial university model and opposed the pursuit of third mission activities because they subtract time and resources to teaching and research (e.g., Slaughter & Leslie, 1998; Hayes, 2017). However, performances achieved in pursuing the first mission (i.e., teaching activities) are still one of the main criteria through which funds are allocated to universities (Maassen, 2017). In this sense, some tensions can occur at organizational or individual levels, between different missions and even within the same mission, with scholars asked to pursue entrepreneurship and pure academic activities at

the same time. Nonetheless, according to Etzkowitz *et al.* (2000), the third mission is not meant to weaken these missions but rather to leverage them to their full potential.

The Inclusiveness Logic. In Table 1, the KPIs related to the inclusiveness logic are presented. Notably, this logic is linked to the necessity of universities to foster social cohesion and integration, enabling as many people as possible to participate in the higher education system (CEC, 2005; Scott, 2001). In this sense, KPIs such as the resources allocated for helping physically and/or learning disabled students or grants for deserving students emerged. Furthermore, this logic is linked to the capacity of the university to enhance its reputation, for example, hiring “star professors” (Macfarlane, 2013) or innovating the teaching activities through digital technologies (Huynh *et al.*, 2003).

Table 1. KPIs of the teaching inclusiveness logic.

Teaching inclusiveness logic	U.BIRM	U.HK	U.MIB
% of incoming visiting students	X	X	X
% of limited enrolment courses			X
% of professors recruited from other universities			X
% of students attending e-learning or blended learning courses			X
% of students satisfied with the infrastructure		X	
N° of "star" professors		X	X
N° of courses in e-learning or blended learning			X
N° of incoming visiting professors	X	X	X
N° of MOOCs	X		
Resources allocated for helping physically and/or learning-disabled students	X		
Total number of students	X	X	X

Source: Authors’ own elaboration

The Vocational Logic. This logic is associated with the idea that employability chances of students are associated with the capability of universities to transmit them the right knowledge and the network of partnerships that such institutions are able to build (Clark, 1998; Gibb *et al.*, 2009; Grimaldi & Fernandez, 2017). So, Table 2 shows the KPIs associated with this logic,

such as the percentage of graduates with a curricular internship, the number of courses that have been revised to meet the needs and expectations of the labor market, or the number of companies involved in job placement activities.

Table 2. KPIs of the teaching vocational logic.

Teaching vocational logic	U.BIRM	U.HK	U.MIB
% of graduated Ph.D. students currently employed		X	
% of graduated with a curricular internship		X	
% of students employed in 1 year	X	X	X
Companies' satisfaction of employed graduates		X	
N° of companies involved in job placement initiatives	X		
N° of degree courses revised according to employment opportunities		X	X
N° of students accessing to career guidance services	X		
Partnerships with other leading organizations in the same area	X		X
Students' satisfaction with the service provided by the university	X	X	

Source: Authors' own elaboration

The Excellence Logic. The logic of excellence is founded on the assumption that universities need to attract and/or create talented and skilled people (i.e., both faculties and students), promoting the development of human capital and contributing to the competitiveness of the territorial system in which are located (Secundo *et al.*, 2017). In this regard, also the internationalization rate seems to play a crucial role (Tang, 2018; Wang, 2018). Thus, Table 3 shows the KPIs associated with this logic. Examples are the percentage of incoming students and professors, the staff employed, or students' perceived quality of teaching.

Table 3. KPIs of the teaching excellence logic.

Teaching excellence logic	U.BIRM	U.HK	U.MIB
% of academic staff with recognized professional teaching accreditation		X	
% of ECTS registered abroad			X
% of incoming visiting students	X	X	X
% of limited enrolment courses			X
% of outgoing visiting students	X	X	
Extra-regional mobility	X		X
Faculties / N° of students	X		X
N° of double degrees taken through exchange programs	X	X	X
N° of incoming visiting professors	X	X	X
N° of on-time graduates		X	X
N° of teaching assistants / N° of enrolled students	X		X
Students' perceived quality of teaching		X	

Source: Authors' own elaboration

4.2 Researching Institutional Logics

Some authors criticized the entrepreneurial shift of universities, claiming that basic research is no more a preoccupation of such institutions, and recognizing the introduction of private logics for what regards knowledge production and commercialization (Slaughter & Leslie, 1998; Hayes, 2017). However, at the individual level, most academics engage in a combination of basic and applied research (Bentley *et al.*, 2015). Indeed, career progressions of academics are often linked to high performances in researching rather than in teaching or third mission activities. The request is to produce knowledge that is relevant and useful at both an international or local level, considering its impact on society (Owen *et al.*, 2012; von Schomberg, 2012). According to the analysis of the primary and secondary sources, we found that only the excellence logic is well covered by entrepreneurial universities for what regards performance assessment, with a lack of KPIs for mapping the performances achieved in pursuing the focalization and materiality logic.

The Focalization Logic. This logic is founded on the idea that universities should become a reference point, at both regional and international levels, focalizing themselves on some specific areas (Etzkowitz *et al.*, 2000; Siegel & Zervos, 2002). From the KPIs in Table 4, this logic seems to be essentially neglected concerning performance evaluation. Indeed, we found only two KPIs related to this logic: the participation in joint research centers and the establishment of partnerships with other leading organizations in the same area.

Table 4. KPIs of the research focalisation logic.

Research focalization logic	U.BIRM	U.HK	U.MIB
Participation in joint research centers	X	X	
Partnerships with other leading organizations in the same area		X	

Source: Authors' own elaboration

The Materiality Logic. This logic is based on the assumption that universities should contribute to solving real-world problems through their researching activity, going beyond the ivory tower and attracting new funding from external subjects (Etzkowitz *et al.*, 2000). Owen *et al.* (2012) defined this as transitioning “from science in society to science for society, with society.” However, also this logic seems to be only partially covered in the strategic plans of the selected universities, due to a paucity of KPIs (see Table 5). Examples are the percentage of papers co-authored with non-academics or funding attracted for financed researches or promoting dissemination activities.

Table 5. KPIs of the research materiality logic.

Research materiality logic	U.BIRM	U.HK	U.MIB
% of papers co-authored with non-academics	X		
% of private funding for dissemination activities	X	X	X
Incomes from competitively financed researches	X	X	X
N° of financed researches		X	

Source: Authors' own elaboration

The Excellence Logic. As can be observed in Table 6, this is the mostly covered logic for what regards the researching activity. It is linked to the aim of pursuing the second mission at the highest level possible, in terms of both relevance and recognition by the international academic communities (Secundo *et al.*, 2017; Tang, 2018; Wang, 2018). Some KPIs that emerged from the analysis are the percentage of papers published in highly rated peer-reviewed journals and the number of citations received by scholars affiliated with the university, the capacity to attract international PhD students and professors, or the number of international awards received for excelling in researching.

Table 6. KPIs of the research excellence logic.

Research excellence logic	U.BIRM	U.HK	U.MIB
% of completed research projects out of planned projects			
% of foreign Ph.D. students		X	
% of multidisciplinary Ph.D. programs			
% of papers published in highly-rated peer-reviewed journals	X	X	X
% of papers with international co-authors		X	
Investment in research infrastructures and equipment	X	X	
N° of incoming visiting professors	X	X	X
N° of Ph.D. students		X	X
N° of professors who have received international awards	X	X	
N° of received citations		X	

Source: Authors' own elaboration

4.3 Third Mission Institutional Logics

The third mission includes every activity besides teaching and researching. Due to the vast heterogeneity of activities that universities perform, this mission is highly dependent on the field that each university or department covers (Guerrero *et al.*, 2016). Thus, STEM departments (i.e., science, technology, engineering, and mathematics) would perform more activities that are related to technology transfer and research commercialization (Etzkowitz, 2003), such as granting and licensing patents or participating in spin-offs and start-ups.

Conversely, departments from social sciences would focus more on knowledge dissemination and outreach (Rinaldi *et al.*, 2018), such as organizing public engagement initiatives, participating in advisory boards, or providing continuing education programs. Although this is the most recent mission, the analysis of the sources enabled us to identify three institutional logics that are broadly covered by the investigated universities in terms of KPIs. However, it should be noted that most indicators are still focused on capturing the tangible returns of such activities, measured in terms of economic benefits.

The Dissemination Logic. The third mission consists of disseminating knowledge outside the boundaries of academia, reaching a broader public than just students or the scientific community (Gleeson, 2010). In this regard, the academic can show both a pro-active or reactive role if he actively promotes or let himself being involved in some disseminating initiatives (e.g., organizing or participating in public events or interviews, contributing to nonscientific publications, participating). This logic seems to be better monitored by generalist universities (Table 7), through KPIs such as the number of MOOCs or public engagement initiatives, the economic returns for continuing education programs or sponsored research, or the implementation of tools and/or metrics for evaluating the sustainability impact.

Table 7. KPIs of the third mission dissemination logic.

Third mission dissemination logic	U.BIRM	U.HK	U.MIB
% of continuing training activities funded during the year	X		
% of private funding for dissemination activities			X
Implementation of tools and/or metrics for evaluating the sustainability impact	X		X
Income from continuing education activities	X		X
N° of active continuing education programs	X		X
N° of collaborative projects with third parties	X	X	X
N° of companies participating in continuing education activities			X
N° of consultancy services for knowledge exchange		X	
N° of faculties engaged as members of external advisory bodies		X	
N° of MOOCS	X		

N° of partnerships for providing sponsored continuous training programs	X		X
N° of public engagement initiatives		X	X

Source: Authors' own elaboration

The Translational Logic. Universities should be able to translate their activities, especially researching, addressing real-world issues and incentivizing companies, institutions, and communities to adopt new solutions at an operational level (Owen *et al.*, 2012). In this sense, patents express one of the best examples to represent how research can address industrial necessities, potentially generating also new sources of income for the university (Etzkowitz & Leydesdorff, 2000). Table 8 shows how universities should pay more attention toward this logic, in which only U.HK seems to excel. Some KPIs that emerged from the analysis are the percentage of granted and licensed patents (and the revenues generated from them) or the percentage from granted patents, the number of registered patents in the last 10 years, and the percentage of university patents registered.

Table 8. KPIs of the third mission translational logic.

Third mission translational logic	U.BIRM	U.HK	U.MIB
% of private funding for sponsored research	X	X	
% of granted university patents	X	X	X
% of licensed patents		X	
% of Ph.D. students with previous experience in a company		X	
N° of financed researches		X	
N° of registered patents in the last 10 years			X
Revenues from granted patents	X	X	X

Source: Authors' own elaboration

The Entrepreneurial Logic. In Table 9 the KPIs associated with the entrepreneurial logic are shown. In this regard, it is assumed that universities are actively called to foster innovation and contribute to the development of economies and societies, co-developing the sustainability paradigm through multi-stakeholder partnerships (Trencher *et al.*, 2014; Rinaldi *et al.*, 2018). Some of the most relevant KPIs that emerged from the analysis are the income generated from

incubated companies or the percentage of spin-off that have gone through an acquisition or have been listed on the stock market, as well as the revenues generated from granted patents, sponsored researches, and other technology transfer activities. So, we can affirm that this logic is broadly covered, but mainly through KPIs that capture the economic return of such activities.

Table 9. KPIs of the third mission entrepreneurial logic.

Third mission entrepreneurial logic	U.BIRM	U.HK	U.MIB
% of acquired or listed spin-offs	X		X
Implementation of tools and/or metrics for evaluating the sustainability impact	X		
Incomes from incubated companies		X	
Incomes from sponsored research			X
N° of active spin-offs and start-ups	X	X	X
N° of collaborations with spin-offs	X		X
N° of spin-offs' employees			X
Participation in incubators, science parks, consortia or associations for technology transfer	X		
Revenues from granted patents	X	X	
Revenues from technology transfer activities	X	X	
Revenues from sponsored researches	X	X	

Source: Authors' own elaboration

5 Discussion and Conclusion

5.1 Discussion

Building an effective system for managing universities' performances is undoubtedly a tough challenge (Meissner & Shmatko, 2017; Secundo *et al.*, 2017). Indeed, such institutions are subject to continuous changes that also require adapting their management and organizational structures. In this study, we developed a framework for classifying and mapping the KPIs used to assess entrepreneurial universities' performances according to different institutional logics. Notably, we identified nine different logics (three for each academic mission) that are linked to nine different views about what role entrepreneurial universities should assume in society. The first mission is the foundational mission that universities have been asked to pursue and represented a benchmark on which measuring their reputation for a long time (Maassen, 2017).

So, the performances associated with teaching activities appear covered through a significant number of KPIs in each of the three logics that we identified (i.e., inclusiveness, vocational, and excellence). Conversely, the performances of the second mission are well covered only for what regards the excellence logic. Indeed, the reputation of universities and the careers of scholars are mainly built on this logic nowadays. It is not surprising that the two logics associated with the potential impact of universities on societies, namely the focalization and materiality logics, show a lower coverage rate. Finally, entrepreneurial universities show to pay high attention to map their performances in conducting third mission activities, even if most of them are related to capture the tangible aspects related to those activities. However, in line with the suggestions from Owen *et al.* (2012) and von Schomberg (2012), more attention should be paid on the translational logic, which comprehends a lower coverage than the dissemination and entrepreneurial logics.

5.2 Implications

In this study, we aimed at providing both theoretical and practical contributions. From a theoretical point of view, this research contributes to the institutional logics' theory analyzing a context in which more than two logics are at stake. Indeed, to date, most of the studies addressed the combination of two reciprocally conflicting or complementary logics (e.g., Murray, 2010; Almandoz, 2012; Pache & Santos, 2013), ignoring the existence of several logics (i.e., logics multiplicity) in complex and dynamic contexts such as the academic one. Indeed, entrepreneurial universities are asked to pursue three different missions that can be reciprocally complementary or conflicting, resulting in paradoxical tensions and competition around key resources allocation (e.g., faculty's time) if not effectively governed. Moreover, this study contributes also to studies that addressed universities' performance management by providing a comprehensive mapping of the KPIs used to assess such performances in the three different academic missions. Practitioners, and especially decision makers, would benefit from the results of this work as well, having the possibility to better align their strategies with the different logics underlying their decisions. Moreover, understanding the system of practices, values, rules, and beliefs that characterize the organizational field in which entrepreneurial

universities operate would help decision makers increase cooperation inside an entrepreneurial university's ecosystem.

5.3 Limitations and Further Steps

This study is not free from limitations, that can all represent possible future developments. First of all, we considered the organizational field of the investigated universities only for what regards the institutional logics that shape it (and their associated KPIs). So, future studies could investigate the organizational fields of such complex structures considering, for example, the definition of novel strategies, practices, or governance models, decisions on how to allocate resources, the design of adaptive performance management systems, or the active involvement of new actors in executing different tasks (Gibb *et al.*, 2009; Ezzamel *et al.*, 2012; Secundo *et al.*, 2017). Moreover, further research is needed to understand how the normative context and the related coercive pressures influence universities and their institutional logics. Second, we analyzed the strategic and/or performance plans of a specific timespan (2015–2020). However, we encourage scholars to consider developing longitudinal studies to evaluate how decision makers are monitoring the performances of universities in pursuing the three academic missions and their related institutional logics. Moreover, future analyses could verify if the different KPIs are impacting the organizational asset of the investigated universities. Third, some indicators resulted in being cross-sectional with regard to different missions and logics, so it is still not clear how to properly consider and represent them. So, the proposed framework still needs to be revised to give major importance to these cross-cutting elements

Reference list

- Almandoz, J. (2012). Arriving at the starting line: The impact of community and financial logics on new banking ventures. *Academy of Management Journal*, 55(6), 1381–1406.
- Ardito, L., Ferraris, A., Petruzzelli, A. M., Bresciani, S., & Del Giudice, M. (2019). The role of universities in the knowledge management of smart city projects. *Technological Forecasting and Social Change*, 142, 312–321.
- Battaglia, D., Landoni, P., & Rizzitelli, F. (2017). Organizational structures for external growth of university technology transfer offices: An explorative analysis. *Technological Forecasting and Social Change*, 123, 45–56.
- Bentley, P. J., Gulbrandsen, M., & Kyvik, S. (2015). The relationship between basic and applied research in universities. *Higher Education*, 70(4), 689–709.

- Bryman, B., & Bell, E. (2011). *Business research methods* (3rd ed.). Oxford University Press.
- CEC. (2005). *European universities: Enhancing Europe's research base*. European Commission.
- Chau, V. S., Gilman, M., & Serbanica, C. (2017). Aligning university–industry interactions: The role of boundary spanning in intellectual capital transfer. *Technological Forecasting and Social Change*, *123*, 199–209.
- Clark, B. R. (1998). The entrepreneurial university: Demand and response. *Tertiary Education and Management*, *4*(1), 5–16.
- De Bernardi, P., Bertello, A., & Forliano, C. (2019). *Unpacking Higher Educational Institutions (HEIs) performances through the institutional logics lens*. In IFKAD 14th international forum on knowledge assets dynamics-knowledge ecosystems and growth (pp. 1537–1555). Institute of Knowledge Asset Management (IKAM)-Arts for Business Institute-University of Basilicata.
- Dumay, X., Draelants, H., & Dahan, A. (2017). Organizational identity of universities: A review of the literature from 1972 to 2014. *Theory and Method in Higher Education Research*, *3*, 99–118.
- E3M. (2010). *European Indicators and Ranking Methodology for University Third Mission*.
- Easton, G. (2010). Critical realism in case study research. *Industrial Marketing Management*, *39*(1), 118–128.
- Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, *14*(4), 532–550.
- Etzkowitz, H. (1983). Entrepreneurial scientists and entrepreneurial universities in American academic science. *Minerva*, *21*(2–3), 198–233.
- Etzkowitz, H. (2003). Research groups as ‘quasi-firms’: The invention of the entrepreneurial university. *Research Policy*, *32*(1), 109–121.
- 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. R. C. (2000). The future of the university and the university of the future: Evolution of ivory tower to entrepreneurial paradigm. *Research Policy*, *29*(2), 313–330.
- Ezzamel, M., Robson, K., & Stapleton, P. (2012). The logics of budgeting: Theorization and practice variation in the educational field. *Accounting, Organizations and Society*, *37*(5), 281–303.
- Fini, R., Rasmussen, E., Wiklund, J., & Wright, M. (2019). Theories from the lab: How research on science commercialization can contribute to management studies. *Journal of Management Studies*, *56*(5), 865–894.

- Forliano, C., De Bernardi, P., Bertello, A., & Temperini, V. (2020). Innovating business processes in public administrations: Towards a systemic approach. *Business Process Management Journal*, 26, 22.
- Forliano, C., De Bernardi, P., & Yahiaoui, D. (2021). Entrepreneurial universities: A bibliometric analysis within the business and management domains. *Technological Forecasting and Social Change*, 165, 120522.
- Geuna, A., & Muscio, A. (2009). The governance of university knowledge transfer: A critical review of the literature. *Minerva*, 47(1), 93–114.
- Gibb, A., Haskins, G., & Robertson, I. (2009). *Leading the entrepreneurial university*. University of Oxford.
- Gillham, B. (2005). *Research interviewing: The range of techniques: A practical guide*. McGraw-Hill.
- Gleeson, R. E. (2010). *The third mission and the history of reform in American higher education. The community engagement and service mission of universities*, pp. 121–137.
- Greenwood, R., & Suddaby, R. (2006). Institutional entrepreneurship in mature fields: The big five accounting firms. *Academy of Management Journal*, 49(1), 27–48.
- Greenwood, R., Raynard, M., Kodeih, F., Micelotta, E. R., & Lounsbury, M. (2011). Institutional complexity and organizational responses. *Academy of Management Annals*, 5(1), 317–371.
- Grimaldi, D., & Fernandez, V. (2017). The alignment of University curricula with the building of a Smart City: A case study from Barcelona. *Technological Forecasting and Social Change*, 123, 298–306.
- 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.
- Guerrero, M., Urbano, D., Fayolle, A., Klofsten, M., & Mian, S. (2016). Entrepreneurial universities: Emerging models in the new social and economic landscape. *Small Business Economics*, 47(3), 551–563.
- Hayes, D. (Ed.). (2017). *Beyond McDonaldization: Visions of higher education*. Taylor & Francis.
- Huynh, M. Q., Umesh, U. N., & Valacich, J. S. (2003). E-learning as an emerging entrepreneurial enterprise in universities and firms. *Communications of the Association for Information Systems*, 12(1), 3.
- Jelfs, P. (2016). Financial performance analysis of spin-off companies from a UK 'regional' university: A case study of the University of Birmingham. *International Journal of Entrepreneurship and Small Business*, 29(2), 271–286.
- Kraatz, M. S., & Block, E. S. (2008). *Organizational implications of institutional pluralism*. In *The Sage handbook of organizational institutionalism* (Vol. 840, pp. 243–275). Sage.

- Kraatz, M. S., & Block, E. S. (2017). *Institutional pluralism revisited*. In *The Sage handbook of organizational institutionalism* (Vol. 2, pp. 635–662). Sage.
- Maassen, P. (2017). The university's governance paradox. *Higher Education Quarterly*, 71(3), 290–298.
- Macfarlane, B. (2013). *Intellectual leadership in higher education: Renewing the role of the university professor*. Routledge.
- Marginson, S., & Van der Wende, M. (2007). To rank or to be ranked: The impact of global rankings in higher education. *Journal of Studies in International Education*, 11(3–4), 306–329.
- McGrath, J. E., Martin, J. M., & Kulka, R. A. (1982). *Judgment calls in research* (Vol. 2). Sage.
- Meissner, D., & Shmatko, N. (2017). “Keep open”: The potential of gatekeepers for the aligning universities to the new knowledge triangle. *Technological Forecasting and Social Change*, 123, 191–198.
- Miller, K., McAdam, M., & McAdam, R. (2014). The changing university business model: A stakeholder perspective. *R&D Management*, 44(3), 265–287.
- Murray, F. (2010). The oncomouse that roared: Hybrid exchange strategies as a source of distinction at the boundary of overlapping institutions. *American Journal of Sociology*, 116(2), 341–388.
- Netval. (2018). *XIV Rapporto Netval*. In L. Ramaciotti & C. Daniele (Eds.), *La rete del trasferimento tecnologico si rafforza con la clinical innovation*. Edizioni ETS.
- Ocasio, W., Thornton, P. H., & Lounsbury, M. (2017). *Advances to the institutional logics perspective*. In *The Sage handbook of organizational institutionalism*. Sage.
- Owen, R., Macnaghten, P., & Stilgoe, J. (2012). Responsible research and innovation: From science in society to science for society, with society. *Science and Public Policy*, 39(6), 751–760.
- Pache, A. C., & Santos, F. (2013). Inside the hybrid organization: Selective coupling as a response to competing institutional logics. *Academy of Management Journal*, 56(4), 972–1001.
- Patton, M. Q. (1990). *Qualitative evaluation and research methods*. Sage.
- Philpott, K., Dooley, L., O'Reilly, C., & Lupton, G. (2011). The entrepreneurial university: Examining the underlying academic tensions. *Technovation*, 31(4), 161–170.
- Pierce, P., Ricciardi, F., & Zardini, A. (2017). Smart cities as organizational fields: A framework for mapping sustainability-enabling configurations. *Sustainability*, 9(9), 1506.
- Powell, W. W., & DiMaggio, P. J. (Eds.). (2012). *The new institutionalism in organizational analysis*. University of Chicago Press.
- Qiu, Y., Chen, H., Sheng, Z., & Cheng, S. (2019). Governance of institutional complexity in megaproject organizations. *International Journal of Project Management*, 37(3), 425–443.

- QS ranking. (2020). *QS World University Ranking*. Retrieved from <https://www.topuniversities.com/qs-world-university-rankings>
- Rinaldi, C., Cavicchi, A., Spigarelli, F., Lacchè, L., & Rubens, A. (2018). Universities and smart specialisation strategy. *International Journal of Sustainability in Higher Education*.
- Scott, W. R. (1991). *Unpacking institutional arguments*. In W. W. Powell & P. J. DiMaggio (Eds.), *The new institutional in organizational analysis* (pp. 162–182). University of Chicago Press.
- Scott, W. R. (1995). *Institutions and organizations*. Sage.
- Scott, P. (2001). *Conclusion: Triumph and retreat. The state of UK higher education—managing change and diversity* (pp. 186–204). Routledge.
- Secundo, G., Ndou, V., Del Vecchio, P., & De Pascale, G. (2019). Knowledge management in entrepreneurial universities. *Management Decision*, 57(12), 3226.
- Secundo, G., Perez, S. E., Martinaitis, Ž., & Leitner, K. H. (2017). An intellectual capital framework to measure universities' third mission activities. *Technological Forecasting and Social Change*, 123, 229–239.
- Siegel, D. S., & Zervos, V. (2002). Strategic research partnerships and economic performance: Empirical issues. *Science and Public Policy*, 29(5), 331–343.
- Siggelkow, N. (2007). Persuasion with case studies. *Academy of Management Journal*, 50(1), 20–24.
- Silverman, D. (2013). *Doing qualitative research: A practical handbook*. Sage.
- Slaughter, S., & Leslie, L. L. (1998). *Academic capitalism: Politics, policies, and the entrepreneurial university*. The Johns Hopkins University Press.
- Strauss, A., & Corbin, J. (1990). *Basics of qualitative research, grounded theory procedures and techniques*. Sage.
- Tang, H. H. H. (2018). Academic profession, entrepreneurial universities and scholarship of application: The imperative of impact. *Journal of Comparative and International Higher Education*, 10(3), 3–5.
- Thornton, P. H., & Ocasio, W. (1999). Institutional logics and the historical contingency of power in organizations: Executive succession in the higher education publishing industry, 1958–1990. *American Journal of Sociology*, 105(3), 801–843.
- Trencher, G., Yarime, M., McCormick, K. B., Doll, C. N., & Kraines, S. B. (2014). Beyond the third mission: Exploring the emerging university function of co-creation for sustainability. *Science and Public Policy*, 41(2), 151–179.
- University of Milano-Bicocca. (2020). *Piano strategico 2020/2022*. Retrieved from https://www.unimib.it/sites/default/files/allegati/piano-strategico-2020_1.pdf

- Von Schomberg, R. (2012). *Prospects for technology assessment in a framework of responsible research and innovation*. In M. Dusseldorp & R. Beecroft (Eds.), *Technikfolgen abschätzen lernen* (pp. 39–61). VS Verlag für Sozialwissenschaften. https://doi.org/10.1007/978-3-531-93468-6_2
- Wang, J. (2018). Innovation and government intervention: A comparison of Singapore and Hong Kong. *Research Policy*, 47(2), 399–412.
- Wooten, M., & Hoffman, A. J. (2008). *Organizational fields: Past, present and future*. In *The Sage handbook of organizational institutionalism* (Vol. 1, pp. 131–147). Sage.
- Yin, R. K. (2017). *Case study research and applications: Design and methods*. Sage.
- Zietsma, C., & Lawrence, T. B. (2010). Institutional work in the transformation of an organizational field: The interplay of boundary work and practice work. *Administrative Science Quarterly*, 55(2), 189–221.

CHAPTER 4

ESSAY III

A dynamic viewpoint of institutional logics multiplicity in entrepreneurial universities

Canio Forliano^{1,2,*}, Paola De Bernardi², Francesca Ricciardi²

¹ University of Palermo, via Amico Ugo Antonio, 90134 Palermo, Italy

² University of Turin, C.so Unione Sovietica 218/bis, 10134 Turin, Italy

**Corresponding author: canio.forliano@unito.it*

* Status: The article was published online in March 2022 in IEEE Xplore, IEEE. Full reference: Forliano C., De Bernardi P., & Ricciardi F. (2021). A dynamic viewpoint of institutional logics multiplicity in entrepreneurial universities. In 2021 IEEE International Conference on Technology Management, Operations and Decisions (ICTMOD) (pp. 1-6). IEEE. <https://doi.org/10.1109/ICTMOD52902.2021.9739265>

Abstract

With the introduction of the third mission concept, universities have been increasingly asked to perform different activities besides teaching and researching, outreaching knowledge outside their boundaries and assuming a leading role in fostering innovation in modern knowledge-intensive societies. However, how do the three academic missions pursued by entrepreneurial universities interact with each other? To what logics do they refer? To address these questions, institutional logics are leveraged as a theoretical lens in this study. Thus, a qualitative system dynamics model (i.e., a causal loop diagram) was developed to investigate how entrepreneurial universities respond to logic multiplicity, providing different implications for both researchers and policy-makers.

Keywords: entrepreneurial university, institutional logics, system dynamics

1. Introduction

The third mission (TM) concept implies that universities are expected to perform several different and diversified activities besides teaching (first mission) and scientific research (second mission) (Clark, 1998; Etzkowitz, 1998). TM efforts may include activities such as knowledge dissemination, technological innovation, social innovation, advisory services, or entrepreneurship (Battaglia *et al.*, 2017; Secundo *et al.*, 2019). Through TM activities, universities engage in sustainable, inclusive development and territorial competitiveness by interacting with a wide range of subjects far beyond its students and reference scientific communities (Rinaldi *et al.*, 2018; Secundo *et al.*, 2016). Several researchers also theorized the existence of a fourth mission, which refers to the role of universities in contributing to the development of economies and societies, addressing real-world issues, and co-developing the sustainability paradigm through multi-stakeholder partnerships (Bienkowska & Klofsten, 2012; Trencher *et al.*, 2014).

Given the above, it can be seen how the TM transforms universities into key actors of local and/or global ecosystems that are based on innovation and knowledge. TM activities vary a lot according to the specific characteristics of each university, territory in which it is located, or intricate nature of relations it has the possibility (or capacity) to build in the entrepreneurial and innovation ecosystems of which it is part. This situation often produces effects that show up not as the direct consequence of a university activity or with delays since they could depend on different factors. Moreover, a second-order problem comes into play due to the intertwined relationships among the three academic missions. In fact, universities usually have scarce resources to invest in performing the variegated academic activities and tensions could arise when those resources need to be allocated among the different missions (Cosenz, 2014). In addition to that, each involved actor has different logics that can be competing with each other or not, leading to possible unintended consequences and further competition between the various missions (or within the same mission) and the multifaceted university's role (Ricciardi *et al.*, 2020). Thus, due to the variety of actors and interests that take part in them, entrepreneurial universities can be seen as hybrid organizations influenced by different institutional logics that can be contradictory to each other or not. Following this idea, those organizations are immersed in a complex field of social forces that the literature on institutional studies calls organizational field (Wooten & Hoffman, 2008). So, different institutional logics influence people's behaviors and, consequently, different managerial approaches.

In the face of the challenges ahead, such as the rise of the data-driven economy, the importance of universities' TM is perceived as steadily growing (Wakkee *et al.*, 2018). This shift has led to the pressing necessity of adopting a participatory, comprehensive, and systemic approach for assessing universities' performances, thus overcoming the mainstream models that are mainly built for evaluating their teaching and research activities and capturing their short-term outcomes (Cosenz, 2014).

In this study, leveraging the institutional logics theory and based on the typology of institutional logics and KPIs developed in Forliano *et al.* (2022), a system dynamics (SD) causal loop diagram (CLD) was developed to capture the systemic and interconnected nature of entrepreneurial universities' TM activities. Indeed, SD is a promising approach that is gaining increasing attention from scholars to build models able to guide decision-making processes in both private and public organizations (Bivona & Cosenz, 2021; Forliano *et al.*, 2020), identifying the holistic implications of complex systems characterized by the presence of delays, nonlinearities, and multiple feedback loops (Bianchi, 2016; Forrester, 1958; Sterman, 2000). In this way, the limits of traditional, linear models (and subsequent key performance indicators, KPIs) used for assessing universities' performances are highlighted and a possible strategy to overcome such limits is proposed.

2. Literature review

According to recent advances in neo-institutional theory, society is made up of inter-institutional systems in which several institutional orders coexist at the same time (Qiu *et al.*, 2019). Hence, each of these institutional orders may affect people and organizations in various ways. Arising from this theoretical underpinning, the concept of institutional logics can be defined as “the socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality” (Thornton & Ocasio, 1999, p. 804). According to institutional logics, the organizational field in which an organization is submerged mediates the relationship between society and a social organization (Royston Greenwood & Suddaby, 2006; Wooten & Hoffman, 2008)

An organizational field is defined as “a community of organizations that takes part of a common meaning system and whose participants interact more frequently and fatefully with one another than with actors outside the field” (W. R. Scott, 1995, p. 56). Thus, it comprises governmental

entities, professional and trade organizations, financing sources, special interest groups, as well as any other constituent that may impact the organization (Powell & DiMaggio, 2012). As a result, investigating these areas is critical for identifying, comprehending, and abstracting the expectations and behaviors that distinguish a certain organization (Pierce *et al.*, 2017).

According to recent studies, organizational fields may be defined by the existence of various institutional logics, which can be complementary (Kraatz & Block, 2017) or conflicting (Royston Greenwood *et al.*, 2011) to each other. As a consequence, due to the variegated number of actors and institutional logics that characterize them, different studies have investigated logic multiplicity in universities (e.g., Ezzamel *et al.*, 2012; Guerrero, Urbano, Fayolle, *et al.*, 2016; Ricciardi *et al.*, 2020). Thus, this research aims to extend the knowledge about how entrepreneurial universities react to logics multiplicity at the organizational-field level, as well as how this logic diversity is represented in their KPIs and different academic missions.

3. Materials and methods

An SD qualitative model was developed in this study to identify the intertwined relationships that characterize the three academic missions. Indeed, SD (Forrester, 1958) represents an effective tool to frame and visualize organizational processes, as well as finding the patterns and causal relationships that characterize them. Moreover, it can also help in formulating a richly explanatory behavioral model capable of reproducing the dynamic problem of concern (Maani & Cavana, 2007; Richardson & Andersen, 2010). With this aim, a CLD was developed, emphasizing connections between variables that may be positive (in blue) or negative (in red) and that result in delineating vicious or virtuous closed feedback loops (Forrester, 1958; Sterman, 2000). Hence, the feedback loop is self-reinforcing (indicated with an “R”) if each variable is connected by an even number of negative connections (or none). The loop is self-balancing (indicated with a “B”) if an odd number of negative connections links each variable. In contrast, the word “closed” should apply to causally closed loops and should not be confused with its meaning in systems theory, which refers to systems that do not exchange information with other systems (Richardson, 2011, p. 241). The resultant linkages form a system, which Wikipedia defines as “a group of interacting or interrelated elements that act according to a set of rules to form a unified whole”. Thus, system elements influence one another across time through diachronic or synchronous interrelationships (i.e., the feedback loops) (Sterman, 2000).

In particular, the different variables included in the CLD and the overarching institutional logics that characterize them were retrieved from the typology developed in Forliano *et al.* (2022), who developed an exploratory cross-country comparative case study (Yin, 2009). In particular, the authors investigated three internationally recognized entrepreneurial universities (i.e., the University of Milano Bicocca, the University of Birmingham, and the University of Hong Kong). Hence, the institutional logics characterizing those universities were identified, triangulating the insights emerging from in-depth semi-structured interviews (Bryman & Bell, 2011; Silverman, 2013) and the analysis of secondary data sources (Eisenhardt & Graebner, 2007). The interview, ten in total, were conducted with professors and heads of research and TM activities in those universities. The secondary data were the strategic and/or performance plans of the three institutions. Such analysis led to the identification of nine institutional logics, three for each academic mission, as portrayed in Table 1. In brief, the logics individuated are: (1) inclusiveness, vocational, and excellence logic as regards the first mission; (2) focalization, materiality, and excellence as regards the second mission; (3) dissemination, translational, and entrepreneurial concerning the TM.

To corroborate what resulted from the typology developed by Forliano *et al.* (2022), the analysis was accompanied by extensive research in the scientific literature about the topic and investigating the rankings and/or guidelines developed by some of the most important national and international organizations. These organizations are: (1) the Italian National Agency for the Evaluation of Universities and Research Institutes (i.e., ANVUR); (2) ShanghaiRanking Consultancy, which develops the “Academic Ranking of World Universities”; (3) E3M, research project financed by the European Commission and ended in 2011 with the development of the “European Indicators and Ranking Methodology for University Third Mission”; (4) QuacquarelliSymonds, which annually releases the “World University Ranking”; (5) Times Higher Education, which is famous for the “World University Rankings”; (6) U-Multirank, independent consortium implemented on the initiative of the European Commission to rank international higher education institutions. In this way, the strategic resources and the KPIs used to assess the universities’ activities, objectives, and performance in pursuing their three academic missions were identified and leveraged to build a CLD.

Table 1. The nine institutional logics associated with each of the three academic missions as identified in Forliano *et al.* (2022).

Academic Mission	Institutional Logic	Definition
First mission (teaching)	Inclusiveness logic	Providing a higher education to as many students as possible
	Vocational logic	Transferring valuable knowledge to students and ensuring their employability
	Excellence logic	Attracting talented and skilled people and promoting the development of human capital
Second mission (researching)	Focalization logic	Becoming a reference point, at both regional and international levels, on some specific research areas
	Materiality logic	Contributing to solve real world problems through the researching activity
	Excellence logic	Becoming relevant in terms of publication quality and building international networks
Third mission	Dissemination logic	Disseminating knowledge outside the boundaries of academia
	Translational logic	Translating researching and other capabilities into addressing real-world issues
	Entrepreneurial logic	Fostering innovation and co-developing the sustainability paradigm through multi-stakeholder partnerships for contributing to the development of economies and societies

Source: Authors' own elaboration

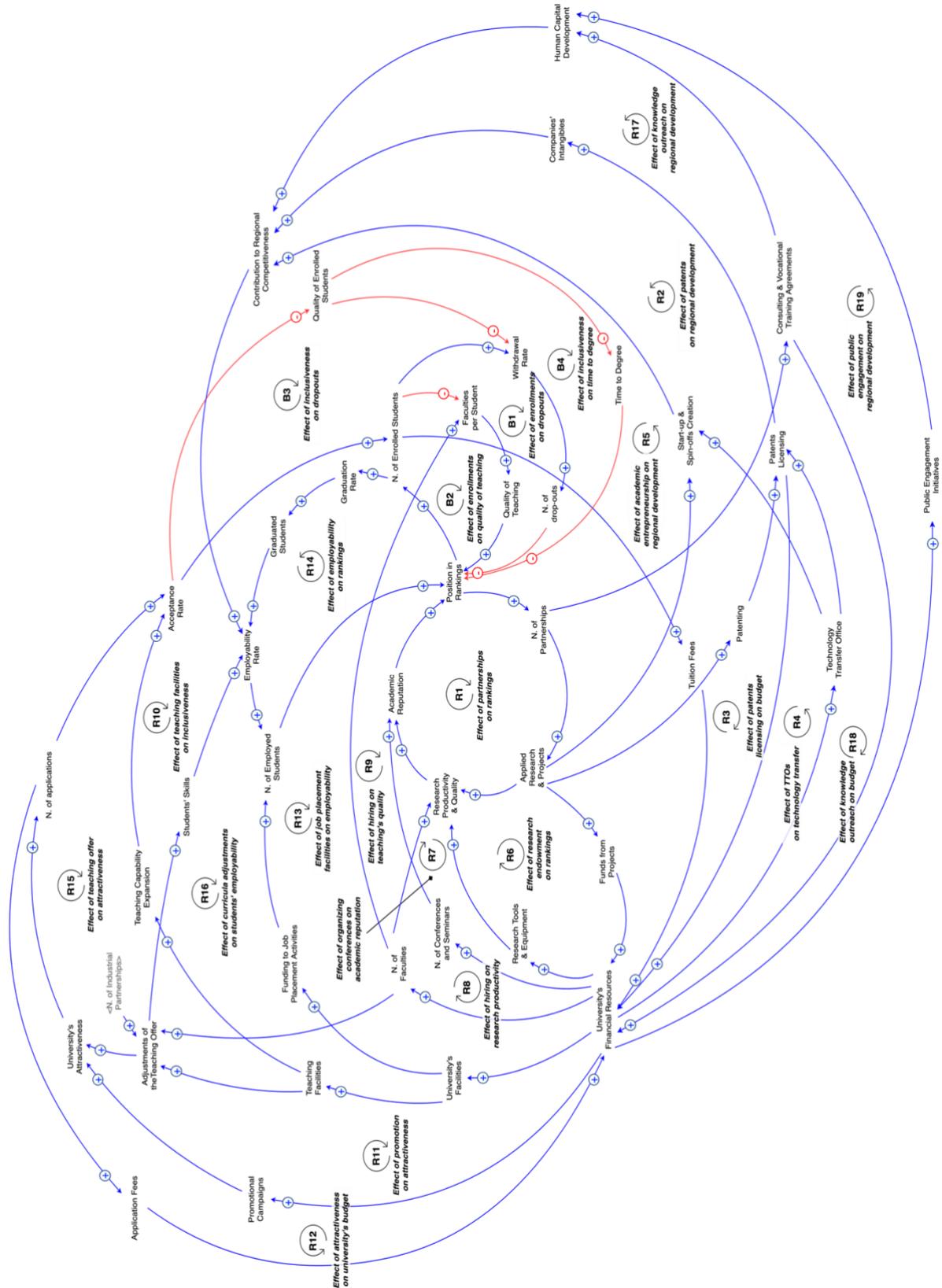
4. Findings and Discussions

In this study, a CLD was developed to represent the intertwined complexity that characterizes the three academic missions as performed by entrepreneurial universities (Fig. 1). In the next sub-paragraphs, the different feedback loops characterizing the diagram are discussed in detail.

4.1 The interplays between basic and applied research

Due to the transition toward an entrepreneurial model, universities have increasingly positioned themselves as equal partners in their relationships with industry and government. Hence, each of these organizations can be considered as a helix of the so-called triple-helix model (Etzkowitz & Leydesdorff, 2000). In this model, knowledge creation and transfer are spurred by the interactions among each of the three helices (government, industry, and university), resulting in an increase in the amount of applied research able to foster regional economic and

Figure 1. The CLD of the three academic missions and their different institutional logics.



Source: Authors' own elaboration

societal growth (Clark, 1998; Etzkowitz, 2003a). In this sense, universities increasingly play a crucial role in managing innovation in modern knowledge-driven societies (Cerver Romero *et al.*, 2020; Iqbal, 2021). This new function resulted in an academic entrepreneurial spirit that emerged in universities in coexistence with teaching and basic research missions (Etzkowitz, 1998). For example, in Kirs *et al.* (2017) it was found that academics involved in conducting sponsored research aimed at developing new industrial solutions performed well in obtaining financial resources from both private and public sources without jeopardizing their performance in pursuing the two other academic missions. Hence, four reinforcing loops have been identified in relation to the interplays between basic and applied research, namely between the three researching institutional logics (i.e., focalization, materiality, and excellence) and the TM translational and entrepreneurial logics.

When the university establishes a new partnership with third parties, it will increase the number of conducted projects and the amount of applied research. This increases both research productivity and quality (Hughes *et al.*, 2005; Kongsted *et al.*, 2017), as well as the university's reputation and its position in academic rankings.

This will enable the university to attract even more external partners in the future, leading to deeper research interactions (R1 – *Effect of partnerships on rankings*). Similarly, more applied research also means higher capabilities of the university to deal with knowledge commercialization and technology transfer activities (Etzkowitz, 2017; Perkmann *et al.*, 2013). Hence, a part of the university's applied research would result in a patenting and licensing activity that can foster companies' endowments of intangible assets and their competitiveness (Daim *et al.*, 2006). This, over the long term would develop the territory in which the company is located and increase the employment rate. Thus, a more robust regional economy results in higher chances for students to find a job, which represents a crucial KPI in academic rankings (R2 – *Effect of patents on regional development*). Moreover, when knowledge is commercialized through patents and the university is able to sell or license them, this results in financial returns (R3 – *Effect of patents licensing on budget*) that can be used to build or empower specific technology transfer offices (TTOs) able to strengthen even more the outcomes of such activity (R4 – *Effect of TTOs on technology transfer*) (Battaglia *et al.*, 2017). A similar path can be observed if the results of applied research programs lead to creating academic start-ups or spin-offs (R5 – *Effect of academic entrepreneurship on regional development*).

However, an increase in the amount of applied research also results in more funds received by industrial partners to conduct this sponsored activity. Hence, more budget can be invested in research tools and equipment (Thursby & Thursby, 2011), boosting scholars' ability to perform new relevant research and the university's capability to conduct basic research (Philpott *et al.*, 2011). Thus, with a delay, the academic reputation would increase together with the possibility to attract third parties for establishing new partnerships (R6 – *Effect of research endowment on rankings*). Moreover, more funding also gives the university the ability to organize scientific conferences and seminars, giving the institution more visibility and increasing its reputation in specific research sub-fields (R7 – *Effect of organizing conferences on academic reputation*). In addition to that, more budget could mean hiring new researchers, which can further increase research productivity (R8 – *Effect of hiring on research productivity*). Especially the possibility to obtain more funding was proven to be the primary driver for spurring scholars to establish new partnerships in several studies (e.g., (Iorio *et al.*, 2017; Ramos-Vielba *et al.*, 2016)). Indeed, such activity is still not well institutionalized and no specific KPIs exist to promote careers' advancements when new partnerships are established, leaving such activity to a voluntary basis and faculties' individual relationships (Galán-Muros *et al.*, 2017; Orazbayeva & Plewa, 2020).

4.2 The interplays between teaching and reputation

Besides producing and disseminating knowledge, one of the typical missions of universities is to attract and develop human capital. Hence, allocating part of the university's budget to hire new scholars not only results in improving its performance on conducting research but also on the quality of teaching (R9 – *Effect of hiring on teaching's quality*). Indeed, increasing the rate of faculties per student is commonly recognized as one of the key drivers to increase such KPI, which highly impacts the university's position in academic rankings (i.e., teaching excellence logic) (Quacquarelli Symonds, 2021). Moreover, part of the university's budget can be invested to expand its facilities and offer teaching opportunities to more students, increasing the acceptance rate (i.e., teaching inclusiveness logic). Indeed, universities are traditionally required to foster social cohesion and integration, providing higher education to as many students as possible (European Commission, 2005; Scott, 2001). So, an increase in the number of enrolled students leads to an increase in the university's financial resources thanks to the collected tuitions fees (R10 – *Effect of teaching facilities on inclusiveness*). Similarly, if the

university's budget is invested in promotional campaigns to increase the university's attractiveness, this would mean more students' applications. Thus, financial returns would derive from that part of students passing the admission phase and paying the tuition fees (R11 – *Effect of promotion on attractiveness*), as well as directly from the application fees paid to sustain the admission test (R12 – *Effect of attractiveness on university's budget*).

On the other hand, increasing the number of enrolled students can lead to four unintended consequences over the medium to long term. First, a higher number of enrolled students would increase the withdrawal rate and a lower reputation due to an increase in the number of dropouts (B1 – *Effect of enrollments on dropouts*). Second, it will decrease the KPI of faculties per student and, so, the quality of teaching (B2 – *Effect of enrollments on quality of teaching*). Third, such scenarios can be exacerbated by an increase in the admission rate. Indeed, if such rate is increased at the expenses of less rigorous admission criteria (Wilkinson *et al.*, 2007), the university reputation would decrease over the long term due to an increase in the withdrawal rate (B3 – *Effect of inclusiveness on dropouts*) and an increase in students' average time to degree (B4 – *Effect of inclusiveness on time to degree*).

4.3 The interplays between teaching and regional development

In addition to that, entrepreneurial universities foster human capital development in two ways, directly or indirectly fostering their students' employability (Cunningham *et al.*, 2017; Zollo *et al.*, 2017). First, they need to set up procedures and facilities that directly favor students' entry into the labor market (Franco *et al.*, 2019; Zollo *et al.*, 2017). Thus, it can be observed that a relevant role is played by job placement offices, which bridge between skilled students and firms looking for interns or employees. So, they increase students' probability to be employed, fostering the university's reputation and its position in the rankings (R13 – *Effect of job placement facilities on employability*). Subsequently, a higher reputation would also lead to an increase in the number of enrolled students, who will in part graduate and find a job through the effect of an employability rate (R14 – *Effect of employability on rankings*), here considered in limitation to the endogenous variables and excluding all the other factors that could affect it but are outside the boundaries of the system.

Second, they must ensure that their students possess relevant knowledge and capabilities, constantly aligning academic curricula to companies' needs (Grimaldi & Fernandez, 2017; Plewa *et al.*, 2015). Hence, investing in new facilities and faculties can lead to adjustments of

the teaching offer (e.g., activating new courses). On the one hand, this increases the university's attractiveness and the number of applications (R15 – *Effect of teaching offer on attractiveness*). On the other hand, it empowers students' skills and capabilities and increases the employability rate (R16 – *Effect of curricula adjustments on students' employability*). In this sense, supporting the societal and economic development of the territory in which they are located (i.e., TM entrepreneurial logic) universities also pursue their teaching vocational and inclusiveness logics.

However, the TM includes every activity performed outside the university's boundaries, involving different stakeholders than the scientific community or students (Rinaldi *et al.*, 2018; Secundo *et al.*, 2016). Hence, entrepreneurial universities are also actively involved in knowledge outreach through continuing education and public engagement activities (E3M, 2010). So, on the one hand, the higher the number of partnerships, the higher the number of consulting and vocational training agreements. This increases the university's contribution to regional competitiveness through capabilities' empowerments of other entrepreneurs or their employees (Klofsten & Jones-Evans, 2000; Urbano & Guerrero, 2013). In the end, the university's reputation and its position in the academic rankings increase as well (R17 – *Effect of knowledge outreach on regional development*). Moreover, such agreements usually generate private funding that increases the university's financial resources (R18 – *Effect of knowledge outreach on budget*). On the other hand, knowledge spillover and human capital development can occur thanks to public engagement initiatives organized by entrepreneurial universities (e.g., divulgating scientific results, participating in the cultural life, developing policies, providing community services) (Schoen, 2006; Vargiu, 2014). Hence, another reinforcing loop was identified in relation to the development of human capital resulting from such initiatives and the university's contribution to regional competitiveness (R19 – *Effect of public engagement on regional development*). In this sense, it can be said that entrepreneurial universities act as local agents that drive ecosystem changes stimulating the development of entrepreneurship capital (Audretsch, 2014b; Guerrero & Urbano, 2012).

In the end, it can be seen how pursuing a TM's dissemination logic emerged as reinforcing the entrepreneurial university's capability to pursue its entrepreneurial logic, which further results in better outcomes in conducting the other two missions.

5. Implications, limitations, and further steps

The study provides some interesting practical implications. First, it shows how an SD approach should be implemented to assess entrepreneurial universities' performances and guide policy-makers' decisions. So, the different feedback loops help determine the leverage points that can be manipulated to balance the three missions properly. Specifically, it is interesting to note that the admission policies are one of the critical drivers for the overall system. Second, to limit the possible conflicting interactions among the three academic missions and the different logics they refer to, the model needs to be constantly updated. Hence, this study suggests to universities' heads the relevance of identifying an organizational unit that should constantly gather and update the data necessary to keep the model running.

In addition to that, the article provides some interesting contributions also to theory. First, to the best of the authors' knowledge, this is one of the first studies that propose an SD approach for considering the performance of entrepreneurial universities' TM and their impact on the management of common resources (e.g., local competitiveness or a territory's human capital). Hence, it answers the call of adopting holistic approaches to investigate such phenomena (Ricciardi *et al.*, 2020). Second, this research contributes to the neo-institutional theory, and in particular, to the institutional logics approach, analyzing a context in which more than two logics are at stake. Indeed, to date, most of the studies addressed the combination of two reciprocally conflicting or complementary logics (Greenwood *et al.*, 2011; Guerrero *et al.*, 2016), ignoring the existence of several logics (i.e., logics multiplicity) in complex and dynamic contexts such as the academic one. Conversely, entrepreneurial universities are asked to pursue three different missions that can be reciprocally complementary or conflicting, resulting in paradoxical tensions and competition around key resources allocation if knowledge management practices (i.e., knowledge creation, dissemination, and outreach) are not effectively governed.

However, this study is not free from limitations. The model was created starting from a typology of different institutional logics, which should still be enriched and validated. Moreover, the CLD was developed based on data gathered from the literature and national and international academic rankings. Collecting primary data and creating a quantitative model (i.e., a stock and flow diagram) should be the foundation for future research. Indeed, stocks and flow diagrams allow for graphical representation of the relationships that exist among the strategic resources of the system (i.e., stocks) and the drivers that determine their accumulation or depletion paths

(i.e., flows). Thus, they aid in identifying the critical variables required to develop a comprehensive behavioral model capable of replicating the dynamic issue of concern. Furthermore, additional research should be conducted to enrich and validate this conceptual model by introducing a taxonomy of KPIs for measuring both economic and social performance, as well as determining the model's value in a wide range of practical applications, including simulating its application with various types of stakeholder engagements and policies.

Reference list

- Audretsch, D. B. (2014). From the entrepreneurial university to the university for the entrepreneurial society. *Journal of Technology Transfer*, 39(3), 313–321. <https://doi.org/10.1007/s10961-012-9288-1>
- Battaglia, D., Landoni, P., & Rizzitelli, F. (2017). Organizational structures for external growth of University Technology Transfer Offices: An explorative analysis. *Technological Forecasting and Social Change*, 123, 45–56. <https://doi.org/10.1016/j.techfore.2017.06.017>
- Bianchi, C. (2016). *Dynamic Performance Management* (Vol. 1). Springer International Publishing. <https://doi.org/10.1007/978-3-319-31845-5>
- Bienkowska, D., & Klofsten, M. (2012). Creating entrepreneurial networks: academic entrepreneurship, mobility and collaboration during PhD education. *Higher Education*, 64(2), 207–222. <https://doi.org/10.1007/s10734-011-9488-x>
- Bivona, E., & Cosenz, F. (2021). Designing a Multi-Sided Platform business model assessment framework: a Dynamic Performance Management perspective. *Systems Research and Behavioral Science*, 38(1), 93–107. <https://doi.org/10.1002/sres.2665>
- Bryman, A., & Bell, E. (2011). *Business research methods*. Oxford University Press. https://books.google.it/books/about/Business_Research_Methods_3e.html?id=YnCcAQAQBAJ&redir_esc=y
- Cerver Romero, E., Ferreira, J. J. M., & Fernandes, C. I. (2020). The multiple faces of the entrepreneurial university: a review of the prevailing theoretical approaches. *The Journal of Technology Transfer* 2020 46:4, 46(4), 1173–1195. <https://doi.org/10.1007/S10961-020-09815-4>
- Clark, B. R. (1998). The entrepreneurial university: Demand and response. *Tertiary Education and Management*, 4(1), 5–16. <https://doi.org/10.1007/BF02679392>
- Cosenz, F. (2014). A Dynamic Viewpoint to Design Performance Management Systems in Academic Institutions: Theory and Practice. *International Journal of Public Administration*, 37(13), 955–969. <https://doi.org/10.1080/01900692.2014.952824>
- Cunningham, J. A., Guerrero, M., & Urbano, D. (2017). Entrepreneurial universities: Overview, reflections, and future research agendas. In *The World Scientific Reference on Entrepreneurship* (Vols 1–4, pp. 3–20). <https://doi.org/10.1142/9874>
- Daim, T. U., Rueda, G., Martin, H., & Gerdri, P. (2006). Forecasting emerging technologies: Use of bibliometrics and patent analysis. *Technological Forecasting and Social Change*, 73(8), 981–1012. <https://doi.org/10.1016/j.techfore.2006.04.004>

- E3M. (2010). *Needs and constraints analysis of the three dimensions of third mission activities*. [https://scholar.google.com/scholar_lookup?title=Needs and constraints analysis of the three dimensions of third mission activities&publication_year=2010&author=E3M](https://scholar.google.com/scholar_lookup?title=Needs+and+constraints+analysis+of+the+three+dimensions+of+third+mission+activities&publication_year=2010&author=E3M)
- Eisenhardt, K. M., & Graebner, M. E. (2007). Theory building from cases: Opportunities and challenges. *Academy of Management Journal*, 50(1), 25–32. <https://doi.org/10.5465/AMJ.2007.24160888>
- Etzkowitz, H. (2003). Innovation in innovation: The Triple Helix of university-industry-government relations. *Social Science Information*, 42(3), 293–337. <https://doi.org/10.1177/05390184030423002>
- Etzkowitz, Henry. (1998). The norms of entrepreneurial science: Cognitive effects of the new university-industry linkages. *Research Policy*, 27(8), 823–833. [https://doi.org/10.1016/S0048-7333\(98\)00093-6](https://doi.org/10.1016/S0048-7333(98)00093-6)
- Etzkowitz, Henry. (2017). Innovation Lodestar: The entrepreneurial university in a stellar knowledge firmament. *Technological Forecasting and Social Change*, 123, 122–129. <https://doi.org/10.1016/j.techfore.2016.04.026>
- Etzkowitz, Henry, & 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. [https://doi.org/10.1016/S0048-7333\(99\)00055-4](https://doi.org/10.1016/S0048-7333(99)00055-4)
- European Commission. (2005). *European Universities: Enhancing Europe’s Research Base*. https://scholar.google.com/scholar_lookup?hl=en&publication_year=2005c&author=European+Commission+%28EC%29&title=European+Universities%3A+Enhancing+Europe%27s+research+base
- Ezzamel, M., Robson, K., & Stapleton, P. (2012). The logics of budgeting: Theorization and practice variation in the educational field. *Accounting, Organizations and Society*, 37(5), 281–303.
- Forliano, C., De Bernardi, P., Bertello, A., & Temperini, V. (2020). Innovating business processes in public administrations: towards a systemic approach. *Business Process Management Journal*. <https://doi.org/10.1108/BPMJ-12-2019-0498>
- Forliano, C., De Bernardi, P., Bertello, A., & Ricciardi, F. (2022). Institutional Logics to Unveil Entrepreneurial Universities’ Performances: A Cross-Country Comparative Study. In E. Caperchione & C. Bianchi (Eds.), *University Governance and Performance Management. Current Research and Practice* (pp. 179–196). Springer Nature. https://doi.org/10.1007/978-3-030-85698-4_9
- Forrester, J. W. (1958). Industrial Dynamics: A Major Breakthrough for Decision Makers. *Harvard Business Review*, 36(4), 37–66. https://doi.org/10.1007/978-3-642-27922-5_13
- Franco, M., Silva, R., & Rodrigues, M. (2019). Partnerships between higher education institutions and firms: The role of students’ curricular internships. *Industry and Higher Education*, 33(3), 172–185. <https://doi.org/10.1177/0950422218819638>
- Galán-Muros, V., van der Sijde, P., Groenewegen, P., & Baaken, T. (2017). Nurture over nature: How do European universities support their collaboration with business? *Journal of Technology Transfer*, 42(1), 184–205. <https://doi.org/10.1007/s10961-015-9451-6>
- Greenwood, Royston, Raynard, M., Kodeih, F., Micelotta, E. R., & Lounsbury, M. (2011). Institutional complexity and organizational responses. *Academy of Management Annals*, 5(1), 317–371. <https://doi.org/10.1080/19416520.2011.590299>

- Greenwood, Royston, & Suddaby, R. (2006). Institutional Entrepreneurship In Mature Fields: The Big Five Accounting Firms. *Https://Doi.Org/10.5465/Amj.2006.20785498*, 49(1), 27–48. <https://doi.org/10.5465/AMJ.2006.20785498>
- Grimaldi, D., & Fernandez, V. (2017). The alignment of University curricula with the building of a Smart City: A case study from Barcelona. *Technological Forecasting and Social Change*, 123, 298–306. <https://doi.org/https://doi.org/10.1016/j.techfore.2016.03.011>
- Guerrero, M., & Urbano, D. (2012). The development of an entrepreneurial university. *Journal of Technology Transfer*, 37(1), 43–74. <https://doi.org/10.1007/s10961-010-9171-x>
- Guerrero, M., Urbano, D., Fayolle, A., Klofsten, M., & Mian, S. (2016). Entrepreneurial universities: emerging models in the new social and economic landscape. *Small Business Economics*, 47(3), 551–563. <https://doi.org/10.1007/s11187-016-9755-4>
- Hughes, A., Lawson, C., Kitson, M., Salter, A., Bullock, A., & Hughes, R. B. (2005). *The Changing State of Knowledge Exchange 1 UK Academic Interactions with External Organisations*. https://eprints.lancs.ac.uk/id/eprint/145906/1/NCUB_The_Changing_State_of_Knowledge_Exchange_Feb16_WEB.pdf
- Iorio, R., Labory, S., & Rentocchini, F. (2017). The importance of pro-social behaviour for the breadth and depth of knowledge transfer activities: An analysis of Italian academic scientists. *Research Policy*, 46(2), 497–509. <https://doi.org/10.1016/J.RESPOL.2016.12.003>
- Iqbal, A. (2021). Innovation speed and quality in higher education institutions : the role of knowledge management enablers and knowledge sharing process. *Journal of Knowledge Management*, 1–27. <https://doi.org/10.1108/JKM-07-2020-0546>
- Kirs, M., Karo, E., & Lumi, P. (2017). Strategic behaviour of research groups within the entrepreneurial university policy rhetoric: The Estonian biotechnology sector. *Science and Public Policy*, 44(6), 802–820. <https://doi.org/10.1093/scipol/scx015>
- Klofsten, M., & Jones-Evans, D. (2000). Comparing Academic Entrepreneurship in Europe - The Case of Sweden and Ireland. *Small Business Economics*, 14(4), 299–309. <https://doi.org/10.1023/A:1008184601282>
- Kongsted, H. C., Tartari, V., Fellow, P., Cannito, D., Norn, M. T., Consultant, S., & Wohlert, J. (2017). *University Researchers' Engagement with Industry, the Public Sector and Society: Results from a 2017 Survey of University Researchers in Denmark*. <https://research.cbs.dk/en/publications/university-researchers-engagement-with-industry-the-public-sector>
- Kraatz, M. S., & Block, E. S. (2017). Institutional pluralism revisited. *The SAGE Handbook of Organizational Institutionalism*, 2, 635–662.
- Maani, K., & Cavana, R. Y. (2007). *Systems thinking, system dynamics : managing change and complexity* (2nd ed). Pearson Prentice Hall.
- Orazbayeva, B., & Plewa, C. (2020). Academic motivations to engage in university-business cooperation: a fuzzy set analysis. *Studies in Higher Education*. <https://doi.org/10.1080/03075079.2020.1761784>

- Perkmann, M., Tartari, V., McKelvey, M., Autio, E., Broström, A., D'Este, P., Fini, R., Geuna, A., Grimaldi, R., Hughes, A., Krabel, S., Kitson, M., Llerena, P., Lissoni, F., Salter, A., & Sobrero, M. (2013). Academic engagement and commercialisation: A review of the literature on university-industry relations. *Research Policy*, 42(2), 423–442. <https://doi.org/10.1016/j.respol.2012.09.007>
- Philpott, K., Dooley, L., Oreilly, C., & Lupton, G. (2011). The entrepreneurial university: Examining the underlying academic tensions. *Technovation*, 31(4), 161–170. <https://doi.org/10.1016/j.technovation.2010.12.003>
- Pierce, P., Ricciardi, F., & Zardini, A. (2017). Smart cities as organizational fields: A framework for mapping sustainability-enabling configurations. *Sustainability*, 9(9), 1506.
- Plewa, C., Galán-Muros, V., & Davey, T. (2015). Engaging business in curriculum design and delivery: a higher education institution perspective. *Higher Education*, 70(1), 35–53. <https://doi.org/10.1007/s10734-014-9822-1>
- Powell, W. W., & DiMaggio, P. J. (2012). *The new institutionalism in organizational analysis*. University of Chicago press.
- Qiu, Y., Chen, H., Sheng, Z., & Cheng, S. (2019). Governance of institutional complexity in megaproject organizations. *International Journal of Project Management*, 37(3), 425–443. <https://doi.org/10.1016/J.IJPROMAN.2019.02.001>
- Quacquarelli Symonds. (2021). *QS World University Rankings - Methodology*. <https://www.topuniversities.com/qs-world-university-rankings/methodology>
- Ramos-Vielba, I., Sánchez-Barrioluengo, M., & Woolley, R. (2016). Scientific research groups' cooperation with firms and government agencies: motivations and barriers. *Journal of Technology Transfer*, 41(3), 558–585. <https://doi.org/10.1007/s10961-015-9429-4>
- Ricciardi, F., Bernardi, P. De, Forliano, C., & Franco, M. (2020). Institutional Logics Analysis for Enabling Collaborative DPM Processes: Universities' Third Mission Performance as an Illustrative Example. In *Enabling Collaborative Governance through Systems Modeling Methods* (pp. 277–295). Springer, Cham. https://doi.org/10.1007/978-3-030-42970-6_13
- Richardson, G P. (2011). Reflections on the foundations of system dynamics. *System Dynamics Review*, 27(3), 219–243. <https://doi.org/10.1002/sdr.462>
- Richardson, George P., & Andersen, D. F. (2010). *Systems Thinking, Mapping, and Modeling in Group Decision and Negotiation*. 313–324. https://doi.org/10.1007/978-90-481-9097-3_19
- Rinaldi, C., Cavicchi, A., Spigarelli, F., Lacchè, L., & Rubens, A. (2018). Universities and smart specialisation strategy. *International Journal of Sustainability in Higher Education*, 19(1), 67–84. <https://doi.org/10.1108/IJSHE-04-2016-0070>
- Schoen, A. et al. (2006). *Strategic management of university research activities: Methodological guide*.
- Scott, P. (2001). Triumph and Retreat: British Higher Education at the end of the Century. *The State of UK Higher Education: Managing Change and Diversity*, 186–205.
- Scott, W. R. (1995). *Institutions and Organizations* (Issue 2). Thousand Oaks: Sage.
- Secundo, G, Ndou, V., Del Vecchio, P., & De Pascale, G. (2019). Knowledge management in entrepreneurial universities: A structured literature review and avenue for future research agenda. *Management Decision*. <https://doi.org/10.1108/MD-11-2018-1266>

- Secundo, Giustina, Dumay, J., Schiuma, G., & Passiante, G. (2016). Managing intellectual capital through a collective intelligence approach: An integrated framework for universities. *Journal of Intellectual Capital*, 17(2), 298–319. <https://doi.org/10.1108/JIC-05-2015-0046>
- Silverman, D. (2013). *Doing Qualitative Research: A Practical Handbook*. Sage Publications.
- Sterman, J. (2000). *Business dynamics. Systems Thinking and modeling for a complex world*. Irwin/McGraw Hill.
- Thornton, P. H., & Ocasio, W. (1999). Institutional Logics and Historical Contingency Power in Organizations. *American Journal of Sociology*, 105(3), 801–843. <https://doi.org/10.1086/210361>
- Thursby, J. G., & Thursby, M. C. (2011). Faculty participation in licensing: Implications for research. *Research Policy*, 40(1), 20–29. <https://doi.org/10.1016/J.RESPOL.2010.09.014>
- Trencher, G., Yarime, M., McCormick, K. B., Doll, C. N. H., & Kraines, S. B. (2014). Beyond the third mission: Exploring the emerging university function of co-creation for sustainability. *Science and Public Policy*, 41(2), 151–179. <https://doi.org/10.1093/scipol/sct044>
- Urbano, D., & Guerrero, M. (2013). Entrepreneurial Universities: Socioeconomic Impacts of Academic Entrepreneurship in a European Region. *Gender and Society*, 27(1), 40–55. <https://doi.org/10.1177/0891242412471973>
- Vargiu, A. (2014). Indicators for the Evaluation of Public Engagement of Higher Education Institutions. *Journal of the Knowledge Economy*, 5(3), 562–584. <https://doi.org/10.1007/s13132-014-0194-7>
- Wakkee, I., van der Sijde, P., Vaupell, C., & Ghuman, K. (2018). The university's role in sustainable development: Activating entrepreneurial scholars as agents of change. *Technological Forecasting and Social Change*. <https://doi.org/10.1016/j.techfore.2018.10.013>
- Wilkinson, R. B., Taylor, J. S., Peterson, A., De, M., & Machado-Taylor, L. (2007). *A Practical Guide to Strategic Enrollment Management Planning*. www.educationalpolicy.org
- Wooten, M., & Hoffman, A. J. (2008). Organizational Fields Past, Present and Future. In R. Greenwood, C. Oliver, K. Sahlin, & R. Suddaby (Eds.), *The Sage Handbook of organizational institutionalism*. Sage. <https://deepblue.lib.umich.edu/handle/2027.42/117581>
- Yin, R. K. (2009). Case Study Research: Design and Methods. Essential guide to qualitative methods in organizational research. In I. SAGE Publications (Ed.), *SAGE Publications, Inc.* (Vol. 5). <https://doi.org/10.1109/CALCON.2017.8280775>
- Zollo, L., Laudano, M. C., Ciappei, C., & Zampi, V. (2017). Factors affecting universities' ability to foster students' entrepreneurial behaviour: An empirical investigation. *Journal of Management Development*, 36(2), 268–285. <https://doi.org/10.1108/JMD-06-2016-0093>

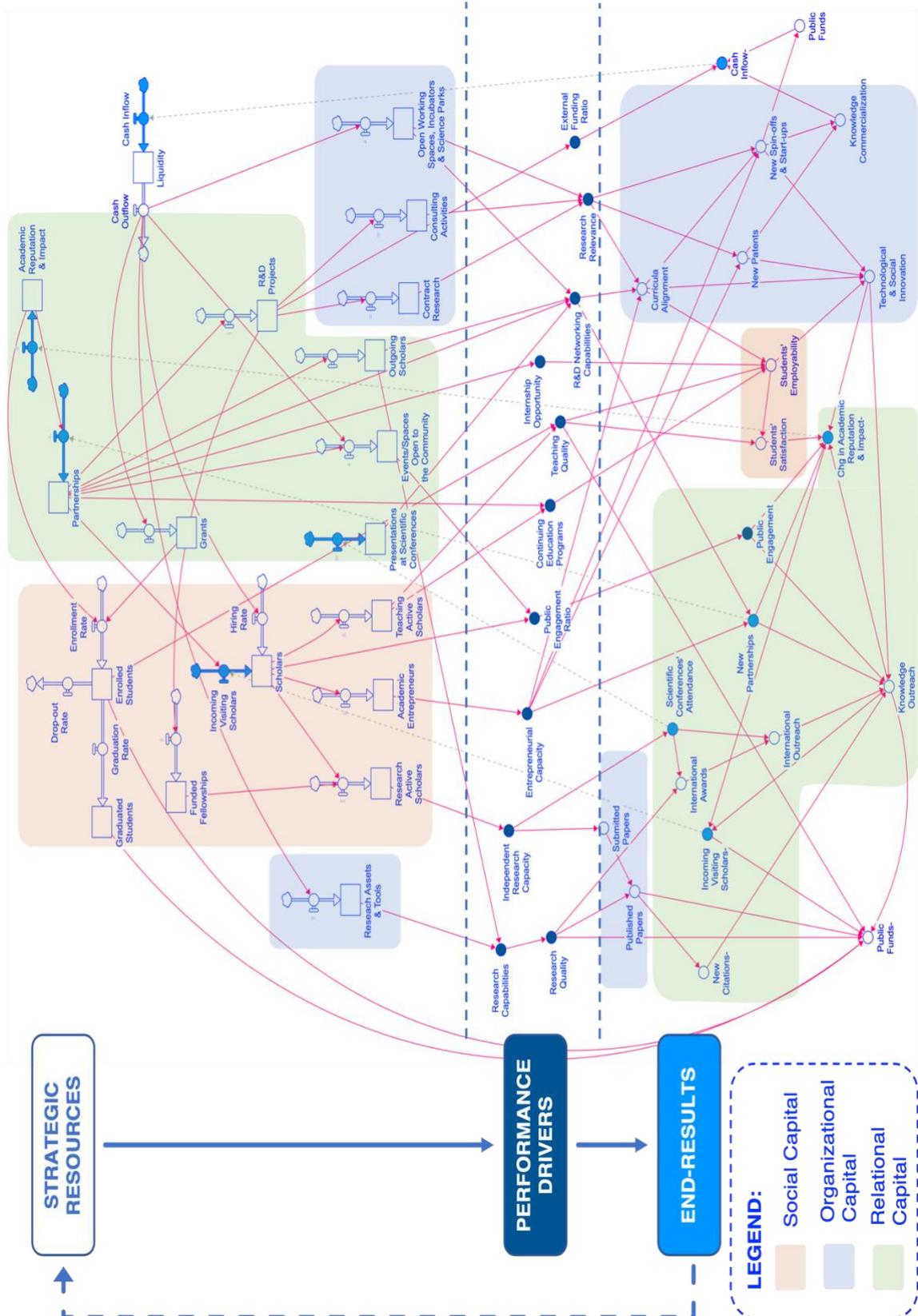
CHAPTER 5

Conclusions

Based on the analyses that have been presented in the previous chapters, in this section some concluding remarks are offered by leveraging a DPM chart (Bianchi, 2016) that has been built to depict the interplays existing among the three different academic missions and their underlying institutional logics. DPM arises from the cohesion between the SD methodology (Forrester, 1961) and performance management in order to support decision-makers in evaluating the performance of complex systems under a systemic perspective (Bianchi, 2016). More precisely, DPM enables decision-makers to highlight short-term end results (i.e., output) and long-term end results (i.e., outcome) by opportunely leveraging performance drivers (or intermediate results), activated, in turn, through the deployment of the strategic resources owned. Finally, these strategic resources usually accumulate or deplete based on the change rates of the end results themselves.

The resulting interconnections constitute a system, namely “a regularly interacting or interdependent group of items forming a unified whole” (Merriam-Webster, 2022). Over time, those system components positively or negatively affect one another based on instantaneous or diachronic interrelationships that constitute the so-called feedback loops. In SD, the latter typically shapes the model’s structure, while the way through which those interrelationships develop over time constitutes the system’s behavior (Sterman, 2000). Accordingly, Figure 1 depicts the structure of the causal mechanisms linking the end results, performance drivers, and strategic resources underlying the three academic missions pursued by entrepreneurial universities, investigated with a particular focus on their relationships with the intellectual capital perspective and the role played by those organizations in fostering societal and economic developments. In particular, to enhance the graphical readability of Figure 1, it can be seen that those resources have been distinguished according to the three main constituents of intellectual capital (Baima *et al.*, 2020; Grande *et al.*, 2022; Secundo *et al.*, 2017), namely: the social (or human) capital, the organizational (or structural capital), and the relational capital. In addition, it should be noted that some of the causal relationships characterizing the relationships between the variables depicted in Figure 1 have been omitted to ensure greater visual clarity.

Figure 1. The DPM chart associated with the three academic missions of entrepreneurial universities. Different colored areas distinguish resources and end results according to an intellectual capital perspective.



Source: Author's own elaboration

Hence, in the following lines some exemplary pathways that can be followed as emerging from Figure 1 are presented. Thus, starting for example from the analysis of a human capital-related asset, the number of scholars who are involved in research activities (e.g., Ph.D. students, post-doc fellows, researchers, and associated and full professors) determines the ability to carry out independent research activities (i.e., measurable as the ratio between the number of scholars involved in researching activities over the total). This *independent research capacity* determines two different assets that are part of the university's organizational capital, such as *the number of submitted and published papers*. Then, the number of published papers contributes to increasing the university's relational capital, depicting the university's *knowledge outreach* through the *number of citations received*. In the end, even if with a delay, this will result in an improvement of the *academic reputation and impact* and public funds received by the central government. In the end, the increased academic reputation and impact will determine an increase in the university's capability to attract *incoming visiting scholars*, who further contribute to increasing research productivity. Similarly, the increased university's reputation can result in an increased *number of partnerships* that determine growth in the number of *incoming scholars*. Differently, the increased *liquidity* can be used to invest in novel *research assets and tools* that further contribute to increasing the performance driver of researching capabilities or hire scholars that are active in conducting research (also through the number of *funded fellowships*). However, suppose those scholars would, for instance, allocate their time to conduct entrepreneurial activities. In that case, the rate of *entrepreneurial capacity* would not directly contribute to short-term end results associated with the research activities.

In the end, it can be noted that even if governance and strategy are based on the prioritization of some logics over others (for example, a specific university may decide to prioritize the dissemination logic over, say, the entrepreneurial logic), the different logics continue to exist at the societal level and dynamically influence the system. For this reason, it is particularly important to map all DPM variables under all key institutional logics that are active in the system under study. Otherwise, the DPM analysis is likely to miss some key aspects of the dynamics that (may) generate public value. The pilot study conducted on universities' third mission systems suggests that conducting a preliminary, in-depth analysis of the relevant institutional logics is important because this gives the impression to all the people who collaborate to modelling that all the points of view are being taken into consideration and that the choice of indicators will be neutral and inclusive, rather than ideologically oriented and exclusive. This inclusiveness and neutrality proved very important in discouraging

counterproductive polarization into opposing coalitions in the phase of variable identification. In this light, the pilot analysis conducted by this study suggests that the focal organization that is at the core of the system under study (in this case, the university that is at the core of a system characterized by three missions) should play a pivotal role as an engine of dynamic integration and reconciliation within and across all of the relevant logics, in order to effectively manage the intertwining fragilities of the key common resources that the system is expected to (re)generate. In this vein, by combining a systemic perspective with a focus on the multiple, dynamic interconnections that can affect an organization's performance (Bianchi, 2016; Bivona, 2022), DPM can represent a proper tool to further advance the neo-institutional literature stream, especially when multiple logics are at stake. Indeed, studies so far have mainly investigated the presence of multiple logics by adopting a dichotomic view (Battilana *et al.*, 2015; Ocasio *et al.*, 2017), such as in the case of hybrid organizations or sustainable entrepreneurship called to pursue a sustainable logic besides a market logic (De Bernardi *et al.*, 2021; Doherty *et al.*, 2014). Hence, adopting a systemic and dynamic perspective that can capture multiple intertwined causal relationships could help in overcoming that shortcoming and is suggested as a future research area to be investigated.

Reference list

- Baima, G., Forliano, C., Santoro, G., & Vrontis, D. (2020). Intellectual capital and business model: a systematic literature review to explore their linkages. *Journal of Intellectual Capital*.
- Battilana, J., Sengul, M., Pache, A.-C. & Model, J. (2015) Harnessing productive tensions in hybrid organizations. The case of working integration social enterprises. *Academy of Management Journal*, 58(6), 1658–1685.
- Bianchi, C. (2016). *Dynamic Performance Management* (Vol. 1). Springer International Publishing. <https://doi.org/10.1007/978-3-319-31845-5>
- Bivona, E. (2022). Determinants of performance drivers in online food delivery platforms: a dynamic performance management perspective. *International Journal of Productivity and Performance Management*, (ahead-of-print). <https://doi.org/10.1108/IJPPM-10-2021-0606>
- De Bernardi, P., Bertello, A., Forliano, C., & Orlandi, L. B. (2021). Beyond the “ivory tower”. Comparing academic and non-academic knowledge on social entrepreneurship. *International Entrepreneurship and Management Journal*, 1-34.
- Doherty, B., Haugh, H., & Lyon, F. (2014). Social enterprises as hybrid organizations: A review and research agenda. *International Journal of Management Reviews*, 16(4), 417-436.
- Forrester, J.W. (1961). *Industrial Dynamics*. MIT Press, Cambridge, MA.

- Grande, S., Bertello, A., De Bernardi, P., & Ricciardi, F. (2022). Enablers of explorative and exploitative intellectual capital in entrepreneurial ecosystems. *Journal of Intellectual Capital*, (ahead-of-print). <https://doi.org/10.1108/JIC-07-2021-0197>
- Merriam-Webster. (2022), 'Definition of System', available at: <https://www.merriam-webster.com/dictionary/system> (last accessed: 8 February 2022).
- Ocasio, W., Thornton, P. H., & Lounsbury, M. (2017). *Advances to the institutional logics perspective*. In The Sage handbook of organizational institutionalism. Sage.
- Secundo, G., Perez, S. E., Martinaitis, Ž., & Leitner, K. H. (2017). An Intellectual Capital framework to measure universities' third mission activities. *Technological Forecasting and Social Change*, 123, 229-239.
- Sterman, J. (2000). *Business Dynamics: Systems Thinking and Modeling for a Complex World*. Irwin/McGraw-Hill, Boston, MA.