

Dimensions of Entrepreneurial Orientation in the Academic Environment

Dimensões da Orientação Empreendedora no Ambiente Acadêmico

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Abstract: The establishment of entrepreneurial orientation (EO) in the academic environment, through its basilar conceptual dimensions such as proactiveness, innovativeness, and risk-taking, has been the subject of relevant debate for academics, higher education managers, and policy-makers. In this context, this article aims to analyze the establishment of EO in the academic environment, pursuing an entrepreneurial university model. Thus, the strategy of multiple case studies was adopted, based on three universities: two in Brazil, the Pontifical Catholic University of Rio Grande do Sul (PUC-RS) and the Pontifical Catholic University of Rio de Janeiro (PUC-Rio), and one in Sweden, the Lund University (LU). Results show that the EO established by the universities studied is seen in several times and in different ways through its conceptual dimensions, suitable to the academic context. The movements observed in the three cases researched show non-sporadic behaviors towards an entrepreneurial university model over time.

Keywords – Entrepreneurial Orientation; Entrepreneurial University; Third Academic Mission.

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Resumo: O estabelecimento da orientação empreendedora (OE) no ambiente acadêmico, por meio de suas dimensões conceituais basilares, como proatividade, capacidade de inovação e tomada risco, tem sido tema de relevante debate para acadêmicos, gestores da educação superior e formuladores de políticas públicas. Nesse contexto, o objetivo neste artigo é analisar o estabelecimento da OE no ambiente acadêmico, em busca de um modelo de universidade empreendedora. Para isso, a estratégia de estudo de casos múltiplos foi adotada, baseada em três universidades: duas no Brasil, a Pontifícia Universidade Católica do Rio Grande do Sul (PUC-RS) e a Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio), e uma na Suécia, a Lund University (LU). Os resultados mostram que a OE estabelecida pelas universidades estudadas evidencia-se em vários momentos e de diversas formas, por meio de suas dimensões conceituais, adequadas ao contexto acadêmico. Os movimentos observados nos três casos pesquisados revelam, ao longo do tempo, comportamentos não esporádicos em direção a um modelo de universidade empreendedora.

Palavras-chave – Orientação Empreendedora; Universidade Empreendedora; Terceira Missão Acadêmica.

Introduction

Since the second half of the twentieth century, society is increasingly closer to knowledge development, as well as its practical applications in new technologies (Castro, Nagano, & Ribeiro, 2019). Universities worldwide have been challenged to become more connected to society and to change their traditional organizational models. In different economic and social contexts, universities have been moving towards new models, especially the entrepreneurial university model as a driver of innovation and entrepreneurship activities (Etzkowitz & Zhou, 2017; Guerrero et al., 2016). The purpose of this paper is to explore the contribution of the entrepreneurial orientation (EO) approach to the changing process of traditional universities to an entrepreneurial university.

The entrepreneurial university phenomenon has spread in both developed and emerging or developing economies and is increasingly attracting the attention of academia and policy-makers. Much of the political debate and theoretical-empirical analysis has focused on the economic outcomes and impact of entrepreneurial universities, such as patents, licensing, and startup firms, or their technology

transfer mechanisms and skills. The broader dissemination of this EO is the foundation of larger-scale and deeper empirical studies, focusing on entrepreneurial potential (Tijssen, 2006).

Despite some studies address the influence of specific policies about entrepreneurship and innovation developed by universities, as well as university ecosystems (e.g., incubators, technology transfer offices, science parks, etc.), inside universities, surrounding, and also in the graduate's career, such as Diniz, Mendonça, Siqueira, & Santos (2020), Guerrero, Urbano, Cunningham and Gajón (2018), Guerrero, Urbano and Gajón (2020), and Pugh, Lamine, Jack and Hamilton (2018), little is known about the EO within the university and how such orientation can influence academic activities. Therefore, the following question guides our investigation: how is the EO established in the academic environment, which underlies the transformation processes towards an entrepreneurial university model?

As an assumption, we assumed that the changes made within the universities studied are guided by the transition from a hybrid, Humboldtian or traditional model, based on teaching and research, to a more engaged and entrepreneurial university model, as mentioned by Tijssen (2006) and as proposed by Clark (1998, 2004), Etzkowitz (2013), and Etzkowitz and Zhou (2017). Therefore, this research aims to analyze the establishment of EO in the academic environment, pursuing an entrepreneurial university model.

This approach is based on two main features: (i) too much focus on the theoretical literature about EO on traditional firms, such as those that have commercial or industrial activities that essentially aim at profitability, rather than other sectors with different objectives; and (ii) the relative scarcity of studies on EO in the academic environment, especially those that explore the institutional transformations of the universities pursuing an entrepreneurial university model.

In addition to the need for this approach, studies addressing the EO have essentially quantitative focuses, measure the business performance, or discuss the multidimensionality of the construct, centered on the relationship with its sub-dimensions. These characteristics are present in several studies in the area, such as Anderson et al. (2015), George (2011), George and Marino (2011), Lumpkin and Dess (1996), Wales (2016) and Wales, Wiklund and McKelvie (2015). These focus matter and this is not a demerit, as it is the conceptual essence that grounds the topic. However, there is an interesting side for the advancement of qualitative studies, as shown by Covin and Miller (2014), Wales (2016) and

Wiklund and Shepherd (2011), to provide greater insight into the manifestation of the EO within organizations, with closer congruence between theory and management practice (Wales, 2016).

As an empirical field, the movements made by the universities, in Brazil and Sweden, are explored through a multiple case study focusing on the transformation process of traditional institutions towards an entrepreneurial university model. Similar to what was exposed by Guerrero, Urbano, Cunningham and Organ (2014) in the comparison of European regions, despite the common strategic objective and certain comparable economic and social conditions, entrepreneurial universities are different from each other due to their traditions and unique features and policies. Thus, case studies in different contexts are appropriate, considering the environmental conditions of inclusion of universities and their challenges.

Having exposed the initial arguments of this study, the following section presents the theoretical background that bases this investigation, followed by the arguments of the research proposition. Consequently, the methodological procedures of the research are presented, focusing on the use of the multiple case study technique. Next, the cases of the universities are presented and discussed, and the final considerations are pointed out.

Theoretical Background

The study of EO has its origins based on the strategy field in the studies of Mintzberg (1971, 1973), Miles, Snow, Meyer and Coleman, (1978), and Miller (1983). Mintzberg (1971) identified four roles describing the control of the managers in the strategy process, such as the entrepreneur, which characterizes the manager as the designer and the one who starts most of the controllable change in their organization. In another study, Mintzberg (1973) concluded that entrepreneurial firms tended to take more risks than other types of firms and were more proactive when searching for new business opportunities.

The two subsequent studies, by Miles et al. (1978) and Miller (1983), further this discussion by developing the typology of firms. Miles et al. (1978) wrote about three strategic types of organizations, including the prospector, which highlights the role played by the entrepreneurial approach of strategy,

when firms are confronted with decision making, such as what products they must offer or in which markets to enter. Miller (1983) identified entrepreneurship as a multidimensional concept that includes the firms' actions related to innovativeness, risk-taking, and proactiveness. He observed that the performance of firms is associated with the EO, that is, firms less willing to take on entrepreneurial behaviors tend to reach inferior results.

This definition by Miller (1983) was later refined by Covin and Slevin (1988). They explain that the EO is shown by the extent to which managers at the strategic level are willing to take risks related to the business (risk-taking dimension); to favor change and innovation for gaining competitive advantage (innovativeness dimension), and to compete aggressively with other firms (proactiveness dimension). On the other hand, these authors also explain that non-entrepreneurial or conservative firms are those in which management style at the strategic level is decidedly averse to risk and innovation, and is passive or reactive.

In Miller's original conceptualization (1983), entrepreneurial firms are those that are simultaneously characterized by proactiveness, innovativeness, and risk-taking. This conceptualization has become commonly accepted when it comes to a firm "being entrepreneurial". Additionally, other authors have extended the domain of the construct by including new dimensions (George, 2011; George & Marino, 2011). Lumpkin and Dess (1996), for example, broadened the concept based on five dimensions: autonomy, innovativeness, risk-taking, proactiveness, competitive aggressiveness. Especially in the context of the entrepreneurial university, Ahmad et al. (2018) suggest considering the issue of "academic" for EO, in order to embrace the entrepreneurship in the several activities of a university.

When the organization engages in entrepreneurial activities, all dimensions may be present or just some of them. The influence of each of these dimensions on the entrepreneurial activity may depend on external factors (e.g., industry or business environment) or internal factors (e.g., the structure of the organization or the characteristics of the executives). These dimensions may vary independently depending on the environmental and the organizational context (Lumpkin & Dess, 1996; Walter, Auer, & Ritter, 2006).

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Contributing to this debate, two fundamental critical requirements for the characterization of entrepreneurial firms are recognized in this concept: (i) the firm must engage in entrepreneurial behaviors that involve the pursuit of new ideas, processes, and technologies, and aggressively attempt to commercialize those ideas in order to expand its frontiers to new product/market domains; and (ii) the firm must engage in entrepreneurial behaviors, with reasonable consistency over time, that is, with temporal stability (Anderson et al., 2015).

Despite the differences when defining the construct and considering the object investigated here, the concept of EO adopted in this study follows the three dimensions commonly used in the literature – proactiveness, innovativeness, and risk-taking – such as Anderson et al. (2015), George (2011), and George and Marino (2011). Moreover, its use is on the behavioral focus, through the analysis of the actions carried out by the studied universities rather than a performance analysis. A conceptual summary of these three dimensions is presented in Table 1.

In addition to the differences surrounding the concept of EO, there are variations in different types of organizations, which are evident in the objectives that guide the strategies formulation, in the characteristics of the organizational structure and governance, and the market conditions. The application of EO in other organizational contexts, different from those of large commercial organizations, is still little explored (Todorovic, McNaughton, & Guild, 2011).

Thus, the study about the establishment of the EO in the academic environment is relevant and has attracted increasing interest, both in the academic environment and for public policy-makers. It is worth highlighting the existence of empirical literature on the phenomenon of the entrepreneurial university that is wide, diverse, and anchored in the seminal studies of Etzkowitz (1983) and Clark (1998). Even so, the use of the concept of EO in the academic environment has been little explored, in light of the basic conceptualizations of Miller (1983), Covin and Slevin (1988), and Lumpkin and Dess (1996), including its dimensions. Thus, the following section presents the research proposition that guides this study.

Table 1.
Dimensions of EO

Dimensions	Definitions
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Proactiveness	a) How an organization addresses market opportunities in entrepreneurial activities. Proactiveness can be crucial to an EO as it suggests a future perspective followed by innovative activities or new ventures. The conceptual opposite of proactiveness is passivity, that is, indifference or failure to seize opportunities or persuade the market (Dess & Lumpkin, 2005; Lumpkin & Dess, 1996). b) The firms' pioneering nature is shown in its propensity to compete aggressively and proactively with industry rivals (Covin & Slevin, 1991). c) Behavior shown by the strategic management of the firm that aims to compete aggressively with other firms (Miller, 1983).
Innovativeness	a) It reflects the organization's tendency to engage and support new ideas, novelty, experimentation, and creative processes that can result in new products, services, or technological processes. Innovation is an important component of EO, as it reflects a means by which firms seek new opportunities (Dess & Lumpkin, 2005; Lumpkin & Dess, 1996). b) Behavior of the strategic management of the organization regarding the breadth and frequency of product innovation and the tendency of actions towards a technological leadership (Covin & Slevin, 1991). c) Behavior shown by the strategic management that favors change and innovation in order to obtain a competitive advantage for the firm (Miller, 1983).
Risk-taking	a) The concept of risk has several meanings depending on the context of the application and is often used to describe entrepreneurship. It can be said that every business involves some degree of risk and that it is not useful to think in terms of "absolutely no risk" (Dess & Lumpkin, 2005; Lumpkin & Dess, 1996). b) The managerial attitude toward risk is evident when senior executives decide to pursue entrepreneurial behaviors as part of their firms' strategy (Anderson et al., 2015). c) The behavior of the organization's strategic management related to investment decision making and strategic actions when facing uncertainty (Covin & Slevin, 1991).

Source: Elaborated by the authors.

Research Proposition

Although it is clear that the EO in the university context is different from that practiced by firms, as defended by Todorovic, McNaughton and Guild (2011), it is argued here that the basic elements that form the concept, such as proactiveness, risk-taking, and innovativeness, continue to characterize the strategic action, suitable to the academic context. Abreu and Grinevich (2013) define the academic entrepreneurship as any activity beyond the traditional academic roles of teaching and/or research, with an innovative character, imbued with risk and leading to financial rewards to the individual or the institution. However, few studies investigate the EO in universities, such as the ones by Lee, Lim and Pathak (2011), Todorovic, McNaughton and Guild (2011), and Walter, Schmidt and Walter (2016).

Another relationship established between the conceptual bases of the EO and the university refers to the adoption of recurrent entrepreneurial behaviors over time through a strategic position, as shown by Anderson et al. (2015) and Covin and Slevin (1991). Several studies exemplify this argument by

reporting different cases of universities oriented to an entrepreneurial model, based on several actions carried out over several years, as shown by Bramwell and Wolfe (2008), Etzkowitz and Klofsten (2005), and Jacob, Lundqvist, and Hellsmark (2003).

It is also related to what was discussed by Clark (2003), who states that the transformation of the university towards the entrepreneurial model involves its capacity for proactiveness, represented in a uniform state oriented towards the change. Covin and Slevin (1991) emphasize that organizations with an entrepreneurial position are those in which particular behavioral patterns are recurrent, that is, the observation of entrepreneurial and sustained behaviors is a necessary condition to characterize the “entrepreneurial being”. This is also highlighted by Anderson et al. (2015), who show the need for a time consistency in the entrepreneurial behaviors.

EO is thus a concept that identifies organizations in which strategic leaders, along with the culture of the organization, generate a strong impetus for innovation and risk-taking and dynamically seek new business opportunities (Dess & Lumpkin, 2005). In the context of universities, these characteristics intersect with Etzkowitz and Zhou’s proposition (2017) about the pillars that sustain an entrepreneurial university, especially regarding the strategic leadership of the institution, the capacity of technology transfer, and the entrepreneurial ethos involving the entire academic community. In this perspective, the following research proposition is presented: the EO in the university is established through its basic conceptual dimensions, such as proactiveness, risk-taking, and innovativeness, suitable to the academic context and in a recurring way over time. This idea is summarized in Figure 1.

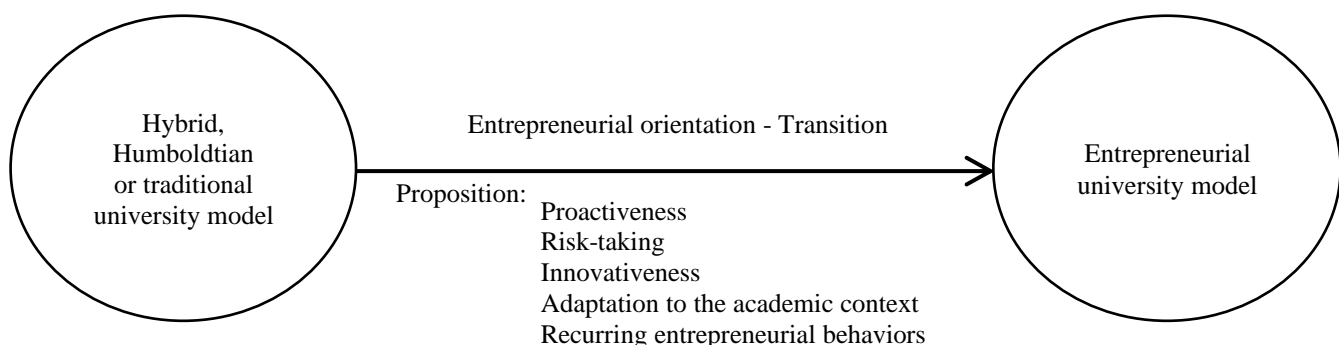


Figure 1. Conceptual framework of the research
Source: Elaborated by the authors.

Most entrepreneurial universities adopt new organizational structures and incentive policies, such as entrepreneurship courses, incorporating entrepreneurs into curricula, and supporting graduates in startup activities. These policies are often designed to promote managerial and behavioral changes in the academic community, for the commercialization of research results, and for collaborative projects with firms (Tijssen, 2006).

The adoption of these entrepreneurial activities is central to the debate about the entrepreneurial university model, in the perspective that the third mission is integrated with the university, just as research was integrated with teaching, in the first academic revolution. As each new mission is incorporated into the university, the path taken by the previous ones is restructured (Etzkowitz, 2013).

The university must recognize that the actions towards an entrepreneurial university model vary according to the experiences and strengths of each institution (Philpott, Dooley, O'Reilly, & Lupton, 2011). The search for the ideal of entrepreneurial university must avoid adopting an "one size fits all" path (Clark, 2001). That is, the capacity of a university to engage effectively in entrepreneurial activities depends on its resources and also on its context of action (Philpott et al., 2011; Williams & Kitaev, 2005).

The discussion around the entrepreneurial university, pursuing the institutional transformation into effective economic and societal change agents, is organized in five key strategic challenges by Klofsten et al. (2019): (i) internal factors; (ii) external or environmental factors; (iii) teaching and learning entrepreneurship; (iv) support to different entrepreneurial pathways; and (v) impact measures of the entrepreneurial university. These challenges summarize the literature advancement and point out several avenues and questions for future researches, as detailed by these authors.

Similarly, an important overview of the concept of entrepreneurial university is shown by Centobelli, Cerchione, Esposito and Shashi (2019). Through a systematic literature review, these authors contribute with a synthesis about the main theoretical approaches (e.g., triple helix model, grounded theory of university adaptation, strategic actions theory, model of development of an entrepreneurial university, among others) and topic area (e.g., taxonomy of entrepreneurial university definitions, factors

affecting entrepreneurial university, effects of entrepreneurial issues on university activity, entrepreneurial university performance measurement).

Research Method

This research is focused on a multiple or comparative case study. This technique is used to understand a complex, context-dependent phenomenon (Eisenhardt, 1989; Yin, 2017) and must be chosen to examine contemporary events, but without manipulating relevant behaviors. The case study is characterized by “how” research questions, based on several sources of evidence and benefits from the prior development of theoretical propositions for data collection and analysis (Yin, 2017), such as the one carried out in this investigation.

Based on the research strategy designed through multiple case studies, three cases were investigated: two in Brazil and one in Sweden. In Brazil, two universities researched were the Pontifícia Universidade Católica do Rio Grande do Sul (Pontifical Catholic University of Rio Grande do Sul, PUC-RS) and Pontifícia Universidade Católica do Rio de Janeiro (Pontifical Catholic University of Rio de Janeiro, PUC-Rio). Tecnopuc (PUC-RS’ Science and Technology Park) was twice elected the best technology park in Brazil, in 2016 and 2009. Raiar, the incubator of PUC-RS firms, was elected in 2014 as the best incubator of firms oriented to the generation and intensive use of technologies by the National Association of Entities Promoting Innovative Enterprises (Anprotec, 2019). In the case of PUC-Rio, the most striking indicator and also object of this study refers to the capacity to raise funds from industry, ranking 29th among universities worldwide in 2018, according to the 2019 ranking of Times Higher Education (THE, 2018). About 50% of the institution’s revenues are originated from research projects and collaboration with private firms and government (AGI, 2016), which is uncommon in the Brazilian context.

In Sweden, the case of Lund University (LU) was researched. LU is ranked among the “top 100” universities in the world, according to the 2019 rankings of the British agency Quacquarelli Symonds (QS) and THE, in the 92nd and 98th positions respectively (QS, 2018; THE, 2018). LU ranks as the 2nd Swedish institution in the specific indicator on revenues from industry in the THE’s 2019 ranking (THE,

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2018), which shows its ability to transfer knowledge. It is linked to the Ideon Science Park, founded in 1983, with the collaboration between the university, the municipality of Lund, and the Wihlborgs Fastigheter AB, being the first technology park in Sweden and the second in Europe after Cambridge, in 1973 (Fehrman, Westling & Blomqvist, 2005; Kaiserfeld, 2017; Staaf, 2016). Table 2 shows a brief presentation of the three universities.

Table 2.
The cases studied

	PUC-RS	PUC-Rio	Lund University
Type of Higher Education Institution	Community (non-state public)	Community (non-state public)	Public
Location	Southern Brazil (Porto Alegre, RS)	Southeast Brazil (Rio de Janeiro, RJ)	South Sweden (Skåne Region)
Foundation Year	1948	1946	1666
Students	30,000	22,500	42,000
Employees	Total: 6,000 - Professors: 1,300 - Technical and administrative staff: 4,700	Total: 3,000 - Professors: 1,200 - Technical and administrative staff: 1,800	Total: 7,500 - Professors: 800 - Research academics and students: 4,200 - Technical and administrative staff: 2,500

Source: Research data.

For the data collection, the present study used various procedures with primary and secondary data. As primary sources, 40 face to face interviews (15 at PUC-RS, 14 at PUC-Rio, and 11 at LU) were carried out with those main involved in implementing the EO in the researched universities, covering the members of the board and directors of the complementary or support units directly related to the third academic mission. The interviews followed a semi-structured script, based on the theoretical background, and were carried out from January to March 2017, in Brazil, and in June 2017 in Sweden. Each interview was recorded and ranged from 46 min to 1 hour 28 min. In addition to these primary

sources, several secondary data were collected on the cases researched, mainly through the university websites, public materials and/or documents available by the institutions, books, academic articles, etc.

Thus, two basic procedures were adopted for the data analysis: content analysis and data triangulation. The content analysis was used when analyzing the primary data, especially the interviews, which were transcribed in full and analyzed using the NVivo 11.0 software by two different researchers, in order to get the cross-checking, as suggested by Creswell and Creswell (2018). As the second procedure adopted in the data analysis, triangulation was performed by crossing information obtained from different data sources, including several types of primary and secondary data. In general, the data from different sources were contrasted in several points about the issue, which gave the material collected greater validity and reliability. Besides, the results were returned to the interviewees participating in this research to verify the analysis, as also recommended by Creswell and Creswell (2018). Once the methodological procedures are exposed, the following section presents the cases studied and addresses the establishment of the EO through its dimensions.

The Cases in Brazil and Sweden

This section addresses the three universities researched. The cases are presented and discussed individually by analyzing the conceptual dimensions of the EO. The analysis is embodied in the transformations carried out by the universities studied towards an entrepreneurial university model. Following, the cases are cross-analyzed in order to highlight the most significant similarities and peculiarities found in the study.

Case 1: PUC-RS

Most decisions made by PUC-RS in favor of an entrepreneurial university model were granted with proactiveness. The actions are aligned with the proactiveness definitions of Dess and Lumpkin (2005) and Lumpkin and Dess (1996), in the way of the institution addresses market opportunities and undertakes entrepreneurial activities, as opposed to indifference or inability to seize opportunities or

persuade the market. As the first milestone in the institutional transformation towards a more entrepreneurial attitude, the creation of the Technology Management Agency (Agência de Gestão Tecnológica, AGT) in 1999 (Audy & Knebel, 2015) symbolizes the beginning of a path with promising prospects for closer university-industry-government relationships.

This milestone marks the beginning of a multifaceted strategy towards the third academic mission, which is represented by several innovations and entrepreneurship mechanisms created by PUC-RS, such as Tecnopuc and the RAIAR incubator in 2003, and by AGT and several others developed as the activities progressed, such as the Technology Transfer Office (TTO) in 2005; Tecnopuc Creativity Laboratory (CriaLab) in 2011; and the Entrepreneurship and Innovation Interdisciplinary Laboratory (Idear), in 2016, as available at PUC-RS (2020). Especially regarding the knowledge transfer to society in general, this multifaceted role of the university is emphasized in the works of Ahmad et al. (2018), Bishop, D'Este e Neely (2011), and Wright, Clarysse, Lockett and Knockaert (2008).

AGT, in practice, was the first structure of INOVAPUC-RS, let's say, with this focus, with a focus on the innovation area, because AGT started the technology park, which was born from a project managed by AGT. For some time, Tecnopuc itself was managed by AGT. Further on, Tecnopuc' board was created, because it became large enough to justify a board. Before, it was part of the AGT's functions to manage the park. AGT was also the one who created and structured the RAIAR incubator. (Interviewee 5 – AGT Director).

So came the Technological Management Agency, which was the first actor in this scenario at the Institution, which started making this connection to the academy, let's say, this knowledge that was emerging there, as a result of this qualification that we had in the faculty. And so we started to connect with companies and the AGT that ended up being, let's say, an embryo, of INOVAPUC-RS network as a whole. (Interviewee 14 – Dean of Research, Innovation and Development).

The adoption of this multifaceted strategy is materialized in the formation of the INOVAPUC-RS network, created in 2006 to articulate and bring together the main actors and mechanisms for innovation and entrepreneurship of the institution, as pointed out by Audy and Knebel (2015). Over time, each actor or mechanism assumed a specific role, such as intellectual property protection, business incubation, fostering entrepreneurship in teaching activities, etc. Together they form a complex and integrated structure for the different activities involved in implementing the third academic mission at

PUCRS. The proactive stance in creating new mechanisms and integrating into the INOVAPUC-RS network, especially concerning Tecnopuc, is exemplified by this excerpt of the interview:

The Tecnopuc project was not a preconceived or pre-planned project. No one knew which path to take. So, there was a need for a proactive and leading set of people to say what needed to be done. Even today, you have to take on the responsibility, from the point of view of proactiveness. Thus, there's a lot of proactiveness in a project like this. [...] The park [Tecnopuc] alone means nothing. It only exists because I have the INOVAPUC-RS network and the interaction is carried out through projects. Then, if I have a project with a company, I have AGT that is managing the project. If it involves intellectual property, I have to notify the Technology Transfer Office. So, depending on the nature of the project, I have several actors from the INOVAPUC-RS network to work together (Interviewee 9 – Tecnopuc Director).

The creation and organization of these different mechanisms over time reflect the engagement and institutional support for new opportunities, which is reflected in the innovativeness, as argued by Dess and Lumpkin (2005) and Lumpkin and Dess (1996). Successive organizational innovations provided PUC-RS a higher capacity to establish its strategic direction, as supported by Etzkowitz and Zhou (2017), based on a cumulative process of interrelated initiatives.

As an assumed and cumulative path, the development of these actors and mechanisms reveals recurring and consistent behaviors, as addressed by Anderson et al. (2015), Covin and Miller (2014), and Covin and Slevin (1991). This feature is central to the disclosure of the EO. In the case of PUC-RS, it is true through non-sporadic actions and a significant commitment of physical, human, and organizational resources in the pursuit of the third academic mission.

Nowadays, the University's strategic positioning is innovation and development, that is, almost 20 years after starting this process, PUC-RS recognizes that one of its main missions is to generate innovation and development for society. So, it is a no return path that it envisioned in the late 90s (Interviewee 9 – Tecnopuc Director).

Another highlight in implementing PUC-RS's EO is risk-taking through specific actions in some research projects, mapped as potential product and royalty generators. These actions are not in large numbers, but confirm the institutional involvement with innovation, as shown in the following interview fragment: "Here at PUC-RS, we have some projects whose value implied a not so great resource, to

advance a little more in a research result, to make this result a little more attractive. So, the University took this risk on some projects.” (Interviewee 2 – Technology Transfer Office Director).

The result is inherent to the risk. Overall, the risks taken by PUC-RS contributed to revenue diversification, which is supported by Clark (1998), Etzkowitz (2013), and Sam and Sijde (2014) as one of the key elements of an entrepreneurial university. This is shown in the institutional capacity related to external fundraising, especially those from the government and interactions with firms, although it still depends on resources from students’ tuition, as mentioned by one of the interviewees: “We have considerable funding here, but we still depend highly on undergraduate tuition. [...] For example, in the area of research, innovation and development, let’s think like this, in the University’s total revenues, it corresponds to 20%” (Interviewee 12 – RAIAR Incubator Manager).

In short, the various mechanisms recurrently created by PUC-RS for an entrepreneurial university model support the proactive character assumed in the institutional transformation and the uniform state of change, as defended by Clark (2003). This is also supported by both Vasconcelos and Cyrino (2000), who address the need to understand organizational change as a frequent and not isolated event, and Clark (1998), who stresses that transformations in universities require an ability for structured change. Once the case of PUC-RS is discussed, the following section explores the second case.

Case 2: PUC-Rio

The EO developed by PUC-Rio is characterized by decentralized and engaged management and by the bottom-up movement carried out, especially by the teaching staff. As government resources for research and postgraduate funding at PUC-Rio were reduced in the early 1990s, the professors involved in these activities started to search for a way out of the institutional crisis and began a diffuse process, which would result in the main alternative found by the institution to its financial sustainability. The details of this important change in the institution can be found in Guaranys (2006).

The process performed by the professors was fundamentally endowed with proactiveness, as exposed by Dess and Lumpkin (2005) and Lumpkin and Dess (1996), and made possible by the support of PUC-Rio’s strategic management to the initiatives that emanated from the closer ties with the firms.

The quality of the teaching staff was fundamental in this transformation, as it accredited the institution in the relationships with firms and facilitated the development of cooperative projects of a high technical-scientific level. The professors showed a significant capacity to change their research mindset, historically based on the institutional path, which involved abandoning their relatively passive behavior regarding the public resources received for their research and adopting a more active stance in the search for financial resources from external partnerships, especially firms, as shown in the following interview excerpts:

As state resources diminished, the resources must be raised from where they derive. So, this requires a researcher, who is still a great researcher, to work with cutting-edge research, but this researcher has to be an entrepreneur. Entrepreneurs are not only the ones who will start a business but the ones that must be proactive. This is the spirit that the University very much cultivates (Interviewee 25 – Academic Vice Dean).
Now, what you notice is that the professors are very active because in that period, look at the number of contracts. We maintain an average of 100 contracts by year. [...] And that's the result, you see that 50% of PUC-Rio's budget comes from partnerships with companies (Interviewee 21 – Executive Coordinator of AGI).

Based on this proactive behavior, the strengthening of PUC-Rio's ties with firms has advanced significantly and reached unique levels in obtaining external resources, as desired by numerous Higher Education Institutions (HEIs) that aim to implement an entrepreneurial university model. In 2015, for example, half of its annual budget, totaling \$ 220,000, came from research projects carried out with external funding (AGI, 2016). This percentage is unusual in the context of Brazilian universities and reflects the institution's ability to connect with firms and carry out projects of technical, scientific, and financial scope.

From an institutional point of view, obtaining this revenue from external partners provides important financial independence and reduces the traditional dependence on resources from student tuitions, which is common in Brazilian private or community universities. Revenue diversification is identified by Clark (1998), Etzkowitz (2013), and Sam and Sijde (2014) as one of the common elements in entrepreneurial universities as a result of the industry- and government-funded projects.

In order to reach this level, the main mechanism used by PUC-Rio to capture large resources lies in its research units, such as the Tecgraf Institute for Technical and Scientific Software Development

(Instituto Tecgraf de Desenvolvimento de Software Técnico-Científico da PUC-Rio, Tecgraf), the Technological Institute (Instituto Tecnológico, ITUC), the Telecommunications Studies Center (Centro de Estudos em Telecomunicações, CETUC), etc. Although disseminated in different areas of knowledge and with dispersed structures throughout the institution, these units form a decentralized mechanism that spreads through the research activities, based on the resources from governmental and non-governmental agencies and mainly from firms.

And the professors to keep their groups active, they pay for a good part of the payroll, of the technicians and employees who work in their group. So, everyone has a commitment to pay wages. So it turns out that entrepreneurship comes from there. I have a commitment that I have to honor (Interviewee 24 – Director of Technological Institute – ITUC).

One way we found was to look for resources elsewhere. Or we will search in public notices, private firms, or state firms, as I told you, [...] and so you work from another perspective, you have deadlines, you have to meet specific demands and you see that the industry interacts with the market: they signal you what is ahead and you feed your research. So, I won't say that every professor, but a good number of them have to work very close to this environment. [...] So, I mean, the University takes on the responsibility of hiring a professor who brings resources for the others (Interviewee 23 – Vice Dean for Development).

Tecgraf, for example, is considered the largest institute of PUC-Rio in terms of fundraising and the number of people involved. Created in 1987, Tecgraf is considered self-sustainable research, development, and innovation model based on projects historically developed with external partnerships (both firms and government, such as Petrobras, Shell and the Brazilian Navy) about digital interactivity, modeling and simulation, and data analytics. Another example is the activities accomplished by CETUC since 1985 through various telecommunications research and development projects. The projects developed by CETUC involve close collaboration with firms and the government, such as relations with Embratel, Petrobras, the Army Technology Center, the Navy Research Institute, Ericsson, Siemens, etc. (AGI, 2016; PUC-Rio, 2019).

Alongside this widespread interaction mechanism university-industry-government developed by PUC-Rio, other initiatives also mark its strategy for diversifying its revenue and disseminating entrepreneurship and innovation, such as the Development Office, the Junior Company, the Genesis Institute and the PUC-Rio Innovation Agency (Agência PUC-Rio de Inovação, AGI), all created within a decade, between 1994 and 2003, as described at PUC-Rio (2019). Such mechanisms emerged from a

combination of the bottom-up movement of professors and students and the institutional support for new opportunities, which is related to the innovativeness, as explained by Dess and Lumpkin (2005) and Lumpkin and Dess (1996).

These initiatives reveal recurring entrepreneurial behaviors in the institutional path, which is fundamental for the EO, as advocated by Anderson et al. (2015), Covin and Miller (2014), and Covin and Slevin (1991). Over time, the different mechanisms developed by PUC-Rio assumed specific activities as they progressed and were institutionalized. Several of these initiatives emerged at CTC, in Engineering courses, and gradually advanced to other areas of knowledge. With the support of the PUC-Rio management, these mechanisms gained institutional character, some of them assumed a strategic status, being linked directly to the Dean's Office, such as the Genesis Institute and AGI, while others were concerned with the dissemination of entrepreneurship and innovation among the students, such as the Junior Company. Once the case of PUC-Rio is discussed, the following section moves to the third case.

Case 3: Lund University

Notwithstanding its characteristics of a public university, rooted in the Swedish higher education system, the path taken by the LU shows several behaviors that support its EO, especially through its basic conceptual dimensions, such as proactiveness, innovativeness, and risk-taking, as proposed by Covin and Slevin (1988), Lumpkin and Dess (1996), and Miller (1983). Although rooted in its secular history, the EO of the LU has flourished only in recent decades, notably because of its basic conceptual dimensions.

As the first own mechanism implemented by LU, the creation of the LU holding company (LUAB) in 1994 (LU, 2017a) shows the basic conceptual dimensions of the EO developed by the institution, especially risk-taking. The beginning of LUAB's activities is supported by Clark (1998), Etzkowitz (2013), and Sam and Sijde (2014), who show revenue diversification as an important element of institutional transformation toward an entrepreneurial university model.

LUAB invests in projects with significant international market potential and with a unique concept to competitively meet a clear consumers' need. Since the projects attract foreign investors, LUAB withdraws its investments through the sale of shares and reinvests the potential return on new projects. LUAB currently has a shareholding in 46 firms, with a maximum of 20% of the shares in each, distributed in the following areas: life sciences (23 firms); technology (15 firms); nanotechnology (four firms); food (3 firms); social innovation (1 firm) (LU, 2017a).

The Innovation Department is the largest one in my division [Research, Collaboration, and Innovation Division] and they work with entrepreneurship in one way, because they help researchers to develop their ideas, put them together with entrepreneurs, and sometimes they go into our holding company [...] and I think we have around fifty companies there, which are then part owned by the University (Interviewee 31 – Executive Director of the Research, Collaboration, and Innovation Division).

So, the chain is that researchers come up with an idea and they need to meet entrepreneurs and the support system. Therefore, they work more to create meetings and so on. Then, they support and develop until they can take over to the incubator. And it's successful, of course, if it could go to Ideon. And to support also in the later stages, the University formed a holding company with special money, which is, from a legal point of view, outside the University but it's still run by the University, but it's completely separate money from the teaching and education (Interviewee 35 – Vice-Chancellor for External Engagement).

Despite the start of the LUAB's activities, the EO developed by LU was significantly boosted by the creation of the Lund University Innovation System (LUIS) in 1999, which is the main LU's internal mechanism to support the innovation and entrepreneurship activities, as described at LU (2017a). Organized as a system for commercialization of the activities developed by LU, the implementation of LUIS incorporated LUAB's actions (LU, 2017a) and broadly and concretely represented the institutional interest and proactiveness, as supported by Dess and Lumpkin (2005) and Lumpkin and Dess (1996).

Although LU has developed LUIS as an institutional mechanism to support innovation and entrepreneurship activities, other initiatives have emerged in the institution, resulting from the decentralization of academic activities to colleges or schools. Some of these initiatives establish direct ties with external partners, especially with firms; others form new internal mechanisms related to entrepreneurship and innovation. For example, VentureLab is an incubator started by the School of Economics and Management (LUSEM) in 2001 to support their students to create new businesses (LU, 2017a).

Another initiative that emerged from LUSEM was the Sten K. Johnson Centre for Entrepreneurship. In 2011, Sten K. Johnson, a successful entrepreneur and former student of the LU's Business and Economics Undergraduate and Master's Degree courses, made a generous donation of SEK 20 million to LUSEM's Entrepreneurship Department, which resulted in the creation of the Sten K. Johnson Centre for Entrepreneurship in early 2012. Although linked to LUSEM, the Sten K. Johnson Centre for Entrepreneurship works across the LU, especially as responsible for the entrepreneurship teaching activities in all its colleges and schools (LU, 2017a).

During the ninety's, more and more we thought of how, how we could support this process. So it's not only a purpose for the researchers alone, but we needed some support structure. And that started, that section in the University which we now call LU Innovation System. That was a great breakthrough because now the University has a system to support the researchers. [...] As well as VentureLab, that we moved it to central administration and now it belongs to LU Innovation System. And it's also a statement from the top management at University saying that this is something that we put money into, we want it to be available for all students and not only one faculty (Interviewee 33 – Innovation Director at LUIS).

So, we [Sten K. Johnson Centre for Entrepreneurship] are formally placed within the School of Economics and Management, but we work for the entire University. [...] We have mentors for the students, from companies and entrepreneurs. We have internship companies for those who take the other track. We started something called the entrepreneurs' society at Lund University, where we try to gather entrepreneurs and other entrepreneurship interested people in the region as a community (Interviewee 40 – Director of Sten K. Johnson Centre for Entrepreneurship).

In 2012, another initiative was created: the emergence of Medicon Village, a science and business park in Lund, near LU, focused specifically on life sciences (LU, 2019). This initiative came from a significant proactive stance carried out by the LU management, following the support of Clark (2003), Dess and Lumpkin (2005), and Lumpkin and Dess (1996), in combination with other local actors, as proposed by the triple helix model of Etzkowitz et al. (2000), Etzkowitz (2003) and Etzkowitz and Zhou (2017). Medicon Village has reached over 1,600 workers in 120 firms and organizations (LU, 2019).

These initiatives developed by LU reveal recurring entrepreneurial behaviors over time, which is supported by Anderson et al. (2015), Covin and Miller (2014), and Covin and Slevin (1991) as one of the key elements of the EO. Either initiated internally, as LUAB, LUIS, VentureLab and Sten K. Johnson Centre for Entrepreneurship, or together with external partnerships, as Ideon and Medicon

Village, those initiatives create the different mechanisms developed by LU for greater flow of their actions related to entrepreneurship and innovation and show the variety of strategies when implementing the third academic mission, as pointed out by Grimaldi, Kenney, Siegel & Wright (2011). As the third case was explored, the following section shows a cross-analysis of the three cases studied.

Varied Mechanisms and One Direction

The EO established by the universities studied here is seen in several stages and in different ways through its basic conceptual dimensions, such as proactiveness, risk-taking, and innovativeness, in light of the recommendations of Covin and Slevin (1988), Lumpkin and Dess (1996), and Miller (1983). In the process of transformation of the universities towards an entrepreneurial university model, these dimensions are sometimes isolated, and sometimes combined.

The behaviors evidenced in the three cases researched show elements of proactiveness, risk-taking, and innovativeness, suitable to the academic context. That is, as higher education is characterized by long-term decisions and choices that are difficult to discontinue, the movements carried out by the three universities studied reflect these characteristics, through the capitalization of knowledge, as mentioned by Etzkowitz and Zhou (2017), and the quality improvement of academic activities in general.

These movements show non-sporadic behaviors towards an entrepreneurial university model over time, which is essential to evidence the EO, as conceptualized by Anderson et al. (2015), Covin and Miller (2014), and Covin and Slevin (1991). Among the investigated cases, PUC-RS reveals more recurring actions in establishing its EO through the creation of several actors and mechanisms related to entrepreneurship and innovation. Despite LU's experience in Ideon activities, since the 1980s, the three universities studied started their internal mechanisms from the 1990s and made successive organizational innovations.

The institutions investigated here used various mechanisms to implement the third academic mission, as addressed by Bishop et al. (2011), Grimaldi et al. (2011), and Wright et al. (2008), who contribute to the institutional revenue diversification, as explained by Clark (1998), Etzkowitz (2013),

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and Sam and Sijde (2014). At PUC-RS, the number of mechanisms brought together in the INOVAPUC-RS network, including Tecnopuc, managed by the institution itself, is remarkable, thus creating a complex and tangled innovation ecosystem. At PUC-Rio, the use of research units is emphasized as the main mechanism of university-industry-government interaction and the raising of external resources, such as Tecgraf, ITUC, and CETUC. At LU, the emphasis lies in the combination of internal mechanisms, such as LUAB, LUIS, VentureLab, and Sten K. Johnson Centre for Entrepreneurship, and external mechanisms, such as Ideon and Medicon Village.

The use of these different mechanisms related to entrepreneurship and innovation generated idiosyncrasies based on proactiveness, risk-taking, and innovativeness in the studied universities. Two examples can be particularly mentioned: (i) the first refers to the creation of the LUAB holding company by LU, held in 1994, with the aim of providing financial resources to the promising projects that emerge from the academic community. The presence of the basilar conceptual dimensions of EO, notably risk-taking, in a public institution is highlighted; and (ii) the second concerns the obtaining of about half of the annual budget by PUC-Rio through projects with external support, which places it among the top 30 universities in the world related to the capacity of industry's fundraising, according to the 2019 ranking of THE (THE, 2018), made possible, in particular, by the proactivity and the mindset change of its faculty. The main similarities and peculiarities of the researched cases are shown in Table 3.

Table 3.
The main evidences in the studied cases

Similarities	- Use of proactiveness, risk-taking, and innovativeness suitable to the academic context.	
	- Recurrent entrepreneurial behaviors over time.	
	- Internal mechanisms for innovation and entrepreneurship initiated in the 1990s.	
Main Peculiarities	PUC-RS	- Several innovation and entrepreneurship mechanisms gathered in the INOVAPUC-RS network.
	PUC-Rio	- Use of research units as the main university-industry-government interaction mechanism. - Obtaining about half of the annual budget through projects with external support.
	LU	- Combination of internal and external mechanisms in the implementation of the third academic mission. - Creation of the holding company LUAB, in 1994, as its own investment mechanism in promising projects for new products or services.

Source: Elaborated by the authors.

Final Remarks

The different ways of EO' establishing in the researched universities revealed several elements of proactiveness, risk-taking, and innovativeness, suitable to the academic context, under the definitions of Covin and Slevin (1988), Lumpkin and Dess (1996) and Miller (1983). The three cases showed recurrent behaviors in the implementation of the third academic mission, which is a critical requirement in the characterization of EO, as supported by Anderson et al. (2015), Covin and Miller (2014) and Covin and Slevin (1991).

The evidence in the three cases showed the use of various actions and mechanisms of innovation and entrepreneurship towards an entrepreneurial university model, in a similar way through incubators and technology transfer. Individually, significant actions and mechanisms are also manifested through the Tecnopuc technological park at PUC-RS, managed by the institution itself; the involvement of research units at PUC-Rio, such as Tecgraf, ITUC, and CETUC; the close relationship with the external technology parks Ideon and Medicon Village accomplished by LU.

On the one hand, despite the different contexts, the analysis revealed some similarities among the researched cases, which reinforces the importance of comparative studies in different countries, as carried out by Clark (1998), Guerrero et al. (2014) and Kalar and Antoncic (2015). On the other hand, the analysis highlights the importance of the particularities of each case, which corroborates the research of Nelles and Vorley (2010), Philpott et al. (2011) and Stensaker and Benner (2013).

Regarding this study, it is noteworthy that the three cases have successful paths in the process of institutional transformation towards an entrepreneurial university model, as well as exemplary practices in conducting efforts to establish EO in the academic environment. However, cases of failure or lack of internal support for institutional transformation, especially caused by isomorphic pressures, may reveal new distinctive peculiarities and/or outcomes.

Lastly, there are several questions about this phenomenon to be investigated, which still raise doubts or new discussions from different theoretical combinations and perspectives, especially from the qualitative perspective: (i) the contextualization of entrepreneurial universities in the natural environments of society and economy for the production of knowledge and innovation systems leads to an interesting research potential; and (ii) the impact on regional development, provided by the

establishment of an EO in the academic environment, is a topic that deserves to be investigated, especially in regions with less favored contexts or lacking advanced infrastructure.

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