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ARTIGO

BASILAR PATHWAYS TOWARDS AN ENTREPRENEURIAL UNIVERSITY MODEL

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ABSTRACT: The phenomenon of the entrepreneurial university has been the subject of important debates and discussions in different economic and social contexts due to the need for greater interaction between university, industry, and government. As a result, several universities in different parts of the world have been engaged in a transformation process towards a new organizational model, with adherence to a more entrepreneurial or innovative university. In this context, the aim of this study is to analyze the pathways developed by studied universities pursuing an entrepreneurial university model. Therefore, the technique of multiple case study was used having three universities as the empirical field: two in Brazil, the Pontifical Catholic University of Rio Grande do Sul (PUCRS) and the Pontifical Catholic University of Rio de Janeiro (PUC-Rio), and one in Sweden, Lund University (LU). Results show that those universities developed pathways based on research activities, which significantly contributed to the increase of university-industry-government relationships. In addition, the three cases show the relevance of a close relationship with their surroundings when implementing the third academic mission.

Keywords: entrepreneurial university, third academic mission, university-industry-government.

TRAJETÓRIAS BASILARES EM DIREÇÃO A UM MODELO DE UNIVERSIDADE EMPREENDEDORA

RESUMO: O fenômeno da universidade empreendedora tem sido tema de importante debate e discussão em diferentes contextos econômicos e sociais, devido à necessidade de maior interação entre universidade, indústria e governo. Em função disso, várias universidades em diversas partes do mundo têm se engajado em um processo de transformação em direção a um novo modelo organizacional, com aderência a uma universidade mais empreendedora ou inovadora. Nesse contexto, esta pesquisa tem o objetivo de analisar a trajetória percorrida pelas universidades estudadas em busca de um modelo de universidade empreendedora. Para isso, a técnica de estudo de casos múltiplos foi utilizada, tendo como campo empírico três universidades: duas no Brasil, a Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS) e a Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio), e uma na Suécia, a Lund

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University (LU). Os resultados mostram que as universidades pesquisadas desenvolveram trajetórias baseadas nas atividades de pesquisa, as quais contribuíram significativamente para o incremento nas relações universidade-indústria-governo. Ao mesmo tempo, os três casos estudados evidenciam a importância da relação estreita com seu entorno de atuação na implementação da terceira missão acadêmica.

Palavras-chave: universidade empreendedora, terceira missão acadêmica, universidade-indústria-governo.

TRAYECTORIAS BASILARES HACIA UN MODELO DE UNIVERSIDAD EMPRENDEDORA

RESUMEN: El fenómeno de la universidad emprendedora ha sido objeto de importantes debates y discusiones en diferentes contextos económicos y sociales, debido a la necesidad de una mayor interacción entre la universidad, la industria y el gobierno. Como resultado, varias universidades en diferentes partes del mundo han participado en un proceso de transformación hacia un nuevo modelo organizacional, con adhesión a una universidad más emprendedora o innovadora. En este contexto, esta investigación tiene como objetivo analizar la trayectoria seguida por las universidades estudiadas en busca de un modelo de universidad emprendedora. Para esto, se utilizó la técnica de estudio de caso múltiple, teniendo como campo empírico tres universidades: dos en Brasil, la Pontificia Universidad Católica del Rio Grande do Sul (PUCRS) y la Pontificia Universidad Católica del Rio de Janeiro (PUC-Río) y uno en Suecia, Universidad de Lund (LU). Los resultados muestran que las universidades investigadas desarrollaron trayectorias basadas en actividades de investigación, que contribuyeron significativamente al aumento de las relaciones universidad-industria-gobierno. Al mismo tiempo, los tres casos estudiados muestran la importancia de la estrecha relación con su entorno en la implementación de la tercera misión académica.

Palabras clave: universidad emprendedora, tercera misión académica, universidad-industria-gobierno.

INTRODUCTION

The environmental dynamic instigates universities to become closer to society as a whole. It is a historical challenge directly related to the different models assumed by universities in many places in the world. In order to meet the environmental changes and interfere in the environmental dynamics, universities move towards new models, especially the entrepreneurial or innovative university model, which has been used in different economic and social contexts.

As knowledge plays an increasingly important role in innovation, the university, as an institution of production and dissemination of knowledge, is of greater significance in the process of industrial innovation. In addition to establishing links with other organizations, the entrepreneurial university assists in the creation of new organizations, such as companies based on academic research and leadership when structuring regional organizations (ETZKOWITZ *et al.*, 2000).

When assuming a new role in society, the university goes through internal changes while integrating new functions and relationships. Thus, the internal logistics of the original academic mission is expanded from conserving knowledge (education), followed by the creation of knowledge (research), and then applying this new knowledge (entrepreneurship) (ETZKOWITZ, 2013a). Thus, it is assumed that the changes made within the studied universities 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 in the example given by Tijssen (2006) and proposed by Clark (1998, 2004) and Etzkowitz (2013a, 2013b).

This research is within this locus, based on the following question: how do the pathways developed by the universities allow an institutional transformation towards an entrepreneurial university model? From that, the aim of this study is to analyze the pathways developed by studied universities pursuing an entrepreneurial university model.

In general, global models around the topic of “entrepreneurial university” are often associated with certain organizational characteristics, without recognizing the inter-relationship between institutional capacities and those of the external environment in which the university is inserted (STENSAKER; BENNER, 2013). Moreover, the traditional models of universities, such as the Humboldtian, the Napoleonic, and the Anglo-Saxon models, cannot explain the transformations of a secular institution, rooted in solid missions, which can incorporate a primary role in generating the regional economic growth in a knowledge-based society.

Thus, the intention of becoming an entrepreneurial university is explored by Clark (1998) and Etzkowitz (2013b) as an alternative to the problems presented by the globalized, dynamic, and competitive context and by the pathways developed by the universities, such as lack of efficiency, diversification of revenue, and relevance to society. The search for new organizational behaviors implies several strategies implemented by universities and outlined by the disparate and complex roles they play in different economies.

As an empirical field, the pathways developed by universities in an emerging economy (Brazil) and an advanced economy (Sweden) are explored through a multiple case study focusing on the transformation process of traditional institutions towards an entrepreneurial university model. Many of the pathways shown precede the mechanisms and initial actions established by the studied universities towards an entrepreneurial university model. Those pathways established the basilar conditions that made this transformation process feasible.

Having exposed the initial arguments of this research, the following section presents the literature about the entrepreneurial university. Next, the research methodological procedures are presented, based on the use of the multiple-case study technique, along with the data collection and analysis. Consequently, the pathways of the three cases are presented and discussed, individually and crosswise; finally, the final remarks are exposed.

ENTREPRENEURIAL UNIVERSITY

The literature on the entrepreneurial university shows several transformation models of the traditional university, such as those of Clark (1998, 2004), Etzkowitz (2003a) and Etzkowitz *et al.* (2000), Nelles and Vorley (2010a), and Rothaermel, Agung, and Jiang (2007). The models of Etzkowitz and

Clark are considered seminal in the area, especially the seminal study of Etzkowitz (1983) on the role of the entrepreneurial scientist and the entrepreneurial university in the American context.

Etzkowitz's model is based on the interactions between universities, industries (companies) and governments and their roles in innovation while creating the so-called triple helix. In this model, the institutional spheres can play the role of other actors in the interactions of the triple helix, although they maintain their original roles and distinct identities. The triple helix works as a platform to build institutions and create new hybrid organizational formats to promote innovation, as a synthesis of its elements (ETZKOWITZ, 2003a; ETZKOWITZ *et al.*, 2000).

In the approach of the triple helix, the university is a source of entrepreneurship, technology, and critical investigations. In this focus, entrepreneurial universities have a key role through the technology transfer, incubation of new enterprises, and efforts for local renewals. Thus, the following question is asked: is the university losing its traditional role and independence as it becomes more closely involved with industry and government? Or is it achieving a higher status and influence in society while increasing its independence, when playing a more central role in society by contributing to innovation? (ETZKOWITZ, 2013a).

Although these issues may lead to an interesting debate, the capitalization of knowledge is at the heart of a new mission for the university, to be more closely connected to users of knowledge and to establish itself as an economic actor on its own merits (ETZKOWITZ, 1998). This concept of entrepreneurial university entails an academic function and structure that are revised by aligning the economic development with the academic teaching and research missions (ETZKOWITZ *et al.*, 2000).

The model proposed by Etzkowitz has advanced to the so-called "quadruple helix", which adds the civil society as the fourth element of the innovation system. The arguments for the inclusion of this new element lie fundamentally in that the structure of the triple helix is not sufficient for the growth of innovation in the long term and in the importance of integrating the perspective of the citizens in general. From this perspective, innovation is the result of co-creation between companies, citizens, universities, and government, in a context characterized by partnerships, collaboration networks, and symbiotic relationships (AFONSO; MONTEIRO; THOMPSON, 2012).

By advancing to the quadruple helix model, end users are positioned alongside universities, government, and industry, showing the need to adopt more open innovation models (CARAYANNIS; CAMPBELL, 2012), in which the key role played by universities in this system is reaffirmed. However, there are still a limited number of studies that explore innovation and engagement models based on the quadruple helix, which reflects the emerging nature of the topic (ALEXANDER; MILLER; FIELDING, 2015).

Advances in the model include the emergence of the quintuple helix, which contextualizes the previous models and adopts the perceptive of the natural environments of society and economy for the knowledge production and innovation systems. The quintuple helix model emphasizes that these natural environments must be characterized as drivers for the advance of knowledge production and innovation systems. Both the quadruple-helix model and the quintuple-helix model shape and expand the principles of innovation and knowledge of the triple-helix model (CARAYANNIS; CAMPBELL, 2012).

In parallel to these advances, the model of Clark (1998, 2004) is based on the analysis of some cases of universities that adopt extremely proactive attitudes in their efforts to reform their settings. The main cases studied by Clark are European universities, such as the Warwick University, in central England; the University of Twente, in eastern Holland; the University of Strathclyde, in Glasgow, Scotland; the University of Joensuu, in rural Finland; and the Chalmers University of Technology, in Gothenburg, Sweden.

Evidence about the five universities surveyed shows that they have become more adaptive to the demands imposed by the external environment. The entrepreneurial university encourages entrepreneurial cooperative projects that involve academic units or departments from different areas of knowledge, with a focus on the university's surroundings (CLARK, 1998).

The central point of this model lies in changes in the structure and culture of institutions that add to a general organizational character (whether being significantly revised or new) and not in small changes in teaching and research programs that become isolated enclaves. This type of

entrepreneurship is not a management posture restricted to new science and technology ventures, but an action across the university, including the protection of the traditional fields of knowledge necessary for high-level competence. In addition to providing new bases for collegiality and autonomy, the entrepreneurial transformation establishes new foundations for the sustainable relationship between several fields of research, teaching, and learning of students, inherent to a specific university (CLARK, 2001).

Despite the different approaches and not having a single trajectory, these models are similar in the university's transformation process, such as obtaining varied sources of income, the entrepreneurial attitude of the institution, especially of managers and researchers, and the impact on the local development. The entrepreneurial academic paradigm has both normative and analytical components (ETZKOWITZ *et al.*, 2000).

However, it is wise to consider that not all universities fit into an entrepreneurial university model (ETZKOWITZ, 2013a; ETZKOWITZ; KLOFSTEN, 2005; PHILPOTT *et al.*, 2011). Some universities focus primarily on teaching or research and are not interested in commercializing scientific discoveries or participating in schemes for social improvement. However, there is a global movement towards the transformation of academic universities of many types into entrepreneurial universities (ETZKOWITZ, 2013a).

It is emphasized that the university must recognize that the movements towards an entrepreneurial university model vary according to the experiences and strengths of each institution (PHILPOTT *et al.*, 2011). The search for the ideal entrepreneurial university must avoid adopting an "one size fits all" type of 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).

This is supported by the fact that the higher education activity is not uniform, as there are significant differences between higher education systems in different countries and even between institutions belonging to the same educational system (PHILPOTT *et al.*, 2011). These differences are represented in many ways throughout the historical development of higher education. For example, in the bottom-up and top-down origins of entrepreneurial academic activities in the American and European contexts respectively, and the implementation of land-grant universities and the traditional ivory-tower universities in the American context (ETZKOWITZ, 2003b).

Within emerging countries, such as Brazil, academic entrepreneurship has adopted a broader format to include significant social problems, in addition to economic issues. The concept of incubators was transferred from the development of high-technology companies to the initiatives of cooperatives of low-technology services, using the organizational expertise developed in the initial project to address the deep endemic inequalities of the Brazilian society (ETZKOWITZ, 2013b). Academic entrepreneurship has been transferred to the Brazilian population in general through popular cooperatives and other social programs originating from the university (ALMEIDA; MELLO; ETZKOWITZ, 2012). The entrepreneurial university also includes social entrepreneurship and the generation of social movements as academic products (ETZKOWITZ, 2013b).

The development of an entrepreneurial university often depends on factors external to the academy, such as specific characteristics of the industry and the public sector, and the relationships between industry, university, and public sector. Entrepreneurship is not a path available to all universities but lies in effective and ingenious networks that are not readily available to all institutions (STENSAKER; BENNER, 2013). Having exposed the theoretical assumptions about the topic, the next section presents the methodological procedures that guided the investigation.

METHOD

This research is focused on a multiple-case study. This technique is used to understand a complex, context-dependent phenomenon (EISENHARDT, 1989; YIN, 2010), and must be chosen so that contemporary events are examined, but relevant behaviors cannot be manipulated. The case study is characterized by "how-type" research questions, based on several sources of evidence (YIN, 2010), such as the one carried out in this investigation.

The aim of the case study is to describe accurately or to rebuild a case (FLICK, 2009). One case connotes a spatially delimited phenomenon (a unit), observed at a single point in time or over a while, and comprehends the kind of phenomenon that an inference attempts to explain (GERRING, 2007). Especially regarding the multiple-case study, the use of such as research strategy is consistent because the evidence resulting from this type of project is considered more convincing and the study as a whole is therefore seen as more robust (EISENHARDT; GRAEBNER, 2007; HERRIOTT; FIRESTONE, 1983).

Based on the research strategy designed through a multiple-case study, three cases were investigated: two in Brazil and one in Sweden. In Brazil, the researched universities were the Pontifícia Universidade Católica do Rio Grande do Sul (Pontifical Catholic University of Rio Grande do Sul, PUCRS) and Pontifícia Universidade Católica do Rio de Janeiro (Pontifical Catholic University of Rio de Janeiro, PUC-Rio). Tecnopuc (PUCRS' Science and Technology Park) was twice elected the best technology park in Brazil, in 2016 and 2009. Raiar, PUCRS' business incubator, was elected in 2014 as the best incubator of companies 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 industry's capacity to raise funds, ranking 18th among universities worldwide, according to the 2018 ranking of Times Higher Education (TIMES HIGHER EDUCATION [THE], 2017). About 50% of the institution's revenues are originated from research projects and collaboration with private companies and the government (AGÊNCIA PUC-RIO DE INOVAÇÃO [AGI], 2016), which is uncommon in the Brazilian context. Moreover, the PUC-Rio incubator, the Genesis Institute, is ranked among the best incubators in the world, ranking 1st in Latin America and 13th worldwide, according to the UBI Global 2015 Swedish ranking (PUC-Rio, 2019).

In Sweden, the case of Lund University (LU) was researched. LU ranks as the 4th Swedish institution in the specific indicator on revenues from industry in the THE's 2018 ranking (THE, 2017), which shows its ability to transfer knowledge. It is linked to the Ideon Science Park in the city of Lund and is recognized as one of the largest European technology parks and the main human resources training center from LU (MINISTÉRIO DE CIÊNCIA, TECNOLOGIA E INOVAÇÃO [MCTI], 2015). Ideon Science Park was founded in 1983, after a collaboration between the university, the municipality of Lund, and the company Wihlborgs Fastigheter AB, being the first technology park in Sweden and the second in Europe, after the one in Cambridge in 1973 (FEHRMAN; WESTLING; BLOMQVIST, 2005; KAISERFELD, 2017; STAAF, 2016).

For the data collection, the present study used several procedures, labeled as primary sources and secondary sources. As primary sources, "in loco" interviews were held with the key players implementing the entrepreneurial orientation in the universities researched, starting with the board members of the universities and of the additional or supporting units.

In Brazil, the interviews took place from January to March 2017; and in Sweden, in June 2017. During the first period mentioned, 29 interviews were conducted, 15 at PUCRS and 14 at PUC-Rio. For the period in Sweden, 11 interviews were conducted at LU and Ideon (due to its close collaboration with LU). Each interview ranged from 43 min to 1 hour 28 min. All interviews were recorded while the researcher took notes. In addition to these primary sources, secondary data were collected on the cases researched, mainly from the Higher Education Institutions' (HEIs) websites, public materials, and/or documents made available by the institutions.

Regarding the analysis, two basic procedures were adopted for the data analysis: content analysis and data triangulation. The content analysis was used to analyze the primary data, especially the interviews, which were transcribed in full and analyzed using NVivo 11.0 software. The data triangulation was conducted by crossing information obtained from different data sources, including several types of primary and secondary data. The adoption of this procedure provided the internal validity of the information, as indicated by Azevedo *et al.* (2013). The use of a wide range of informants with individual points of view and experiences that can be comparable, and together with the use of various institutional documents, contributes to the credibility of information from a qualitative perspective. Based on these procedures, the following section describes the cases investigated by analyzing the pathways that conditioned the transformation process in the investigated universities.

THE CASES IN BRAZIL AND SWEDEN

This section addresses the pathways of the three cases researched pursuing an entrepreneurial university model. The different trajectories of the universities are approached individually and then comparatively. The three cases reveal similar behaviors and particular actions, according to the context of each institution.

The Case of PUCRS

PUCRS is identified as a private non-profit, confessional catholic, and community institution, constituted by its campus in Porto Alegre, capital of the state of Rio Grande do Sul (RS), southern Brazil, and by a unit of its technological park (Tecnopuc) located in Viamão, in the metropolitan region of the capital. The city of Porto Alegre has approximately 1.5 million inhabitants and its economy is based essentially on the services and retail and wholesale sectors (PUCRS, 2019).

In its academic environment, PUCRS has around 30,000 students, 1,300 professors, and 4,700 technical-administrative staff, including Hospital São Lucas. PUCRS is a comprehensive university and it offers 56 options for undergraduate courses, 24 masters, and 22 doctorates - organized into 17 academic units. Tecnopuc involves more than 6,500 jobs and houses 120 organizations, including international companies such as Hewlett-Packard, Microsoft, Dell Computer, among others (PUCRS, 2019).

The entrepreneurial pathway developed by PUCRS finds broad support in its foundations. PUCRS was founded in the late 1940s and is one of the most traditional HEIs in Brazil (PUCRS, 2019). With a long-standing tradition in the Brazilian context and community bias, for most of its history, PUCRS has been in an environment marked by the public-private dichotomy promoted by the national higher education system. Despite the recognition of the community university model in the Federal Constitution of 1988, the legal order, represented by the Civil Code, the Law of Guidelines and Bases of Education, the infra-constitutional legislation, and the administrative acts in general, kept on to reproduce this outdated dichotomy in the absence of an appropriate legal framework (LAZZARI; KOEHNTOPP; SCHMIDT, 2009), which in general assigned to PUCRS the condition of a private institution.

After a long period in this condition, only in 2013, this dysfunction was corrected by Law No. 12,881, which defines and qualifies the Higher Education Community Institutions, establishes their prerogatives and purposes, and regulates its cooperation with the State (BRASIL, 2013). Although already having community characteristics for a long time, PUCRS was legally recognized as community only in 2014 after the Ordinance No. 632, of the Secretariat of Regulation and Supervision of Higher Education/Ministry of Education (Seres/MEC, 2014a), which distinguishes community from both public HEIs and private HEIs, especially those with aggressive profit objectives. Among other benefits, such recognition gives access to research resources specifically intended for this type of HEI, since they were previously intended only to public HEIs as a rule.

Although its formal recognition is recent, PUCRS has made many imbrications with society over time through teaching and research activities, which has provided it with local roots, marked by important links with the local and regional community. Among the assumptions of an entrepreneurial university, the focus on the university's surroundings is defended by Clark (1998) to develop entrepreneurial projects that involve several areas of knowledge and different actors.

Supported by non-profit and non-sporadic relationships, PUCRS established important ties with the community, which contributed to establishing its entrepreneurial activities and for regional development. This is evident, for example, in the project called "Porto Alegre Tecnópolis", in which PUCRS worked together with many local and regional actors to transform the reality of the Porto Alegre metropolitan area.

This joint action led to the emergence of a shared conception among the participants of that project. This was decisive for the future installations of Tecnopuc and other technological parks and innovation mechanisms in that region, such as the Unisinos Technological Park, Tecnosinos, and the Center of Excellence in Advanced Electronic Technology called CEITEC (SPOLIDORO; AUDY,

2008). Creating bonds in the local and regional community shows the close and ingrained university-environment interaction, as well as the importance of PUCRS location in the city of Porto Alegre as a locus of adequate and attractive infrastructure for innovation and new ventures based on research and technology.

“[Location] is a determining factor for the success of these actions, especially Tecnopuc; it is our environment [...]. Our ecosystem in the area of higher education and research, mainly at UFRGS and Unisinos; it is decisive in the success of Tecnopuc because all these companies, especially international ones, when choose and settle in a place like this, are not only concerned with their destination. They are concerned if there is an important innovation ecosystem.” (Interviewee 8)

As an important hub of connection between the university and its environment, Tecnopuc develops its activities through more than a hundred links that connect PUCRS with companies, associations, government agencies, and society in general. In addition to taking advantage of traditional teaching and research activities, these relationships also generate other impacts through the generation and attraction of new ventures, jobs, and talents, as approached by Guerrero, Cunningham, and Urbano (2015), and the formation of companies based on academic research, as supported by Etzkowitz *et al.* (2000). This is in line with Etzkowitz (2013a), who argues for the key role of the entrepreneurial universities in technology transfer, incubation of new enterprises, and efforts for local renewal.

The pathway of PUCRS had also an intense development of postgraduate studies, since the first programs in the late 1960s and early 1970s, such as Letters (1969), Buco-maxillofacial Surgery and Traumatology (1969), Education (1972), and Philosophy (1973), with some of them being pioneers in the country. Although these activities started in the late 1960s, the context of the institution in the 1980s was still marked by the low percentage of professors with PhD degrees. In 1987, for example, PUCRS had 64 professors with PhD degrees, corresponding to 5% of the total teaching staff, which damaged its image when compared to other institutions and threatened the achievement of its institutional goals, such as improving the quality of teaching associated with expanding the scientific research (SPOLIDORO; AUDY, 2008).

This scenario was radically modified with the launch of the program “A thousand Masters and PhD graduates for the year 2000” in 1988. This program aimed to promote the qualification of professors and established conditions so that, in just over ten years, about a thousand professors would obtain Masters and PhD degrees in different areas of knowledge. Among the incentives offered, the main one was maintaining the wages of professors who earned their PhDs outside the state of Rio Grande do Sul. The implementation of this program resulted in hundreds of professors going to renowned universities, in the country and abroad, for qualification in different specialties (SPOLIDORO; AUDY, 2008).

That program provided the broadest and densest advance in research and graduate programs at the institution and transformed its reality based on the teaching activities. This is shown in several graduate programs created in the 1990s and early 2000s, as many of them were made available after the qualification of the teaching staff, such as Medicine and Health Sciences (1993), Theology (1993), Computer Science (1994), Social Communication (1994), Electrical Engineering (1994), Pediatrics and Child Health (1995), Criminal Sciences (1997), Dentistry (1999), Biomedical Gerontology (2000), Science and Mathematics Education (2001), Materials Engineering and Technology (2001), Economics (2002), and Cell and Molecular Biology (2003). In addition to these thirteen new postgraduate courses, created in about ten years, other programs previously created by PUCRS advanced in the same period to the PhD level, such as Philosophy (1995), Psychology (1995), Social Service (1998), and Law (2000) (COORDENAÇÃO DE APERFEIÇOAMENTO DE PESSOAL DE NÍVEL SUPERIOR [CAPES], 2017).

“This [program “A thousand Masters and PhD graduates for the year 2000”] ended up being our big change in terms of the University’s profile. The University was focused on teaching, basically on teaching issues. [...] With this turn, we can say that the Program promoted the experience during that period [...]. This allowed the creation of a critical mass of researchers at the institution that we did not have before, and this reflected in several aspects. It ended up reflecting a stronger graduate program because then we started creating new

graduate programs with an increasingly qualified evaluation after the qualification of the teaching staff.” (Interviewee 14)

In just over a decade, the graduate school has exponentially grown at PUCRS. As research and postgraduate studies are closely related, this evolution was certainly supported by the strong focus on research activities. This became crucial in the institutional transformation, which provided the advance in research-based university-industry-government relationships. Like a “snowball”, the transformation of PUCRS towards an entrepreneurial university model is embodied in a cumulative process of actions, initiated by a program called “A thousand Masters and PhD graduates for the year 2000” and enhanced by the qualification of research and graduate activities.

This pathway allowed that 60% of the teaching staff at PUCRS to have a PhD degree and to develop 24 graduate programs, which are distributed in four major areas of knowledge: eight in the health and biological sciences; eight in human sciences; five in applied social sciences; and three in exact and technological sciences (PUCRS, 2019). In 2007, in the last evaluation carried out by the Coordination for the Improvement of Higher Education Personnel (CAPES), 11 of these programs achieved grades 6 or 7, considered of international excellence; 10 of them achieved grade 5, considered of national excellence (CAPES, 2017).

With these two important bases, due to the commitment to the regional development with the community peculiarities and the emphasis on research activities, PUCRS established a series of actions aimed at stimulating entrepreneurship and innovation in the academic environment. This transformation took place after the creation of the PUCRS Technological Management Agency (in Portuguese, Agência de Gestão Tecnológica da PUCRS - AGT) in 1999, which was tasked with managing the university-industry-government interaction process and promoting research and development projects by linking the needs of the market and society with the institution’s teaching and research. The creation of AGT represented the milestone of a new institutional phase, aligned with the university’s third mission (AUDY; KNEBEL, 2015).

Soon after the creation of AGT, PUCRS moved to a new place with the acquisition of the land previously used by the 18th Battalion of Motorized Infantry of the Brazilian Army, in the vicinity of the central campus of the university. There was a long-standing interest in this acquisition, which was first manifested in the 1970s, but only turned effective in May 2001. There was no plan to use the site as a technology park. However, in 2001, companies that had been developing cooperative research and development projects with PUCRS for years, especially Hewlett-Packard and DELL, expressed interest in AGT to expand their activities within the university. In a convergence of internal and external factors, part of the acquired barracks started to be used as a technological park (SPOLIDORO; AUDY, 2008).

From this point on, PUCRS developed several actors and mechanisms to implement the third academic mission, such as Tecnopuc and Raiar incubator both in 2003; the Technology Transfer Office (Escritório de Transferência de Tecnologia - ETT) in 2005; the Tecnopuc Creativity Laboratory (CriaLab) in 2011; and the Entrepreneurship and Innovation Interdisciplinary Laboratory (Idear) in 2016. Articulated in the INOVAPUCRS network, the structure of actors and mechanisms is difficult to be replicated and is rooted in the institution. These particular characteristics and the rooting in its trajectory are supported by the studies of O’Shea *et al.* (2005), Philpott *et al.* (2011), and Stensaker and Benner (2013). The cumulative realization of these actions and the development of interdependent mechanisms are also advocated by Clark (2004, 2006) in implementing the entrepreneurial ideal. Once exposed the milestones and the trajectory developed by PUCRS towards an entrepreneurial university model, the following section addresses the second case researched.

The Case of PUC-Rio

PUC-Rio is configured as a private, confessional catholic, community, philanthropic, non-profit institution. Its campus is inside the lush and dense tropical vegetation that characterizes the city of Rio de Janeiro, capital of the homonymous state, located in southeastern Brazil. Rio de Janeiro has approximately 6.5 million inhabitants and its economy is based on the service sector and it is a dynamic administrative, financial, commercial, and cultural center (PUC-Rio, 2019).

Characterized in some numbers, PUC-Rio has about 22,500 students, 1,200 professors, and 1,800 technical-administrative staff, of whom around 600 are linked to projects or agreements. PUC-Rio has 40 options for undergraduate courses, 28 masters, and 25 doctorates, organized in four academic centers: Center for Theology and Human Sciences (*Centro de Teologia e Ciências Humanas* - CTCH), Center for Social Sciences (*Centro de Ciências Sociais* - CCS), Technical Scientific Center (*Centro Técnico Científico* - CTC), and Center for Biological and Health Sciences (*Centro de Ciências Biológicas e da Saúde* - CCBS) (PUC-Rio, 2019).

The entrepreneurial orientation developed by PUC-Rio finds broad support in its foundations with a community bias and in its extensive trajectory in research and postgraduate studies in the Brazilian context. PUC-Rio was founded in the 1940s and is one of the most traditional Brazilian HEIs (PUC-Rio, 2019). Despite its community vocation, for most of its history, PUC-Rio has been part of the Brazilian higher education environment, which is marked by the public-private dichotomy, and considered as part of the set of private institutions. This dysfunction was only corrected in 2013 by Law No. 12,881, complemented in 2014 by Ordinance No. 679 of the Ministry of Education, which qualifies and formally recognizes PUC-Rio as a community or public non-state university (Seres/MEC, 2014b).

This dysfunction did not prevent PUC-Rio to develop the community characteristics, but limited its access to financial resources made available by the government through specific public calls, particularly those for research activities, which were previously directed only to public institutions. Even so, PUC-Rio developed a series of overlapping with the local/regional community through projects and actions directly related to the economic and social development in its region, which is defended by Clark (1998) as one of the key aspects of the transformation towards an entrepreneurial university model.

PUC-Rio works in a context marked by peculiarities that influenced its development and is rooted in the contrasts arising from its location. On the one hand, it is located in an important productive and economic region of the country, in Southeastern Brazil, where there are large companies, such as Petrobras, which operates in the oil, natural gas and energy industries; Vale, a mining company; Telemar and Embratel, both in the telecommunications area. The city of Rio de Janeiro is recognized as the second-largest metropolis in Brazil and as its main international tourist destination. On the other hand, the apparent beauty of Rio de Janeiro is overshadowed by a large number of slums and the violence that plagues the city. This challenges the performance of PUC-Rio as an entrepreneurial university with the consequent reflection in the economic and social spheres.

“What is interesting here at the University, it [the entrepreneurial spirit] does not affect only the technological aspect of companies in the technological area or the management aspect. We put a new dimension, which is the social entrepreneur, a social agent. So, let's say, this was encouraged in the students, in these courses, as social agents, acting within society for the social action of non-privileged groups, and using their knowledge to improve people's living conditions. It is another face of entrepreneurship. This was highly encouraged at the University.” (Interviewee 25)

“Now, more and more, we see how important it is for the University to be open to society, and that opening occurs exactly through these projects. And then I would tell you that, of course, they are not scientifically based projects, but they are projects, for example, in the education area. We have 10 schools, here in the surroundings of PUC-Rio. We work with these schools, Education, Letters, the Interdisciplinary Reading Institute have some projects, the Unesco Chair has some projects. It is our way to interface with the surroundings because I think this is very important; otherwise, the university will be on top of nothing.” (Interviewee 23)

In addition to the ties established with the local industry, as argued by Bramwell and Wolfe (2008), PUC-Rio develops numerous insertion projects in local/regional communities, focusing on those with social vulnerability, with the idea of academic entrepreneurship adapted to social problems, as addressed by Etzkowitz (2013b). The Genesis Institute is one of the main examples of these overlapping with the surroundings. One of its areas of expertise is specifically focused on local development, both through entrepreneurial projects for communities and regions and through mechanisms and intervention methodologies to promote social inclusion. Most of the projects carried out by the Genesis Institute are developed in a partnership with the government and the business community.

PUC-Rio also has a long tradition of postgraduate studies in Brazil. Boldly for that period, the graduate school started with the creation of ten programs, all in the 1960s. Several of them were

pioneers in Brazil or Latin America, such as Electrical Engineering (1963), Mechanical Engineering (1964), Education (1965), Civil Engineering (1965), Physics (1965), Psychology (1966), Production Engineering (1967), Informatics (1967), Mathematics (1969), and Chemistry (1969). The initial impetus was consolidated with the creation of new programs and the qualification of those that already existed, which enabled PUC-Rio to reach 28 graduate programs.

At PUC-Rio, this resulted in significant quality in research and postgraduate studies. In 2001, for example, PUC-Rio was recognized by CAPES as the institution with the best grades in postgraduate courses in Brazil (PUC-Rio, 2010). In 2007, in the last evaluation carried out by CAPES, PUC-Rio achieved grades 6 or 7 in seven programs, being recognized as having international excellence; while 15 of them achieved grade 5, considered of national excellence (CAPES, 2017). Tradition and quality are supported by its qualified teaching staff, in which there are about 60% of professors with PhD degrees (PUC-Rio, 2016).

The unique trajectory of PUC-Rio in postgraduate studies is based on its capacity to accomplish research. With a rare impulse, within the scope of community and private HEIs and in the Brazilian context of the 1960s, PUC-Rio has structured itself as a university focused on research, given the quality and quantity of graduate programs in different areas of knowledge. This model was put to the test during the institutional crisis of the 1990s. However, despite the momentary difficulties, the research and postgraduate trajectories developed by PUC-Rio were further strengthened, especially based on its capacity to carry out research projects and to seek external partnerships to fund these activities.

Until the 1990s, PUC-Rio was defined as a university focused on teaching and research, mainly theoretical research. Supported by resources from the Financier of Studies and Projects (FINEP) since the 1960s, PUC-Rio has won laboratories and excellence in research in exact sciences and engineering. However, in 1992, the federal government changed some investments in science and technology, which reflected in the reduction of public funds for scientific research and the increase in the technological area. Consequently, funding for PUC-Rio was dramatically reduced and forced the university to rethink itself (GUARANYNS, 2006).

In response to these changes, PUC-Rio accomplished strategic planning and created the Development Office in 1994 to stimulate interaction with society, especially with companies. The management team of the Development Office designed a set of actions to transform the university and created, in 1997, the Genesis Institute for Innovation and Entrepreneurial Action (in Portuguese, Instituto Gênesis para Inovação e Ação Empreendedora) (GUARANYNS, 2006). At the same time, the other existing units at the institution and their teaching staff were “forced” to rethink their activities, especially regarding the financing of research projects and the cost of the time invested in these activities.

The ways found by PUC-Rio to overcome the installed crisis passed, in good measure, by the strengthening of the relationships with companies for the development of the research and the approaching with the society in general. The implementation of these changes permeated the several activities and areas of the University, with the main ones being: a) research institutes and centers; b) Genesis Institute, a business incubator at PUC-Rio; c) the Junior Company at PUC-Rio; d) the Innovation Agency of PUC-Rio (AGI). Together, especially through their research institutes, these actors have shown a significant capacity for fundraising for the institution, which corresponds to half of its revenue nowadays.

“At no time, out of all crises, did the University abandon the project of a research university here, a university of research excellence. During that crisis of not having money to pay, [...] the project to expand research and postgraduate courses to all departments was maintained. In several moments of crisis, it never, never left, abandoned the project of having here and installing quality research and postgraduate courses in all departments.” (Interviewee 20)

“Naturally, in the historical construction of the institution, it had to encourage teachers to, or the teachers themselves had to find an entrepreneurial space, and then they create and start to build something of their own. The University was built based on the performance of several professors. So, it must have this entrepreneurial spirit; otherwise, nothing will happen. And it was motivated, it was institutionally valued.” (Interviewee 26)

The trajectory of PUC-Rio is marked by the involvement of the teaching staff with the institutional needs. Especially during the institutional crisis of the 1990s, their main alternative consisted of the teaching staff moving for external partnerships to support the research and graduate activities. This solution revealed the collective and entrepreneurial behavior of the teaching staff, which is engaged in the main issues that threatened the progress of institutional advancement.

As a result of this movement, PUC-Rio significantly strengthened its ties with both public and private external partnerships, and bet more vehemently on the aspect based on entrepreneurship and innovation that emerged there. Based on an important amalgamation with teaching and research activities, the new dimension strengthened the existing structures, especially the research units created during its trajectory, and developed new mechanisms and actions when implementing the third academic mission.

The entrepreneurial trajectory of PUC-Rio is capillarized in its research units, which were mostly created before the 1990s and based on the approximation of similar research groups. Together, these mechanisms form the course of the institution in search of greater interaction with the government, companies, and society in general and fill the “empty box” of the entrepreneurial university, as exposed by Stensaker and Benner (2013). In addition to and following the ideas of Nelles and Vorley (2010b), O’Shea *et al.* (2005), Philpott *et al.* (2011), and Stensaker and Benner (2013), engagement in entrepreneurial intent depends on the capabilities of universities and the different accumulations of resources, which highlights the peculiarities of each organization according to their particular trajectories. After discussing the main elements that conditioned the transformation of PUC-Rio towards an entrepreneurial university model, the following section describes the third case researched.

The Case of LU

Located in the Skåne county, in southern Sweden, LU has three campuses in the following cities: a) Lund, with 110,000 inhabitants, identified by the presence of high-tech companies and as a university city, being LU one of the main local employers; b) Malmö, located 23 kilometers from Lund, is the third-largest Swedish city, with around 340,000 inhabitants and shows an increasing number of companies in the sectors of transport, financial and business services, entertainment, leisure, and civil construction; c) Helsingborg, located 55 kilometers from Lund and with around 140,000 inhabitants, is defined by port activity and as a regional center for trade, transport, and business (LU, 2019).

LU is a public university, one of the largest and most comprehensive in Sweden, with around 42,000 students, 15% of whom are foreigners. It has 7,500 employees, including 800 professors, 4,200 researchers, and 2,500 technical and administrative staff. LU courses are organized into eight colleges or schools: engineering; social sciences; humanities and theology; economics and management; medicine; science; law; fine and performing arts. There are 80 options for undergraduate courses and about 100 master’s programs (LU, 2019).

The entrepreneurial orientation developed by LU finds broad support in its research activities, aimed at creating new products and services, and in its overlap with the local/regional community. Its historical vocation for discoveries and innovations based on research activities, especially those most recurrent after World War II, contributed significantly to establishing an entrepreneurial orientation in the institution. Several products and services developed based on LU’s research activities reached the international market, improved the quality of life, and formed the basis for new companies or boosted the existing ones.

Strategically installed by the Swedish government, in the city of Lund in 1666, as a way of strengthening the retaken territory of Scania, LU developed a trajectory closely linked to its environment. Despite its secular history and the ties with the local/regional community, this involvement is reflected at different times and in different ways, highlighting the focus on its operating surroundings, as argued by Clark (1998).

Despite accumulating centuries of history, the first 200 years of LU were marked by the slow growth of its campus, especially around the city’s historic cathedral. However, in recent decades, the university has significantly changed its routine and internal organization, despite apparently adopting a conservative view (WESTLING, 2011).

The changes are largely due to its extensive innovation trajectory, marked by several discoveries made by its researchers. In the medical field, two great examples can be mentioned. The first one, led by clinical scientist Nils Alwall, professor of internal medicine at LU, was the use of the artificial kidney in the first hemodialysis performed in a patient with kidney failure in 1946. The machine was later perfected and put into production, becoming the basis of the multi-billion-dollar company Gambro (now Baxter). The second historic achievement was carried out in 1953 by cardiologist Inge Edler and physicist Hellmuth Hertz, both professors at LU who used ultrasound for the first time to diagnose heart diseases. The use of ultrasound was widespread, and Hertz was nominated for the Nobel Prize in Physics. However, he did not win for several reasons (WESTLING, 2011).

In addition, several other innovations were made during the trajectory of LU, which enhanced the quality of life or contributed in some way to society in general, such as the discovery of lactose intolerance (1963), the creation of inkjet technology for printers (1972), the laser cancer treatment (1991), the development of the facial recognition technology (2004), pre-eclampsia treatment (2009), among others. Since 1999, the institution has invested in more than 80 research companies, which together have created more than 3,300 jobs and 100 million Euros in revenue. In 2016 alone, the Institution applied for 18 patent applications and created 20 companies, with shareholding in six of them (LU, 2019).

Despite this successful trajectory, the cooperation between the university and the business world was not always a consensus. In the late 1960s, there were hostile attitudes towards this relationship, shown by the hesitant behavior of some professors and by the widespread criticism involving the university and companies. However, in the second half of the 1970s, cooperation between universities and companies had increased in several ways. It has changed significantly to a natural relationship, especially since the beginning of the activities of the Ideon technology park in the early 1980s (FEHRMAN; WESTLING; BLOMQVIST, 2005).

In the legal-regulatory field, two milestones were important for this change. The first was the university reform accomplished by the Swedish government in 1977. It set the democratization of governance for universities, with the decentralization of government power and wide dissemination of information on research and development activities, their experiences, the accumulated knowledge, and its application. Gradually, universities adopted more appropriate forms of organization and decision-making (FEHRMAN; WESTLING; BLOMQVIST, 2005), which, on the one hand, gave them more responsibility and, on the other, allowed greater differentiation and freedom in the university management.

The second important milestone was the regulation of higher education in 1997 by the Swedish government, which introduced the term “the third task”, alongside teaching and research activities, as a label for the duty of disseminating information and interaction with their surroundings, involving businesses, public administration, associations, and organizations of all kinds. This represented the want for research policy in Sweden about the transfer of knowledge from the universities to the society in a broad way (FEHRMAN; WESTLING; BLOMQVIST, 2005; STAAF, 2016).

In order to take advantage of these changes, in 1999, LU created the Lund University Innovation System (LUIS), an innovation office to generate growth from the University’s research and ensure the application of knowledge for the benefit of society. LUIS role is to establish a link between academia and industry by transferring knowledge and technology from the university to the industry and the public sector. In addition to exploring the existing knowledge at the University, LUIS also aims at understanding the needs of the society and connecting with the right people at the university. This implies a combination of academic expertise, entrepreneurial spirit, and industrial experience (LU, 2017).

Right after the beginning of the LUIS activities in 2001, the School of Economics and Management (LUSEM) of LU created VentureLab as a project to support their entrepreneurial students to start new businesses. The initiative became interesting and applied to the rest of the LU students. Currently, VentureLab is linked to LUIS and its activities reach around 5,000 students each year, in an interdisciplinary and creative environment for entrepreneurship, where the ideas with the best potential are sent to the incubation process (LU, 2019).

In addition to these LU’s initiatives, one of the main institutional collaborative actions with external partnerships, especially the municipality of Lund and companies, is in the constitution of the

technological park called Ideon in 1983, as highlighted by Kaiserfeld (2017). It was developed as an alternative to the local crisis, and it currently houses around 400 companies, such as IKEA, Ericsson, and Sony, and employs around 9,000 people. Part of Ideon's expansion comes from small companies created to explore LU research results (FEHRMAN; WESTLING; BLOMQVIST, 2005).

"I think that one important part of this is the founding of the buildings that are just beside us here, the Ideon Science Park. I think that's one of the major, you know, important events which Lund University moved from a more traditional, I think, maybe not ivory tower but in that respect so to speak, [...] to think of research also being economically interesting, commercializing, and so on". (Interviewee 34)

"So, today I think it's about 25% of the companies here [Ideon] are ICT, IT industry, and there are more companies to account because of the heritage of Lund University and then another 25% are life science, but that's because of the heritage of AstraZeneca who was here before, not anymore, and that also linked to University and research [...]. Then, the other 50% are spread in other areas here." (Interviewee 32)

Being close to the LU has been instrumental to the Ideon's success. Over the years, third-quarters of its companies have some kind of connection with LU. Moreover, Ideon has played an important role in the history of LU by getting close to companies and the contribution to the active search for this approach (STAAF, 2016).

In addition to this venture, which resulted in one of the largest technological parks in Europe (FEHRMAN; WESTLING; BLOMQVIST, 2005), LU was engaged in several other initiatives that contributed to its internal transformation and its surroundings. More recently, an example that shows this engagement is the constitution of Medicon Village in 2012, which was developed according to the triple-helix model led by LU. Acting directly in the search for solutions for the significant unemployment that would result from the closing of AstraZeneca's operations in Lund, LU again worked collaboratively with the municipality and with the companies for a new technological park, now specifically focused on the life sciences area. In the year following the foundation of the Medicon Village in 2013, LU transferred 200 of its cancer researchers to the new technology park (MEDICON VILLAGE, 2019) as another demonstration of involvement with its environment.

LU's active operation in developing new mechanisms aligned with the third academic mission is directly related to the approach of Etzkowitz (2013a), notably in the key role played by the university in conducting efforts for a local renewal, such as that explored by Benneworth *et al.* (2009) in their study on the influence of LU in strengthening the local innovation system in Scania. With the links established with external partnerships, LU has contributed to creating several companies based on academic research and has participated in structuring new local organizations, such as Ideon and Medicon Village, as shown by Etzkowitz *et al.* (2000).

The main milestones that portray the establishment of the entrepreneurial orientation at LU include the development of internal and external mechanisms in several strategies, as addressed by Grimaldi *et al.* (2011). In the implementation of the third academic mission by LU, it is important to highlight the influence of the university reforms carried out by the Swedish government, which provided opportunities to establish its strategic direction, as discussed by Clark (1998) and Etzkowitz (2013a), and consequently to transform the university into an entrepreneurial university model.

The different movements accomplished by LU towards an entrepreneurial university model have significant roots whether locally or in their institutional pathway, which finds support in the studies of Nelles and Vorley (2010b), O'Shea *et al.* (2005), Philpott *et al.* (2011), and Stensaker and Benner (2013). LU created a series of internal mechanisms, associated companies, partnerships, and external connections to support and engage with Scandinavia's industrial structure. Thus, the bases for the transformation of LU were created, historically characterized as a classic Humboldtian university, however, in recent decades, it was reshaped towards an entrepreneurial university. This transformation included several internal changes that allowed LU to become increasingly involved in local and regional development (BENNEWORTH *et al.*, 2009). Based on the individual analysis of the three cases, the next section summarizes the cross-analysis of the studied universities.

THREE UNIVERSITIES, DIFFERENT PATHS, AND ONE DIRECTION

The entrepreneurial orientation established by the universities analyzed has a significant relationship with the particular pathway of each institution, their environment and the ties developed with external partnerships. In the three cases researched, their trajectories represented diverse accumulations of resources, which resulted in idiosyncratic transformations in the institutions towards an entrepreneurial university model, as addressed by Nelles and Vorley (2010b), O'Shea *et al.* (2005), Philpott *et al.* (2011) and Stensaker and Benner (2013).

In the context of Brazilian universities, PUCRS and PUC-Rio are among the most traditional HEIs in the country and show consistent trajectories, especially regarding research and postgraduate studies. Established in the 1940s, both institutions started postgraduate studies in the 1960s, pioneering in some areas. The initial impetus for postgraduate development was greater at PUC-Rio, with the establishment, in the 1960s, of ten programs. At PUCRS, the boost took place with the launch of the program "A thousand Masters and PhD graduates for the year 2000" in 1988 and the consequent creation of many postgraduate programs.

Despite the different impulse times in graduate school, PUCRS and PUC-Rio reached a prominent position in the national scenario, with a total of 24 and 28 programs, respectively, almost all of them with grade 5 or higher. The trajectories of both institutions in postgraduate studies, predecessors or simultaneous to the transformations towards an entrepreneurial university model, were key for developing qualified research projects, capturing external resources and establishing development partnerships. Such movements made it possible to reach the third academic mission, especially in the case of PUC-Rio, due to its focus on research contracts.

The trajectory of LU is secular and accumulates about 350 years of history, making it one of the most traditional universities in Sweden. Due to the facts and influences that marked its trajectory, LU was dedicated to research, which resulted in several products or services that contributed to improving the quality of life in general, especially after World War II. The historical vocation for discoveries and innovations based on research activities proved to be an important indication for the transformation of LU towards the third academic mission, given its aptitude for applied research, its cooperation with business and government, and the creation of many companies based on academic studies.

The three universities investigated are characterized by the articulation with their environment and actively participate in the economic and social development, which is at the heart of the third academic mission, as addressed by Clark (1998), Etzkowitz (2013a, 2013b), and Philpott *et al.* (2011). In the case of Brazilian HEIs, both PUCRS and PUC-Rio, because of their foundation, have community traits, although they were legally recognized as such only in 2014. Despite the late recognition, over time, both institutions have developed numerous ties with the local/regional community, which largely distance them from those private HEIs with purely profitable interests.

In the case of LU, the involvement with the local/regional community is shown in its public character, especially in the Swedish government's concern regarding the relationship of universities with society in general, emphasized since the higher education reform in 1977. In the light of the studies of Etzkowitz (2013a), LU's focus on its surroundings is reflected in the efforts made for local renewal and strengthening of the innovation system in Scania, notably in the engagement to build and develop Ideon and Medicon Village technology parks, as detailed in the study of Benneworth *et al.* (2009).

The involvement with economic and social development, present in the three universities investigated, takes place through the several ties established with external partnerships, which frame the entrepreneurial orientation of each institution. This is evident, for example, in the numerous connections between the university and its environments, such as those of Tecnopuc at PUCRS, the research units at PUC-Rio, and the LU's relationships with Ideon and Medicon Village. From this, the final discussions of the study are presented.

FINAL REMARKS

The pathways developed by the universities during the implementation of the third academic mission followed the focus on research activities, which provided the conditions to enhance the

university-industry-government interactions. Evidence reveals that these universities developed trajectories based on research activities, which have an origin link with the implementation of the third academic mission and a significant influence on the increase of the university-industry-government relationships.

Moreover, the studied cases show a significant adherence to their local/regional communities through several ties with external actors and the contribution to the economic and social development, as supported by Clark (1998), Etzkowitz (2013a, 2013b), and Philpott *et al.* (2011). The local/regional rooting contributed to creating unique trajectories towards an entrepreneurial university model, as mentioned by Nelles and Vorley (2010b), O'Shea *et al.* (2005), Philpott *et al.* (2011), and Stensaker and Benner (2013), which refutes the "one size fits all" path.

On the one hand, despite the different contexts, this analysis revealed similarities between the cases studied, which reinforces the importance of comparative studies between different countries, as those already performed by Clark (1998, 2004), Etzkowitz (2003b), 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 studies of Nelles and Vorley (2010b), O'Shea *et al.* (2005), Philpott *et al.* (2011), and Stensaker and Benner (2013).

In this study, the three cases were successful in the process of institutional transformation towards an entrepreneurial university model, as well as exemplary practices in conducting efforts to establish entrepreneurial orientation 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.

It should also be noted that universities both in Brazil and Sweden are linked to different education and innovation systems at the national level. They produce a variety of influences in each university and different contexts, especially in those of an emerging economy and an advanced economy, as Brazil and Sweden respectively. Regarding these differences, this research turned its focus to the internal transformations and strategic behaviors in the studied universities pursuing a new organizational model, based on the assumptions of an entrepreneurial university.

Finally, the relatively recent rise of the entrepreneurial university thematic in many parts of the world indicates new inquiries and curiosities to be better elucidated in different economic and social contexts. Consequently, there are several issues about this phenomenon to be investigated, which still raise questions or new discussions from different views and theoretical combinations. For example: a) the impact on the local development, provided by the entrepreneurial orientation in the academic environment, is a topic that deserves to be investigated, especially in less favored regions or those lacking advanced infrastructure; b) the study of other universities that are guided by an entrepreneurial university model in different contexts of emerging economies remains relevant. As the economic and social development is at the heart of the third academic mission, research in universities in emerging countries keeps key, in addition to being a little-explored empirical field.

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