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## **THE RELATIONSHIP OF THE THIRD ACADEMIC MISSION WITH TRADITIONAL TEACHING AND RESEARCH ACTIVITIES**

**A RELAÇÃO DA TERCEIRA MISSÃO ACADÊMICA COM AS ATIVIDADES TRADICIONAIS DE ENSINO E PESQUISA**

**Fábio Dal-Soto, Doutor**

<https://orcid.org/0000-0002-0342-2706>

[fsoto@unicruz.edu.br](mailto:fsoto@unicruz.edu.br)

Universidade de Cruz Alta | Curso de Administração  
Cruz Alta | Rio Grande do Sul | Brasil

**Yeda Swirski de Souza, Doutora**

<https://orcid.org/0000-0001-9299-9509>

[yedasou@unisinos.br](mailto:yedasou@unisinos.br)

Universidade do Vale do Rio dos Sinos | Programa de Pós-graduação em Administração  
Porto Alegre | Rio Grande do Sul | Brasil

**Mats Benner, PhD**

<https://orcid.org/0000-0003-3446-9344>

[mats.benner@ehl.lu.se](mailto:mats.benner@ehl.lu.se)

Lund University | Lund University School of Economics and Management  
Lund | Escânia | Suécia

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### **ABSTRACT**

In the process of adapting to environmental changes, universities are moving towards new organizational models, with emphasis on the entrepreneurial university model. This is a global phenomenon that takes place in different economic and social contexts. In that regard, this research aims to identify the different ways of accomplishment of the third academic mission in universities and their relationship with traditional teaching and research activities. For this sake, this research is a case study focusing on two Brazilian universities: the Pontifical Catholic University of Rio Grande do Sul (PUCRS) and the Pontifical Catholic University of Rio de Janeiro (PUC-Rio). The results show the use of several actions and mechanisms of innovation and entrepreneurship towards an entrepreneurial university model, with the establishment of links with both teaching and research. Furthermore, the studied cases show synergistic relationships between the third academic mission and the traditional academic missions, especially with research.

**Keywords:** Third Academic Mission. Teaching. Research. Entrepreneurial University.

### **RESUMO**

Em um processo de adaptação às alterações ambientais, as universidades movimentam-se em direção a novos modelos organizacionais, com destaque ao da universidade empreendedora. Esse é um fenômeno global que ocorre em diferentes contextos econômicos e sociais. Nesse sentido, esta pesquisa tem o objetivo de identificar as diferentes formas de realização da terceira missão acadêmica em universidades e sua relação com as atividades tradicionais de ensino e pesquisa. Para isso, esta pesquisa centra-se em um estudo de casos, baseado em duas universidades brasileiras: a Pontifícia Universidade Católica do Rio Grande do Sul (PUCRS) e a Pontifícia Universidade Católica do Rio de Janeiro (PUC-Rio). Os resultados mostram a utilização de variadas ações e mecanismos de inovação e empreendedorismo em direção a um modelo de universidade empreendedora, com o estabelecimento de vínculos tanto com o ensino quanto com a pesquisa. Além disso, os casos estudados evidenciam relações sinérgicas da terceira missão acadêmica com as missões acadêmicas tradicionais, especialmente com a pesquisa.

**Palavras-chave:** Terceira missão acadêmica. Ensino. Pesquisa. Universidade Empreendedora.

## **1 INTRODUCTION**

The rise of a knowledge-based society and the competition in the labor market, both locally and globally, makes higher education even more critical for individuals and society in general. Given contemporary higher education importance and the growing demand, status quo of traditional institutions has been challenged. In many countries, one can observe not only expansion, but also reforms, and restructuring of the traditional, teaching and research centered universities, to make them more aligned to the needs of the knowledge-based economy (SAM; SIJDE, 2014).

In this context, the entrepreneurial university phenomenon has spread in both advanced and emerging economies and has increasingly attracted the attention of academia and policymakers. 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 capacities. The broader dissemination of this entrepreneurial orientation is the foundation of larger-scale and more in-depth empirical studies, focusing on entrepreneurial potential (TIJSSEN, 2006).

Consequently, the increasing importance of the university in terms of its impact on the economy is observed in the entrepreneurial economy area, which focuses on exploiting entrepreneurial opportunities based on knowledge (GUERRERO; CUNNINGHAM; URBANO, 2015). The assumption is that universities become more entrepreneurial to improve their competitiveness, and they become more productive and creative when ties between teaching and research are established (KIRBY; GUERRERO; URBANO, 2011).

Synergies that link the different missions to build a genuinely entrepreneurial university must be found, as suggested by Boardman and Ponomariov (2009), Etzkowitz, Webster, Gebhardt, and Terra (2000), Philpott, Dooley, O'Reilly, and Lupton (2011), and Van Looy, Landoni, Callaert, Pottelsberghe, Sapsalis, and Debackere (2011). This process is not free from tensions and conflicts, as discussed by Kalar and Antoncic (2015), Rasmussen, Moen, and Gulbrandsen (2006) and Urbano and Guerrero (2013), but furthering the third academic mission and its integration with teaching and research can prove to be important antidotes to these restrictions.

This investigation targets the following question: how is established the relationship of the third academic mission with the traditional teaching and research academic missions? Therefore, this paper aims to identify the different ways applied to accomplish the third

academic mission in universities and their relationship with traditional teaching and research activities.

It is assumed that the changes made within the studied universities have been 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) and Etzkowitz and Zhou (2017). As an empirical field, actions and mechanisms developed by universities in an emerging economy (Brazil) are explored through a case study focusing on the processes of transformation of traditional institutions towards an entrepreneurial university model.

The following section presents the literature that bases this investigation. Next, the methodological procedures are presented, focused on the use of the case study technique and the data collection and analysis. Then, the research results are described and analyzed, and the final considerations are exposed.

## **2 THEORETICAL BACKGROUND**

The concept of entrepreneurial university aims to embody the traditional roles played by the university. The university mission originally lies in preserving and transmitting knowledge. The transition from a teaching-centered institution to a research-centered gave rise to the first academic revolution in the mid-XIX century with the emergence of the Humboldt model. The second academic revolution takes place when universities assume a third mission. This change initiated in American universities in the 19th century with two different strategies: land-grant university, including those aimed at improving agriculture and industry, such as UC Berkeley and MIT, respectively, and the classic ivory-tower universities, based on pure research, such as Johns Hopkins and the University of Chicago. These two university models converged due to the growing relevance of basic research for technological and industrial development in the United States (ETZKOWITZ, 2003; ETZKOWITZ; ZHOU, 2017).

The second academic revolution only gained momentum in the US with the interaction between university and government in military research projects conducted during the World War II, both through the application of science to military problems and through theoretical advancement. The creation of firms by academics was encouraged in the post-war years by many academic institutions, such as MIT and Stanford, which started to have a significant

number of professors involved in organizing firms and forming an entrepreneurial culture (ETZKOWITZ; WEBSTER; GEBHARDT; TERRA, 2000; ETZKOWITZ; ZHOU, 2017).

On the transition to the entrepreneurial university, the traditional academic missions are associated to new missions. The academic entrepreneurship activities become additional to the teaching and research activities. This new mission can be accomplished in many ways, in different countries, according to the various academic traditions (ETZKOWITZ; ZHOU, 2017). For this sake, it's important emphasizing the knowledge that can be shared with the industry, as well as the establishment of the entrepreneurial mindset inside the university to become more inclined towards entrepreneurship (AHMAD; HALIM; RAMAYAH; POPA; PAPA, 2018).

One of the prerequisites for this transition lies in the university's ability to define its strategic direction (CLARK, 1998), while each successive academic organizational innovation gives the university a greater ability to establish its strategic direction (ETZKOWITZ; ZHOU, 2017). The entrepreneurial university aims to break up the relationship of decision-makers with the full-time status-quo so that it works in favor of a process promoting change. In contrast, traditional universities have a steady, inertia-oriented state, driven by the status quo and with no proactive efforts to recreate their setting. However, there are still questions about this transition from a traditional position based on the status quo to a new attitude towards change in the universities. In theory, this new position is related to the logic of the innovative university, proactive university, or entrepreneurial university (CLARK, 2006).

In most cases, the transformation of the university is not an accident or an isolated action. On the contrary, transformation happens when several people from different units of the university meet, through an organized initiative, to change the structuring and orientation of the institution. Thus, the collective entrepreneurial action is the center of the transformation phenomenon. The entrepreneurial response to the growing imbalance in the environment-university relationship gives the university a better chance of controlling its destiny (CLARK, 1998).

An entrepreneurial university plays its role in putting knowledge to use and expanding the contribution to the creation of academic knowledge, providing a supporting structure for teachers and students to start their ventures. An entrepreneurial university must also develop the ability to understand and address the problems and needs of the society. These problems and needs are basis for new research projects and intellectual paradigms, with the creation of

a virtuous circle of internal intellectual development (ETZKOWITZ; ZHOU, 2017). Some researchers approach these points: Castro, Nagano, and Ribeiro (2019) show the main critical factors that influence an academic research project in generating social and economic impact; Diniz, Mendonça, Siqueira, and Santos (2020) point out critical factors of knowledge transfer between university-industry, including some ways and challenges in this relationship; and Guerrero, Urbano, and Gajón (2020) describe the influence of entrepreneurial university ecosystems (i.e. incubators and entrepreneurship education programs) on the career developed by graduates (i.e. academic entrepreneur, self-employed or paid employed).

Clark (1998) suggests that all universities should adapt and become more entrepreneurial, as they respond to the growing demand for higher education. The entrepreneurial model has also been a mean to universities to become financially more independent and seek funds from external sources by exploiting their knowledge. Thus, universities are encouraged to act entrepreneurially to find new sources of income and ensure their space in the knowledge-based economy (SAM; SIJDE, 2014). In this sense, good operational policies, both inside the university and in development agencies, are very important to perform the desire of the university becoming an entrepreneurial one (CASTRO; NAGANO; RIBEIRO, 2019).

Some studies summarize the literature advancement and show an important overview around the entrepreneurial university, such as Audretsch and Belitski (2022), Centobelli, Cerchione, Esposito, and Shashi (2019), and Klofsten, Fayolle, Guerrero, Mian, Urbano, and Wright (2019). However, the ideal entrepreneurial university consists of an “empty box” that must be filled with content by each institution, considering that different universities have different access to resources that are fundamental for the evasive entrepreneurial ideal. The idea of becoming an entrepreneurial institution is filled mainly with structural and process-oriented factors, related to their forms of governance and cultural characteristics imperative to boost innovation and entrepreneurship (STENSAKER; BENNER, 2013). Exposed some theoretical assumptions, the methodological procedures are presented in the next section, including how the data were collected and analyzed.

### **3 METHOD**

This research is based on case studies. This technique is used to understand a complex, context-dependent phenomenon (EISENHARDT, 1989; YIN, 2017) and must be chosen so

that contemporary events are examined, but relevant behaviors cannot be manipulated. 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 (YIN, 2017).

The investigated cases were the Pontificia Universidade Católica do Rio Grande do Sul (Pontifical Catholic University of Rio Grande do Sul, PUCRS) and the Pontificia Universidade Católica do Rio de Janeiro (Pontifical Catholic University of Rio de Janeiro, PUC-Rio). Tecnopuc (PUCRS' Science and Technology Park) was twice elected as the best technology park in Brazil in 2009 and 2016 (ANPROTEC, 2022). 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 8th among universities worldwide, according to the 2022 ranking of Times Higher Education (THE, 2022).

For the data collection, the present study used several procedures, labeled as primary sources and secondary sources. As primary data source, 29 in loco interviews (15 at PUCRS and 14 at PUC-Rio) were carried out with those main involved in implementing the entrepreneurial orientation 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 and were accomplished from January to March 2017. Each interview ranged from 46 min to 1 hour 28 min. All interviews were recorded. In addition to the primary sources, several secondary data were collected on the cases researched, especially through the university websites, public materials and/or documents provided by the institutions, books, academic articles, etc.

Two basic procedures were adopted for the data analysis: the 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. As 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. Once the methodological procedures are exposed, the following section presents the cases studied and the results of the relationship between the academic missions.

## **4 THE CASES IN BRAZIL**

The present section addresses the cases of the two universities researched. In addition to the basic characteristics of each university, the main types of relationships between academic missions are presented.

### **4.1 THE CASE OF PUCRS**

PUCRS is one of the most traditional higher education institutions (HEIs) of Brazil. It became a university in 1948 and had its initial milestone with the creation of the Superior School of Commerce in 1931. Being identified as a non-profit private, Catholic confessional, community-based private entity, PUCRS has a campus in Porto Alegre (the capital of the state of Rio Grande do Sul, Brazil) and a Tecnopuc unit located in Viamão, in the metropolitan area of the capital. PUCRS has about 30,000 students, 1,300 teachers, and 4,700 technical-administrative employees, including the São Lucas Hospital. It offers 56 undergraduate courses and 24 postgraduate programs – 24 master’s degrees and 22 Ph.D. degrees –, which are organized into 17 academic units (PUCRS, 2022).

The evolution of entrepreneurial activities at PUCRS is largely due to the development of research activities interacting with firms and the government. Since the creation of Technological Management Agency (in Portuguese “Agência de Gestão Tecnológica” – AGT) in 1999, the development of more robust research projects, with external funds based on university-industry-government interaction, has reportedly been stimulated by the institution. This is closely aligned with Etzkowitz and Zhou (2017), who supports the development of academic entrepreneurship as an extension of teaching and research activities, especially research.

This motto based on qualified research resulted in numerous ties between university-industry-government and, consequently, in the creation of important research institutes nationwide, for example, the Institute of Petroleum and Natural Resources (in Portuguese “Instituto do Petróleo e dos Recursos Naturais” – IPR) and the Brain Institute of Rio Grande do Sul (BraIns) (in Portuguese “Instituto do Cérebro do Rio Grande do Sul” – InsCer). IPR was created in 2014, after the activities developed by the Center of Excellence in Research and Innovation in Petroleum, Mineral Resources and Carbon Storage (in Portuguese “Centro de Excelência em Pesquisa e Inovação em Petróleo, Recursos Minerais e Armazenamento de Carbono” – CEPAC) since 2007, and after a close link with Petrobras and the involvement of



several research groups and laboratories. InsCer, created in 2012 and originated from the activities carried out in the Institute of Biomedical Research (in Portuguese “Instituto de Pesquisas Biomédicas” – IPB) since 1997, emerged with a multidisciplinary purpose to use new neurological technologies, processes, and treatments, with important financial contributions received from the Ministry of Health and the Ministry of Science, Technology and Innovation (AUDY; KNEBEL, 2015; PUCRS, 2022). These research bases are shown in the following interview excerpt:

[...] because, in reality, the entire innovation area was very connected with the research area. In fact, we always say that the innovation and development area are expressions of the research area. Having a strong research area is reflected in terms of actions focused on innovation and development. [...] All of this is justified because we have an image, a very strong research support. So, you can't neglect this here. This has to be going very well for the innovation area to continue developing. – Dean of Research, Innovation and Development (CARLA, 2017).

These examples show how close the research activities are concerning the third academic missions, especially in the strengthening of ties with firms and government, as something inborn of the established relationships. Even more widely and variedly, the actions developed by PUCRS are shown in the Tecnopuc's activities when implementing the third mission and in its relationship with the traditional academic missions. With more than a hundred organizations installed in its spaces, Tecnopuc provides various types of interaction between the actors involved, such as research projects and technology transfer, in several fields of knowledge, as proposed by Clark (1998). Interaction with the university is one of the requirements for a new organization to enter Tecnopuc, which ensures, as a rule, the strengthening of relationships with teaching and/or research activities.

When Tecnopuc was conceived, at the origin, its proposal has always been to be a space where companies can settle here, business entities can come to foster the relationship with the university, as projects or other collaborations that may happen. [...] So this is a very important guideline. The presence of these companies, organizations, and entities in Tecnopuc enables this interaction to benefit students in our main activity. – Director of AGT (RICARDO, 2017).

The Startup Garage (in Portuguese “Startup Garagem”) is an important tool for interacting with traditional academic activities, developed by one of the actors of the INOVAPUCRS network. This is a pre-incubation initiative, in order to pan new ideas that can be shaped for the formation of firms, based on projects prepared by PUCRS students and

originated from several fields of knowledge. The projects selected by Startup Garage receive mentoring on various subjects required to advance the idea, such as business modeling, personal development, communication, and intellectual property.

There are also initiatives developed by the Interdisciplinary Laboratory for Entrepreneurship and Innovation (in Portuguese “Laboratório Interdisciplinar de Empreendedorismo e Inovação” – Idear), which promotes entrepreneurship and the entrepreneurial attitude for students, teachers and the community in general. Idear was created in 2016 and is linked to the Academic Dean’s Office, in order to mainstream entrepreneurship in all areas of knowledge at PUCRS. Part of its activities was developed by the previous Entrepreneurial Nucleus (in Portuguese “Núcleo Empreendedor”), started in 2007, and linked to the former College of Administration, Accounting and Economics (FACE), current Business School (PUCRS, 2022). The change of the status of Idear, from a specific academic unit to the institutional level, shows the intention of PUCRS to disseminate entrepreneurship to all areas of knowledge.

Among the activities accomplished by Idear, two are emphasized: The Challenges Project (in Portuguese “Projeto Desafios”) and the Entrepreneurial Tournament (in Portuguese “Torneio Empreendedor”). The Challenges Project is an elective discipline, available to all undergraduate students at PUCRS, intending to encourage the entrepreneurial and innovative attitude through thematic challenges, based on new classroom dynamics and projects guided by the *Design Thinking* methodology. The Entrepreneurial Tournament consists of an open competition to undergraduate and graduate students from PUCRS and other Brazilian HEIs, who are interested in developing entrepreneurial projects aimed at identifying business opportunities. The Entrepreneurial Tournament, originated from the former Entrepreneurial Nucleus, takes place every year. With more than ten editions, it is already a traditional event at PUCRS (PUCRS, 2022).

So, we have several initiatives. For example, the Entrepreneurial Tournament, which connects undergraduate and graduate students to develop a business plan; we have the Startup Garage; we have a series of initiatives for these students who have the focus, so to speak, to set up a company, create a business plan. But now we have another space at the University, which is Idear, [...] which has exactly this role of connecting the ideas of students of cutting-edge research with our environment [INOVAPUCRS], let's say. [Idear] is the first one, the starting point. – Dean of Research, Innovation and Development (CARLA, 2017).

Despite important initiatives that connect the student with the PUCRS ecosystem of innovation and entrepreneurship, such as Startup Garage, the Challenges Project and the Entrepreneurial Tournament, the challenge remains for teaching activities, especially in those areas with less tradition in entrepreneurial activities, so that this broad apparatus becomes, in fact, a differential in the training of students. Improving these ties is not a light or quick task, as there are several factors involved, such as the scope of PUCRS in different areas of knowledge, the different profiles in the faculty, and the problems caused by the undergraduate and postgraduate assessment systems in Brazil.

Commonly in the academic environment and also due to the channeling of external funding in science and technology, some areas are more connected with the INOVAPUCRS network, such as the Faculties of Informatics, Engineering, Social Communication, and Biosciences, which is supported by the studies of Kalar and Antoncic (2015), Philpott, Dooley, O'Reilly, and Lupton (2011), and Todorovic, McNaughton, and Guild (2011). The different areas of knowledge in entrepreneurial activities are not of course expected to be equated, but the scope brings it closer to an entrepreneurial university model across the institution, as proposed by Abreu and Grinevich (2013) and Clark (2001).

Those areas with less tradition in the entrepreneurial intent can be expanded in several ways, such as promoting interdisciplinarity and new market alternatives for the professions. Interdisciplinarity, for example, has been encouraged by PUCRS through the Challenges Project and research projects – as when submitting to the notice of internal funding known as PRAIAS. This is an initiative of the research sector and has resulted in the development of products and the filing of patents, using interdisciplinary research (preferably by integrating Human Sciences and Applied Social Sciences to other areas) – and solving complex and/or innovative problems that necessarily involve different areas of knowledge.

And now our biggest challenge is to add this brand of entrepreneurship to the training of the PUCRS students, so it follows them when they graduate. If this is not part of their training, just saying that they studied at PUCRS and it has a technological park does not help. If they never came here, they have never been here, they never interacted, it doesn't help them. It must be a solid experience, which means: an internship, a job, a scholarship here or else it is all shown to them in the classroom, based on the connection we make. Otherwise, it doesn't do anything for them. There is no point in saying that they studied at Tecnopuc. – Innovation and Development Director (GABRIELA, 2017).

Actually, the ‘path is paved’ and now there is a better use of the links between the INOVAPUCRS network and teaching activities. This effort may contribute to an even more unique path towards an entrepreneurial university model. The multifaceted strategy developed through the INOVAPUCRS network and the university-industry-government relationships already established by the qualified research activities are proving to facilitate the next steps of integration between “the new and the old”.

Having exposed the main relationships established by PUCRS between its innovation and entrepreneurship ecosystem and the traditional academic missions of teaching and research, the following subsection addresses the case of the second university analyzed here.

#### 4.2 THE CASE OF PUC-RIO

PUC-Rio is also one of the most traditional Brazilian HEIs. It was founded in 1941 and officially recognized in 1946. Its reference landmark puts it as a private law, Catholic confessional, community, philanthropic, not-for-profit institution. The PUC-Rio campus is located in the city of Rio de Janeiro, the capital of the homonymous state, in southeastern Brazil. PUC-Rio has about 22,500 students, 1,200 teachers and 1,800 technical-administrative employees, of which around 600 are linked to projects or partnerships. PUC-Rio has 40 undergraduate courses and 28 postgraduate programs, with 28 Master’s degrees and 25 Ph.D. degrees, organized in four centers: Center of Theology and Humanities (in Portuguese “Centro de Teologia e Ciências Humanas” – CTCH), Center of Social Sciences (in Portuguese “Centro de Ciências Sociais” – CCS), Scientific-Technical Center (in Portuguese “Centro Técnico Científico” – CTC), and Center for Biological and Health Sciences (in Portuguese, “Centro de Ciências Biológicas e da Saúde” – CCBS) (PUC-Rio, 2022).

The development of the entrepreneurial and innovative aspect in PUC-Rio is closely related to the teaching and research activities. In the field of education, there are at least three actions that represent the new aspect developed by the institution, with some of which forming the origin itself. The first refers to the institution’s participation in the program Re-engineering the Engineering Education (in Portuguese “Reengenharia da Educação em Engenharia” – REENGE), started in 1995 and aimed at reformulating the teaching in Engineering courses. As part of this reform, entrepreneurship gained space in the curriculum of Engineering undergraduate courses at PUC-Rio when a discipline on the topic was added. Although it was a small opening for the subject, this inclusion in the broader reform of

Engineering courses has represented an important space for discussions about entrepreneurship in an area traditionally considered as difficult.

The second, also started in 1995, in the area of Engineering courses, refers to the beginning of the activities of the Junior Company. Motivated by a bottom-up movement by CTC professors and students, the Junior Company emerged as an important mechanism to approximate and apply the knowledge from the “classroom” to the business environment almost immediately, or, following Nelles and Vorley (2010), as a means of bringing students closer to the “real world”. Gradually, the new discipline of entrepreneurship and the Junior Company gained new followers, both from the faculty and from the student body. The interest in the topic was reinforced as the activities began to show results, especially because of the growing number of students involved and the contracts established by the Junior Company with the business community. The following excerpts from the interviews show these first two actions:

[...] there, the first discipline, the first entrepreneurship course, was implemented. Actually, it was not a course, but a discipline about entrepreneurship in the Technical Scientific Center. And then I got in touch with the other departments and then professors of Letters, Communication, Psychology, etc. started to enrich the disciplines. The course started to be more open, and I started talking to each department [...]. So, multidisciplinary classrooms were started, with students from various courses discussing the same subject, and I think that was exactly the strength of the business. – Advisor of the Vice-Chancellor for Development Affairs (JOSÉ, 2017).

Another mechanism we have that I think is also very interesting is the Junior Company. Our Junior Company here is absolutely, I'd say, a fantastic company. It is managed by students. The University provides space and tutoring, so to speak, for projects. [...] they sign contracts practically every 3 days. The number of contracts is impressive. It works wonderfully and the management is made by them. They work during their vacation and the competition to get in is huge. There are 700 candidates for 30 places. It is a business like this that really makes the University proud. – Vice Dean for Development (SÉRGIO, 2017a).

As a direct consequence of the advance and with the creation of the Genesis Institute (in Portuguese, “Instituto Gênese”), in 1997, the third action started with the launch of the Entrepreneurship Training Program by the Entrepreneurship Education Coordination (in Portuguese “Programa de Formação de Empreendedores pela Coordenação de Ensino de Empreendedorismo” – CEMP), linked to the Genesis Institute. As reported by Guarany (2006), this Program consisted of three disciplines and aimed at the creation of firms at that

time. Supported by the rise of the topic, the Program's activities gradually increased, after the inclusion of new subjects and the growth in the number of students and professors involved, which resulted in the creation of the Additional Domain in Entrepreneurship (in Portuguese "Domínio Adicional em Empreendedorismo") in 2005.

In general, this third action lies in taking the disciplines of entrepreneurship to other courses beyond CTC and in the institutional recognition of the importance of the topic in teaching activities, playing an interdisciplinary role at PUC-Rio. This occurred especially with the creation of the Additional Domain in Entrepreneurship, offered to all students and former undergraduate students of the institution. The transversal character symbolizes the institutional stimulus for the involvement of the courses and, in particular, the student body with the topics of entrepreneurship and innovation. At the end of the credits of the Additional Domain, students receive a specific certificate related to the topic studied.

We were the first University to have entrepreneurship as an Additional Domain for undergraduate courses. So, we created from the beginning, in 1997. When the incubator [Instituto Gênesis] was created, the PUC-Rio Entrepreneur Training Program was also created, which has always been multidisciplinary and I think this is a great differential. It emerged in three areas, joining the disciplines of psychology (entrepreneurial attitude and behavior), information technology (experimentation and simulation), and industrial engineering (tools, business plan, marketing principles). – Manager of the Entrepreneurial Culture Program at Instituto Gênesis (JULIA, 2017).

Together, these three actions carried out within the scope of PUC-Rio's teaching activities, represent integration with the third academic mission. The first two actions – inclusion of entrepreneurship as a discipline in the Engineering curriculum and beginning of the activities of the Junior Company – simultaneously contributed to the initial formation of an academic culture that valued the business environment being part of the teaching activities, in a complementary way to other initiatives developed by the institution. Subsequently, the third action, which resulted in the creation of the Additional Domain in Entrepreneurship, contributed to the dissemination of that theme in an interdisciplinary way and as a means of professional insertion, made available for all undergraduate courses of PUC-Rio.

Similar to being closer to the teaching activities, the development of the third academic mission at PUC-Rio has an origin link with the research activities. Although occasionally, the links between PUC-Rio's research activities and firms date back to the 1960s, shortly after the creation of the first institutes and with the structuring of their first

graduate programs. This long-standing relationship is evident, for example, in the installation of the first large computer in Brazil, held in 1960 at PUC-Rio, in cooperation with IBM (AGI, 2017), which triggered a significant number of researches on Information Technology.

The most intense university-industry approach only came about in the 1990s due to an institutional crisis motivated by the cut in government resources for research and graduate studies. This encouraged the faculty to search for resources and the need for greater connection with society in general. Most of the close ties between the university and the business environment occurred, therefore, due to the need for financial support for research and graduate activities.

The main ‘path’ found by the institution to face the institutional crisis was through research units. Many of them already had a long research path, such as Technological Institute (in Portuguese “Instituto Tecnológico” – ITUC) and Center for Studies in Telecommunications (in Portuguese “Centro de Estudos em Telecomunicações” – CETUC), created in 1959 and 1965, respectively, after the formation of research groups in specific areas. In the light of the set of activities of an entrepreneurial university, as presented by Philpott, Dooley, O’Reilly, and Lupton (2011), the main one adopted by PUC-Rio does not focus on the extreme of the entrepreneurial paradigm, in those activities considered *harder*, such as the installation of a technological park, but especially on establishing research contracts with industry and government through research units.

The focus on establishing research contracts was based on the ability to accomplish research projects of high technical-scientific level, through research groups structured in different areas of knowledge, which formed the bases of the research units, such as ITUC, CETUC, Tecgraf Institute for Technical-Scientific Software Development, etc. The combination of the institution’s history in the areas of research and graduate studies with the reaction generated by the institutional crisis in the 1990s resulted in the establishment of numerous research contracts between government and industry, supported by reciprocal and recursive relationships, such as addressed by Nelles and Vorley (2010). In the period from 2003 to 2009, for example, PUC-Rio established 1,685 cooperative research contracts with external partners (AGI, 2017). This development through research is shown in the following interview excerpt:

In order to maintain the model, a new form of financing has to be found. And this new form of financing was: each one is responsible for finding a way to support their laboratory. So, it worked and now this is how the University is supported. Research today represents more than half of all resources that are available for the University; it is actually slightly higher, but basically, it is the same thing. So, a culture was created here, groups were formed, some large, some small that seeking support. So that was the main reason. – Director of the Technological Institute – ITUC (SERGIO, 2017b).

The study by Guarany (2006) details the history and the relationships with the main partnerships developed by some research groups at PUC-Rio, with emphasis on those of CETUC and Tecgraf, the latter as an example of a “quasi-firm” research group, as used by Etzkowitz (2003). From this author’s perspective, research groups work as entities, as firms, except for the motivation of direct profitability. In institutions, the internal organization of research around these “quasi-firm” groups represents the first phase of transformation towards an entrepreneurial university model, followed by the phases of knowledge capitalization and impact on the economy.

In sum, the development of the third academic mission at PUC-Rio can be seen as deriving from longings and needs directly related to traditional teaching and research activities, which gradually led to changes in its general organizational aspect and involved it as a whole, as proposed by Clark (2001). In the scope of teaching, the new aspect is developed especially starting from Engineering courses and in the context of CTC, then later reaching other courses. In the area of research, the third academic mission has been mainly developing since the institutional crisis of the 1990s and the consequent need for financing research and graduate activities, after the establishment of several research contracts with firms and government, based on the capacities developed by groups and research units.

The development of the new entrepreneurial and innovative aspect by PUC-Rio reinforced the traditional missions of teaching and research, as proposed by Etzkowitz and Zhou (2017) and Nelles and Vorley (2010). The academic entrepreneurship is configured as a way of extending teaching and research activities, as approached by Etzkowitz and Zhou (2017). It is especially evident in the activities of the Junior Company and the research units; the generation of diverse alternatives for the entire academic community, through the identification of entrepreneurial opportunities and the creation of new jobs; the discovery of new talents, as proposed by Guerrero, Cunningham, and Urbano (2015) and Guerrero and Urbano (2012).



The close ties between traditional academic missions and entrepreneurship and innovation, as historically developed by PUC-Rio, were not built free of tensions or conflicts, as mentioned by Kalar and Antoncic (2015), Rasmussen, Moen, and Gulbrandsen (2006) and Urbano and Guerrero (2013). During the institutional crisis of the 1990s, for example, there was resistance to partnering with firms, especially the “entry” of for-profit firms into the university, because this could threaten the status of a philanthropic institution.

Having exposed the main relationships of the entrepreneurial and innovative aspect developed by PUC-Rio with the traditional academic missions of teaching and research, the last section summarizes the research accomplished.

## **5 FINAL CONSIDERATIONS**

The evidence in the two cases showed the use of several actions and mechanisms of innovation and entrepreneurship towards an entrepreneurial university model, similarly through incubators and particularly through the Tecnopuc technological park at PUCRS; the engagement of research units at PUC-Rio, such as Tecgraf, ITUC, and CETUC.

The two cases show predominantly synergistic relationships between the traditional academic missions, especially with research. The rise of the third academic mission in the investigated universities has an origin link with research activities, which formed the basis for their development. In the relationship with teaching activities, the results show the development of institutionalized and interdisciplinary actions and mechanisms in the dissemination of the third academic mission, comprehensively for all knowledge fields, such as Idear at PUCRS, and the Additional Domain in Entrepreneurship at PUC-Rio.

The cases studied show the previous preparation to adopt an entrepreneurial orientation, notably due to the focus on the research activities. Evidence reveals that these universities developed paths 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, through the ability to carry out highly technical and scientific projects with external support.

Evidence shows that the institutions investigated here used several actions and mechanisms to implement the third academic mission, with gradual institutionalization over time. In general, the analysis highlights the synergies and the alignment between the different academic missions, as mentioned by Boardman and Ponomariov (2009), Etzkowitz, Webster,

Gebhardt, and Terra (2000), Nelles and Vorley (2010), Philpott, Dooley, O'Reilly, and Lupton (2011), and Van Looy, Landoni, Callaert, Pottelsberghe, Sapsalis, and Debackere (2011).

Especially regarding the traditional academic missions, the results show the seminal and close relationship of the third academic mission with research activities and the most recent approach to teaching activities, in order to extend the scope of entrepreneurial activities to all knowledge fields, as proposed by Abreu and Grinevich (2013) and Clark (1998), in an interdisciplinary perspective. In the case of PUC-Rio, the relationship of the third academic mission with teaching has an origin link, as well as the relationships established with the research activities.

Finally, as the phenomenon of the entrepreneurial university grows in the empirical field and the resulting transformations lead to positive changes for the society in general, new questions arise and increasingly attract the attention of researchers, university managers, and public policymakers. Some questions are still little explored and must be investigated, such as the influence of institutions and government policies in the process of transforming the universities towards an entrepreneurial university model, as well as the impact of this transformation in the local development.

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