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The innovative ecosystem of university spin-offs: spaces, agents and transfer networks in the regional case studies of Madrid and Andalusia

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Innovative scientific-technological companies are those that base their activity on the application of novel scientific or technological discoveries for the generation of new products, processes or services. When these innovative companies emerge in the academic field (from the results of the research), a special type of scientific-technological-based companies is defined that are generally and more internationally named as university spin-offs, although in practice they have many others denominations in the regulations of each university (Beraza & Rodríguez, 2012a). And when these spin-offs are located and agglomerated in the territory looking for common spaces such as business incubators and science-technological parks close to universities, they define innovative territorial ecosystems around the academic field but also overlap with other location factors, linked to urban centrality and to agents promoting innovation and entrepreneurship.

On a regional scale, the relationship between companies, spaces and institutional agents of innovation and entrepreneurship constitutes scientific-technological business networks, through which flows the transfer of the results of academic research to the business world and society in general. In short, these are innovative environment as defined by the GREMI (Ratti et al., 2019), whose best-known representation in urban and metropolitan environments is Silicon Valley, which has been analyzed following the “triple helix innovation model”, based on the interaction between academia, the business world and governments (Etzkowitz & Leydesdorff, 1995; Etzkowitz & Zhou, 2017).

In the context of the regional competitiveness of the Spanish political regions (named Comunidades Autónomas) based on the companies that transfer scientific-technological knowledge from the Universities, the Technology Transfer Offices (TTO, OTRI in Spanish) play a very important role as providers of support services, in addition to the Liaison Entities of Technological Innovation that connect Universities with the business world in its early stages. Among the latter, the Science or Technology Parks of the Universities



stand out, as well as the incubators of innovative companies that are located within the university space, which require a large investment by governments that reverts to their territorial image.

Based on the state of the art on the subject and a generic model developed by the regional process of creating a university spin-off within an ecosystem of innovation, the objectives of the research are multiple, alluding to the triple helix model applied to entrepreneurship in the regional university context. In the first place, that the academic world has updated and detailed information on case studies to deepen the knowledge of the entrepreneurial phenomenon in innovative territorial contexts, and thus base the formulation of regional and national public policies to support innovation and entrepreneurship. Secondly, that university entrepreneurs and seed capital and venture capital investors acquire better knowledge about the most attractive factors in a certain territory for companies, depending on the agents and support services for entrepreneurship based on scientific knowledge that exist today. Finally, the research proposes as the ultimate goal that public administrations can make decisions in a qualified way for the development of their innovative productive systems through support policies for university spin-offs in all phases of the process identified in the study carried out, which will result in the image of their governments and their territories.

The research is based on a participant observation methodology, since the authors have been support staff for university spin-offs at the TTO of the Complutense University of Madrid for a long time. It starts from an in-depth regional case study in the Comunidad de Madrid based on the analysis of public universities and the agents and spaces of innovation and entrepreneurship, which is then compared with the situation in Andalusia region. The work is based on qualitative research techniques, mainly business surveys and interviews with key agents in the process of scientific-technological transfer from universities to the business world. The qualitative information makes it possible to identify the connections between the agents involved, both university and business and political, as well as the intensity of the relationships within the ecosystem of innovation flows, transfers and entrepreneurship.

In the case of Madrid, along with the TTO of each public university, the role played by the Fundación para el Conocimiento Madri+d (foundation for knowledge) and its Technology-Based Entrepreneur Support Office, as coordinator of a regional university network, stands out. In the case of Andalusia, the role of the regional TTO Network and the 10 science or technology parks that exist in the multi-provincial macro-region stand out. The analysis uses the SWOT method to identify and at the same time compare and categorize the research results into strengths, weaknesses, opportunities and threats of each case study. The comparative diagnosis is complemented by a CAME strategy proposal (what should be corrected, what threats must be adapted, what can be maintained because it works well, and what opportunities must be explored) in university innovation and entrepreneurship ecosystems in Spain, which could guide current and future initiatives around the concept of the Entrepreneurial University and in relation to the Spanish Strategy for Science, Technology and Innovation and the European innovation policy.

The Community of Madrid has an extensive network of scientific-technological infrastructures in addition to the 7 public universities (counting UNED, national distance university): 9 university hospitals, 91 technological institutes, 6 scientific-technological parks and 6 IMDEAS (Madrid Institutes for Advanced Studies), as well as 40 research institutes of the Spanish National Research Council (CSIC). In addition, Madrid has 6 innovation clusters (in ICT, aerospace, tourism, energy and sustainability, and automotive areas) and 23 technology platforms. For its part, Andalusia has 10 public universities, 14 university hospitals, 10 science and technology parks, and 23 CSIC institutes and research centers.

The main aspects of the comparison of the regional ecosystems of support for the spin-offs of the two case studies are based on the important evidence that all the public universities analyzed contemplate in their norms and regulations the support for university spin-offs as a way of transferring research to society, they have TTO and delegate support, advice and monitoring of companies promoted by their academic and research staff to specific areas within these offices. Intra-regional differences have been detected between universities in terms of pre-incubation spaces and in terms of the volume of technical personnel dedicated to supporting spin-offs. Secondly, most of the universities studied have linked science and technology parks, offering spaces and facilities to university spin-offs that have very specific needs adapted to this type of company. Andalusia has a greater number of parks, although only half are linked to regional universities.



Lastly, as regards transfer and innovation liaison entities that are related to university spin-offs, in the case of the Community of Madrid the role of Madri+d stands out, while in the case of Andalusia, the role of coordination between regional universities is performed by ROA network. In the comparison between both agents for the support they offer to university spin-offs, Madri+d and its Technology Based Entrepreneurship Area stand out very positively, due to the wide range of types of services it offers.

Madrid and its metropolitan area are consolidated as a top-level entrepreneurship hub on a national scale, where there are many strengths and opportunities in the innovative ecosystem for university companies in the Community of Madrid. The region has recently been recognized with the 2021-2022 European Entrepreneurial Region (EER) award and seal by the European Committee of the Regions. However, there are also certain weaknesses that become obstacles to the creation of this type of company, such as the high price of land or the flight of talent. For its part, Andalusia is a region that is growing in investment and strategic positioning for the promotion and consolidation of innovative companies, as reflected in the large number of science parks built in recent years, although its position as a peripheral region slows down investment in innovation and venture capital.

It is concluded that there is a need to support the transfer of research results that are generated in universities, for which it is previously necessary to investigate from a multidisciplinary perspective and understand from within the concept of the ecosystem of support for university entrepreneurship. Analyzing and comparing regional cases, both in Spain and internationally, is essential for the design of effective support policies. Some of the entrepreneurs and agents interviewed say they have visited San Francisco and Silicon Valley, in order to understand the cultural and socioeconomic factors of the success of the entrepreneurial ecosystem of reference and par excellence of university spin-offs, where Etzkowitz (2022) considers that there are “exemplary entrepreneurial universities”, a “multi-pronged financial strategy” (regional financing, university land rental, income from technology transfer, as well as donations and actions in university spin-offs in variable past and future proportions) and a interdisciplinary academic development strategy.

Territorial Planning in the university campuses of Spain to bring them closer to the business world is one of the pending subjects or in which a much better grade can still be obtained, together with the university training of researchers for scientific and technological entrepreneurship. Adding more detailed regional case studies of university knowledge transfer spaces, agents and networks and support for university spin-offs with all kinds of specialized services will be essential to improve the future global vision of the current state of affairs of this research topic in Spain, Europe and the rest of the world.