Business Meets Technology

3rd International Conference

Universitat Politècnica de València, Spain
September 23-24, 2021

edUPV
Universitat Politècnica de València

M Rosario Perello-Marín
Conrado Carrascosa López
Daniel Catalá Pérez (Eds.)

GENERALITAT VALENCIANA
Conselleria d'Innovació, Universitats, Ciència i Societat Digital
UNIVERSITAT POLITÈCNICA DE VALÈNCIA
ADE FACULTAD DE ADMINISTRACIÓN Y DIRECCIÓN DE EMPRESAS. UPV
doe Departamento de Organización de Empresas
HOCHSCHULE ANSBACH

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BMT 2021 – 3rd International Conference Business Meets Technology 2021

Dear 3rd Business Meets Technology Conference organizers, dear participants, dear readers, thanks for the opportunity to participate in this proceedings' publication. I would like to look back to envision where the future may lead us.

For those who don´t know, this all began more than 10 years ago in a small coffee shop taking notes on a napkin while enjoying a cup of coffee and a piece of cake. Since then, and thanks to the leadership of professors María de Miguel and Bárbara Hedderich, we have been fortunate to see a double UPV-Ansbach international master's degree grow. Since 2009/2010, more than 60 students graduated based on the double degree agreement and we have also developed other types of joint activities such as final master's joint projects and doctoral theses. There have been frequent visits by professors from both institutions, Erasmus agreements, research stays and workshops that ended, a few years ago, in the organization of the first BMT conference.

The first two editions took place at the Ansbach University of Applied Sciences and this time the conference was hold in Valencia, where we all could take the best of all the opportunities that brings sharing time and discussions together. The Universitat Politècnica de València is ranked as the first technical university in Spain and is a leader university in technology, innovation and knowledge transfer to the industry, which contributed to the vibrant discussion on the different topics that the conference addressed such technology and innovation management, operations, entrepreneurship, public policies, sustainability, new management or digital transformation, trends among other that you can find in this proceeding's edition.

I would like to thank professors M Rosario Perelló, Conrado Carrascosa and Daniel Catalá for all the work carried out to organize this conference and also the Management Department (DOE), the Business School and all the professors, students and researchers that participated in this edition.

To be part of the team since the beginning is an honor and it has been our intention to provide the best possible environment to facilitate the academic knowledge exchange and network generation to reinforce Ansbach Hochschule – UPV links and to establish scientist strong basis to organize the 4th BMT conference soon.

All the best,

Prof. Marival Segarra Oña

Vice-Rector for Organization of Studies, Quality, Accreditation and Languages
Universitat Politècnica de València

A year after the COVID-19 pandemic interrupted our lives, paralyzed the real world and plunged us into a parallel world where the Internet, computers and electronic devices were the only way to relate to each other, we observe with a smile on our faces when we realize that once again university campuses are full of students, professors and administrative and service staff. The smile is even bigger when we see the campus of Universitat Politécnica de Valencia full of our students. In the middle of the pandemic we could be paralyzed by the fact of not being able to reach our students as we normally did in face-to-face classes. This situation has made us reflect on where the university has to go. The university is not just about contents; going to university is a life experience and it must be lived. As Aristotle (384-322 B.C.) already discovered, "man is a social being by nature", we are born with the social characteristic and we develop it throughout our lives, since we need others to survive.

Now, one academic year after COVID-19 broke into our lives, we cannot turn our heads without having learned that technology saved the situation and thanks to it companies, employees and customers continued to operate with no downtime. In this context, I would like to welcome the 3rd International Conference "Business meets Technology", a conference organized between the Universitat Politécnica de Valencia and the University of Applied Sciences of Ansbach, a forum where experiences in the field of business administration, management and technology are shared among professors from different countries who participate in it.

The Department of Business Organization welcomes this initiative and as director I congratulate our professors for the organization of the same, I also encourage them to repeat the organization of this conference in future years, remaining as a reference in the field of business management.

Gabriela Ribes Giner

Directora

Departamento de Organización de empresas

Universitat Politècnica de València

The first BMT conference took place at the Ansbach University of Applied Sciences as a result of the fruitful and long relationship that exists between Ansbach University in Germany and our Universitat Politècnica de València. The second edition was also held in the city of Ansbach and this third edition has just been held in our beautiful Valencia at our beloved Polytechnic University of Valencia.

The theme of the conference has been «Business Meets Technology». We confirm that our broad topic has led to a great variety of papers in various areas of science, commerce and arts related to business and technology. We have enjoyed the sessions with the valuable knowledge explained by the speakers that has led us to enrich the exchange of knowledge for all attendees.

When we took over from organizing the third edition of the "Business meets Technology" congress at our University, we only knew part of the challenge that we had before us. When we took over the organization of the congress, we had a lot of uncertainty, especially due to the pandemic. We were aware of the evolution of it and the restrictions that we were suffering due to it. The intention, if the situation allowed it, was to do so under conditions of total presence. We were committed to it because we were aware of the importance of person-to-person communication, of the richness of interpersonal communication and that is why we have been the first face-to-face congress at the UPV after the pandemic. We are very satisfied with the results obtained and we look forward to the next edition, which will be held again in Ansbach.

Many thanks to the Faculty of Business Administration, the Department of Business Organization and the Generalitat Valenciana who have supported this congress.

Rosario Perelló
President-Chair
UPV (Spain)

Conrado Enrique Carrascosa
Secretary-Co-chair
UPV (Spain)

Daniel Catalá
Secretary-Co-chair
UPV (Spain)

BMT21
3rd International Conference
Business Meets Technology.
Valencia, 23rd & 24th September 2021

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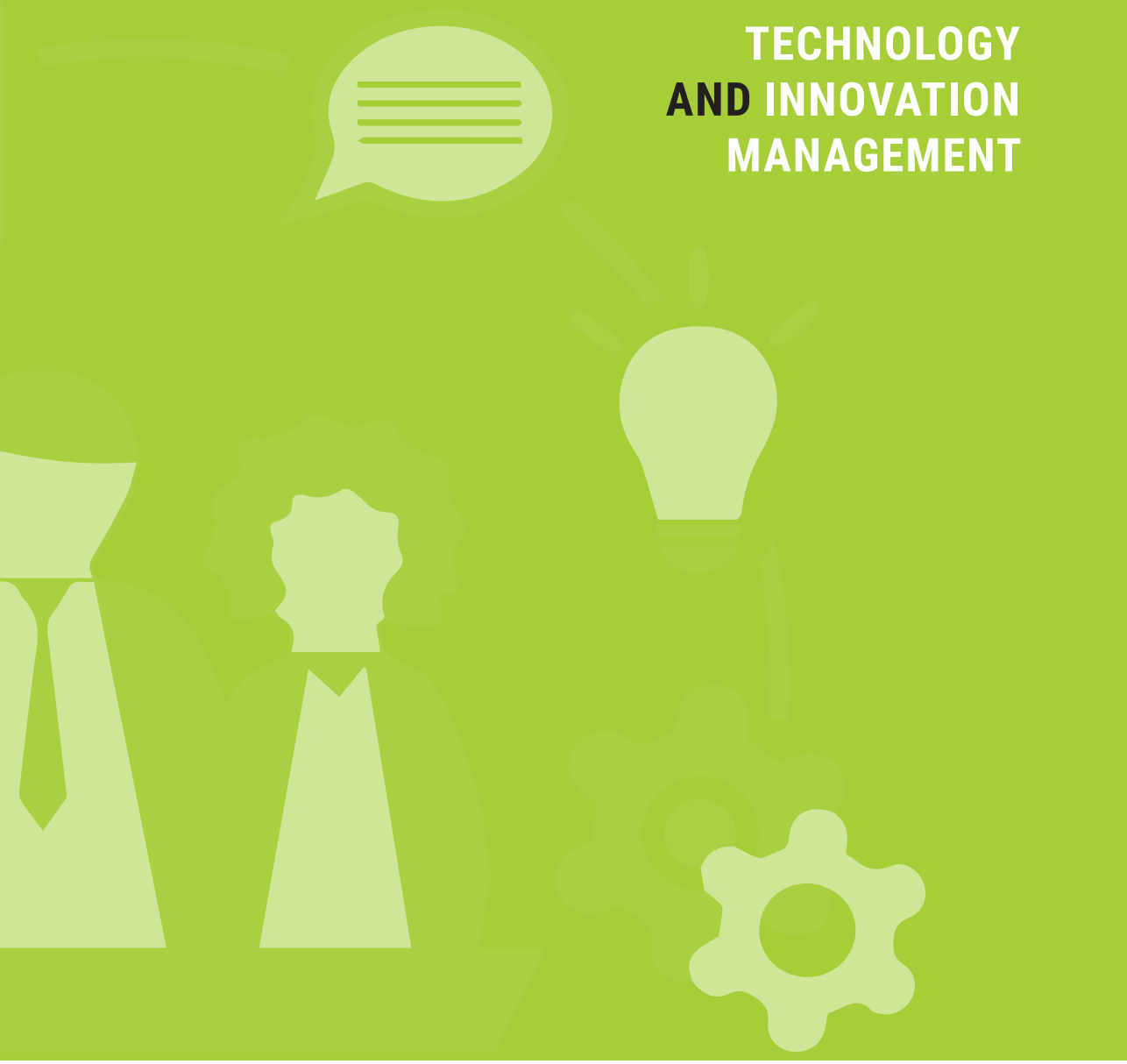

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SPANISH INNOVATION STRATEGIC PLAN. ANALYSIS OF ITS INSTRUMENTS, IMPACT AND RESULTS

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ABSTRACT: The purpose of this piece of research is to analize public instruments implemented to promote innovation in Spain and the results that were obtained among Spanish innovative companies. Along this paper, the National Innovation Strategy for Science, Technology and Innovation 2013-2020, and its impact, prior to the implementation of the next plan that will cover the period 2021-2027, have been analysed. This piece of research sheds light on the main weaknesses identified in the National Innovation Strategy for Science, Technology and Innovation 2021-2027, and particularly how and where it fails in boosting innovation in Spain. The main conclusions are useful for all involved parts, politicians as part of the public sector (Government), industry and academia as fundamental pillar of the Spanish innovation system.

KEY WORDS: *Innovation; Strategic plan; National innovation systems; Public-private collaboration; Spain.*

1. PURPOSE OF THE PAPER

The purpose of this piece of research is to analize public instruments implemented to promote innovation in Spain and the results that were obtained among Spanish companies.

This work is especially interesting since it analyses National Innovation Strategy for Science, Technology and Innovation 2013-2020, and its impact, prior to the implementation of the next plan that will cover the period 2021-2027.

Thus, this paper includes, on the one hand, a review of the public instruments included in 2013-2020 Spanish Innovation strategic plan, which were supposed to be oriented to boost most advanced interactive innovation models. And on the other hand, it is also analysed Spanish innovation system trends during the same period. As a result, main weaknesses not covered are identified. These weaknesess should be covered in the new National Strategy (2021-2027).

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2. RELATED WORK

The relevant role that innovation plays in economic growth and development and, consequently, in the improvement of the quality of life and welfare of society, is beyond doubt for the literature on the economics of technological change (Hall & Rosenberg, 2010).

One of the main contributions of this evolutionary theory is the concept of innovation system, which was introduced to refer the model of cooperation between government, academia, public research sector and industry that determined the success of an economy (Freeman, 1987; Lundvall, 1992). It can be said that innovation is a collective, cumulative process, dependent on the trajectory and the context, which varies between the different types of actors, companies, industries, regions, etc. (Bach & Matt, 2005; Reid, 2010; Wieczorek & Hekkert, 2012). All these factors, and especially the interactions between all these actors, are essential to explain the way in which knowledge is created and transferred within the innovation process. Thus, different ways imply different innovation models. So, from a systemic approach, public intervention is justified by systemic failures that arise as a result of relational dysfunctions among the agents that make up the innovation system and are present at the innovation process (Borrás 2011; Edler et al. 2016; Fagerberg 2017). Public intervation is articulated by different instruments depending on the innovation model that governments intend to promote.

This piece of research is built based on the Quintuple Helix model. This model, as a more recent and complet evolution of the triple helix model, includes the continuous relationship between industry, government and academia together with civil society and environment (Carayannis et al., 2012, 2018; Carayannis & Campbell, 2010; Maruccia et al., 2020). Thus, the emphasis is placed on a redefinition and strengthening of the role that must play fundamental actors such as the public sector (Kattel & Mazzucato, 2018; Kuhlmann & Rip, 2018), the business sector (Giuliani, 2018) or civil society itself (Rask et al., 2018). From this perspective, proposals such as mission-oriented policies (Mazzucato, 2018) or challenge-oriented (Boon & Edler, 2018) try to give concrete answers to the demands of this new scenario.

Within this context, the relationship of the model with many of the SDGs is evident, not only regarding to social, economic or ecological goals but specifically to 17th SDG, that encourages the creation of alliances between all social agents in order to achieve the rest of the goals.

Since 2000, to a greater or lesser extent, all European countries have implemented innovation policies based on instruments such as R&D collaborative programs, cluster support programs, personnel mobility programs, technological transfer support, networks of technological centers of excellence, spin-offs creation, support programs or promotion of scientific and technological parks (Izsák et al., 2013).

3. DESIGN/METHODOLOGY

For the purpose of this paper, mixed methods have been used. Content analysis of Spanish National Innovation policies and programs combined with more detailed data analysis of innovative results for Spanish industries are used to compare the main trends in the public programs to innovation results.

4. FINDINGS

In the last years, Spanish government has received several recommendations from European institutions highlighting the main problems of the Spanish System of Science, Technology and Innovation (European Council, 2018, 2019). Among these problems are the limited innovation capabilities of Spanish companies and the lack of cooperation between them and universities and research organizations. These weaknesses are structural problems that are affecting the Spanish system since many years ago (Catalá-Pérez & De-Miguel-Molina, 2021).

The fundamental instruments that reflect the innovation policies proposed by the Spanish government and instruments derived from these policies, are included in the Spanish Strategy for Science, Technology and Innovation and the subsequent National Plans for Scientific and Technical Research and Innovation. The National Plans establish the programs and subprograms, their priorities and objectives. On the other hand, Annual Action Programs collect the concrete actions or instruments that arise each year within each of those subprograms.

In 2020 the national strategy for the 2013-2020 period finished, and also the National plan for the period 2017-2020. Among the general goals of this strategy were:

- The impulse of the business leadership in STI activities to increase the competitiveness of the productive fabric. It is in this objective that the promotion of collaboration among the agents of the system takes on special importance through some of its specific objectives:
    - The promotion of business STI activities stimulating business initiatives of great scope and ambition aimed at business leadership in global and highly competitive environments. The strategy explicitly recognizes that this objective requires that the Public Administrations adopt measures to favour public-private collaboration.
    - The promotion of collaborative R&D oriented to the demands of the productive fabric with the realization of public-private collaboration projects. The Public Administrations must act directly on the obstacles that hinder this collaboration, adopting measures aimed at raising the legal quality and security in terms of scientific collaboration and technological development.
- The promotion of STI activities aimed at the global challenges of society. It establishes the need to propose actions that promote the role of Technology Platforms,

Alliances and other agents of the System as communication channels between public and private agents, so that they play a fundamental role in the identification of emerging and convergent technologies, public-private collaboration and the detection of new demands on a global scale.

Based on the work made by Catalá-Pérez and De-Miguel-Molina (Catalá-Pérez & De-Miguel-Molina, 2021) the specific programs and instruments oriented to achieve these goals and, additionally, also oriented to boost interactive innovation models are identified and commented in the following tables (Tables 1 to 4).

Table 1. Public instruments oriented to boost interactive innovation models (I). Source: Based on Catalá-Pérez and De-Miguel-Molina (Catalá-Pérez & De-Miguel-Molina, 2021).

PROGRAM OF PROMOTION OF TALENT AND ITS EMPLOYABILITY		
Priorities in relation to public-private collaboration: Incorporation of researchers and R&D personnel in companies and promotion of mobility between the public and private sectors.		
Training Subprogram	TRAINING OF DOCTORS IN COMPANIES: "INDUSTRIAL DOCTORATES"	Hiring research staff to develop their doctoral thesis in the company itself and be part of an industrial research project or experimental development.
Incorporation Subprogram	"TORRES QUEVEDO" GRANTS FOR THE RECRUITMENT OF DOCTORS IN COMPANIES	Financing of the indefinite hiring of doctors in the private business sector to carry out R&D activities.
	The "Emplea" grants are foreseen in the National plan, to co-finance the hiring of technical personnel in R&D in companies, but not annual programs convened them.	
Mobility Subprogram	Cross-sectoral mobility is considered essential for the promotion of public-private collaboration and the cogeneration and circulation of knowledge. The Plan leaves open the possibility of enhancing this mobility through different mechanisms.	

Table 2. Public instruments oriented to boost interactive innovation models (II). Source: Based on Catalá-Pérez and De-Miguel-Molina (Catalá-Pérez & De-Miguel-Molina, 2021).

PROGRAM OF GENERATION OF THE SCIENTIFIC AND TECHNOLOGICAL KNOWLEDGE AND STRENGTHENING OF THE SYSTEM		
Priorities in relation to public-private collaboration: · Increase the participation of the private sector in the financing of fundamental research through new public-private collaboration formulas. · Increase the participation of the private sector in STI activities, in general, and those carried out by the research institutions of excellence, in particular.		
Knowledge Generation Subprogram	ACTIVITIES OF DYNAMIZATION OF RESEARCH NETWORKS	Financing the creation and consolidation of research networks that generate synergies among system agents.
Subprogram of Institutional Strengthening	CALL FOR THE "CERVERA" NETWORK	Promotion of collaboration between technological and business agents through the accreditation as "Cervera" Centres and Technological Institutes of Excellence to those who stand out for the quality of their scientific-technical research activities and for the impact of their collaborations with the productive fabric.
Subprogram of Research Infrastructures and Scientific-Technological Equipment	The National plan provides funds to ICTS for financing the development and implementation of strategic programs with the objective, among others, of fostering collaboration among agents. They were not convened in all annual programs.	

Table 3. Public instruments oriented to boost interactive innovation models (III). Source: Based on Catalá-Pérez and De-Miguel-Molina (Catalá-Pérez & De-Miguel-Molina, 2021).

BUSINESS LEADERSHIP PROGRAM		
Priorities in relation to public-private collaboration: Promotion of public-private collaboration as mechanisms to accelerate the dissemination and use of knowledge and technologies, the creation of absorption capacities and the valorisation of results. Promotion of strategic projects that mobilize public and private resources and promote the creation of collaboration networks between SMEs, technology centres, PROs and universities. Intensification of instruments aimed at promoting Innovative Public Procurement.		
Subprogram of Business R&D and innovation	R&D PROJECTS and STRATEGIC R&D PROJECTS	Financing of individual R&D projects or in consortium between companies. The strategic ones will have a duration of up to 96 months. They may include the participation, through subcontracting, of universities, public and private research organizations, etc.
	"CERVERA" TRANSFER PROJECTS and "CERVERA" TECHNICAL PROVISION FUND	Financing of business R&D projects in the field of Cervera priority technologies, with the participation of "Cervera" Centres and Technological Institutes of Excellence.
	INNOVATIVE BUSINESS GROUPS (AEI, from Spanish acronym)	Financing of feasibility studies, various projects and expenses of structures of coordination and management of incipient AEIs. The AEIs are the combination, in a geographical space or productive sector, of public or private research and training companies and centres (clusters).
	PROMOTION OF INNOVATION FROM DEMAND AND INNOVATIVE PUBLIC PURCHASE	Financing for the development of innovative products or services through the mechanism of the Innovative Public Purchase.
	The National plan foresees the possibility of PPPs co-financed by the public and business sectors around research priorities. Likewise, instruments such as the Sectoral Strategic Initiatives for Business Innovation, executed as PPPs, are included. They were not convened in all the annual programs.	
Subprogram of Promotion to Enabling Technologies	R&D PROJECTS	Similar to the R&D Projects of the previous Subprogram but in the field of enabling technologies.
Strategic Action "Industry Connected 4.0"	It basically includes financial aid for digital transformation projects, which include STI activities, applied to processes as well as organizational innovations in the field of Industry 4.0.	

Table 4. Public instruments oriented to boost interactive innovation models (IV). Source: Based on Catalá-Pérez and De-Miguel-Molina (Catalá-Pérez & De-Miguel-Molina, 2021).

PROGRAM OF R&D AND INNOVATION ORIENTED TO SOCIAL CHALLENGES.		
Priorities in relation to public-private collaboration: Promotion of public-private collaboration by expanding the scope and impact of the research carried out in universities and PROs. Increase the participation of the private sector in the financing of fundamental research through new PPP formulas.		
R&D actions oriented towards Social Challenges	R&D AND INNOVATION PROJECTS: «CHALLENGES COLLABORATION»	Co-finance the execution, as PPPs, of projects of applied research, experimental development and innovation, always coordinated by a company.
	FUNDS FOR TECHNOLOGICAL PLATFORMS	Financing for the creation and consolidation of the state network of Technology Platforms.
	PROJECTS "CIEN" (National Business Research Consortiums)	Promote research, led by companies and carried out through PPPs, with the aim of mobilizing private investment and have a driving effect on the business fabric. Because of their ambition, duration and organization, they have to tackle long-range problems associated with the challenges of society or cross-cutting, sectoral and strategic problems.
Strategic Action in Health	According to the National plan, the Strategic Action in Health encompasses a set of instruments that, being specific to the health field, contribute to the generation of synergies and complementarities with the actions included in the rest of the programs.	
Strategic Action in Economy and Digital Society	The National plan establishes that the Secretary of State for the Information Society will be able to implement different instruments oriented to the development of strategic areas of innovation and the stimulation of demand, encouraging the creation of PPPs and boosting private investment especially in certain ICT technologies.	

Having analysed the main instruments together with their scope, ICONO platform is consulted in order to identify how this actions have had impact on Spanish industry during the same period.

The ICONO platform, contains a data base complied by the Ministry of Science and Innovation. It collects the information generated by the Spanish Foundation for Science and Technology (FECYT). In the ICONO platform, a system of R&D&I indicators is built to generate information for the different agents of society, providing objective indicators that measure the evolution of technology, science and innovation in Spain.

Research results can be subdivided into 6 families (that includes industry helix and academia helix explicitly): 1) Number of innovative companies; 2) Economic impact of innovative activity; 3) Scientific production WOS; 4) Scientific production SCOPUS; 5) Doctoral theses; and 6) Industrial property.

The most recent and relevant data have been selected within each family in order to assess the national strategy on innovation between the years 2013-2020 and more

specifically the finalized national plan corresponding to the period 2017-2020, therefore the data obtained are presented differentiating between the period 2013-2017 and 2017-present, to facilitate subsequent analysis.

Although the number of innovative companies decreased in the first period of the plan, there was a clear recovery from 2017 until the end of the period (see Figure 1). However, this fact has not clear economic impact, since the % of sales due to innovative products drop down from 2016 to the end of the period (see Figure 2).

As far as the scientific production, the number of papers published in both WOS and SCOPUS increased year by year (see Figures 3 and 5). However, it should be noted that the rate of spending on R&D per number of published papers tend to drop down (see Figure 4), as it happens with the number of PhD thesis within the same period (see Figure 6).

Regarding the protection of innovations, it is important to highlight that although the number of patents granted in Spain has decreased, the tendency for the case of European patents was a clear increment.

As a conclusion, although many instruments have been implemented through the national innovation plan, they do not always result in a clear increase in the Spanish innovation level. On the other hand, it is not clear that the instruments proposed by Spanish Government may reach all companies or that they cover the real needs of the companies and the society.

1. Number of innovative companies.

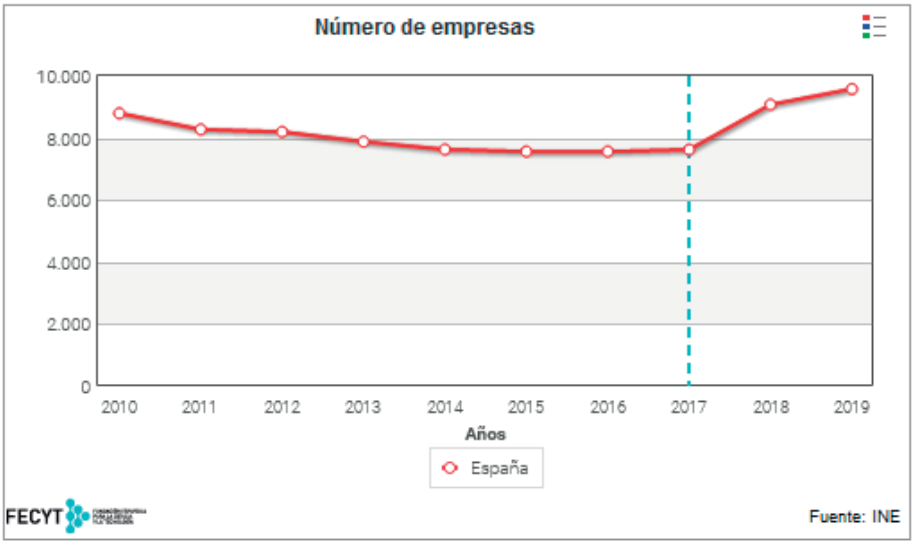

Figure 1. Number of innovative companies. Source: Icono database 2021.

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