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Critical analysis of the role of universities in the creation and survival of university spin-offs. Proposal of an academic model of support

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Abstract

The survival of University spin-offs (USOs) has been directly related to their role as product innovators and as technology transfer agents for years. However, the lack of management abilities and support to get financial resources and strategic alliances make their survival more difficult than for other companies. Academic support would able to increase the competitive advantage of the USOs compared to other innovative spin-offs. However, the number of Spanish new firms is smaller than those of the other countries and their impact over the economy is quite low.

This paper investigates differential factors of survival of USOS in Spain compared to spin-offs not linked to universities by means of the characteristics of the

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founder, the environment surrounding the new firm and the spin-off company itself. Based on the Helm&Mauroner model, our work advances the study of the survival dynamic of these companies and identifies measures to be implemented by the university government to support the survival of USOs. Finally, an academic model for USOs support is presented, considering the role of USOs´ founders, academic institutions and government, a proposal of policies and a set of assessment indicators to control the success of the measures.

JEL classification numbers: M13, M48
Keywords: university spin-offs, human capital, systems dynamic, innovation transference, entrepreneurship

1 Introduction

Most of the literature on firm survival argues that innovation and the new technologies applied to business network stand as the most important factor for competitive advantage and for the regional economic development [1]. The arguments usually presented are straightforward: only those firms that are able to successfully innovate would be able to establish and maintain a competitive advantage in the market [2] and [3]. According to [4], the innovative activity may enhance the survival of new firms, at least under the entrepreneurial regime. However, later on, the extent of scale economies and capital-intensity has a positive effect on the ability of firms to survive in the short term. Following this approach, in 1999 [3] proposes as survival model for companies the Darwininan model, and argues that those firms able to fit the market needs through innovative solutions will have more opportunities of survival than their counterparts, independent of age or size.

However, reality shows a different picture of the situation. If we have a look

of the data offered by the last decade by European Commission, smaller companies investing in R&D are likely to have had much more difficulty in maintaining their level of R&D investment. A rough comparison of the R&D behavior of large scoreboard companies with the evolution of domestic business R&D expenditure indicates that smaller companies investing in R&D (not covered in the scoreboard) consistently reduced their R&D investment in 2009 in a number of European Members States. Besides, the evolution of business investment in R&D after 2009 remains uncertain. Past observations show that fluctuations in business R&D growth are larger than fluctuations in GDP growth with a time lag of 1-2 years. Lessons from the past, therefore, indicate that the negative trend in business R&D started in 2009 might worsen in 2010 and in following years [5].

Notwithstanding, the relationship between innovation and firm survival is rather complex. There is a high risk involved in innovation investments, which may even reduce the likelihood of firm survival [6]. According to this approach, the investment into innovation, as company´s current applications for patents, is a risky activity which lowers the likelihood of survival. However, the innovative activity associated with the launch of a trade mark is a less risky form of the innovation, so successful innovations have a positive effect on survival. In this sense, firms that have patents which are worth renewing also possess the bundle of financial, management and economic capabilities that raise their chances of survival. On the other hand, the spatial factors involving the innovation (inventor network, support infrastructures, easy access to research activities) could also increase the survival of innovative firms [7] and [8].

Most of the innovative activity comes from universities and research institutions. However, the relation between the academic world and the survival of spin-offs is not clear. Actually there is an active discussion about which should be the location of the knowledge mechanisms and the role of universities as promoters of the transference of innovation to the market. When a university or research institute takes a proactive stance in putting results to use as an input into

the creation of academic knowledge, it can be described as an "*entrepreneurial university*" [9]. There is, however, no linear correlation between the effort expended (financial and human resources) and the amount and quality of scientific and technological results achieved. A minimum critical mass of resources (R&D budgets, human resources and intellectual capital) is required to obtain appropriate results for the effort expended. The need for resources, the existence of increasing returns in the use of facilities and technological equipment, the long maturation period of innovative activities and the need for highly specialized staff lead to a concentration of innovative activities [10] and the hindering of their commercial exploitation.

As a result of the importance of the role of "*entrepreneurial pusher*" of the universities, there is a vast literature on spin-off firms as product innovators and as technology transfer agents. Most of the studies concern either research (academic, public) spin-offs or on corporate spin-offs. Although academic spin-offs are assigned to be highly innovative, there is no commonly accepted definition of a spin-off. Meanwhile, our study concerns research university spin-offs (USOs) defined as firms originating from a university or research institute and that have a former or present employee of that facility as one of the founders [11]. The approach of this work is based on the idea that the academic support would increase the competitive advantage of the USOs, compared to other innovative spin-offs.

In Spain, the rate of generation of scientific production is similar to the most developed countries. However, the commercial exploitation of the research results and the patents registration are located in the last places of the European Union, and very far away of United States, Japan or South Korea [5]. Because of this, a better management of intellectual capital generated in universities is needed, considering the creation of new firms as a priority option for graduated researchers, students and academics.

Entrepreneurial success of USOs is mainly affected by three classes of

influencing factors: the characteristics of the founder, the environment surrounding the new firm and the spin-off company itself [12]. This paper investigates differential factors of survival of USOS in Spain, compared to spin-offs not linked to universities. Based on the *Helm&Mauroner model*, our work advances the study of the survival dynamic of these companies, and identifies measures to be implemented by the university government to support the survival of USOs.

This work is divided into four sections. After having justified the need of the analysis, an identification of survival factors for USOs in Spain is provided, from the different approaches of the Human Capital and Organizational Ecology Theories. Based on the model provided by [11] and the identification of the survival dynamic of USOs, we propose a bundle of measures of university governance, in terms of staffing, investment/financing and technology management, aimed to increase the USOs´ survival.

2 Differential Factors of USOs' Survival

2.1 Differential factors from the Human Capital theory

Recent literature has found that the *abilities of the founder of a new firm* set up the key factor to explain the organizational failure or success [13], [2], [14], [12] and [15].

The correlation between human capital and profit was studied by [16] in a set of German firms. In this study, they found out how the chances of organizational survival were very low for young founders, highest for middle-aged founders and, again low for older founders, and they related this inverted U-shaped relationship to the concave age-income profile in human capital research. The profitability of a firm with a young team of founders and organizational

survival are directed connected, and this assumption may not hold for older firms [17] and [2]. To advance this issue, *medium age of the founder* will be considered as a factor to explain the differences between USOs and other spin-offs.

According to [13], a greater human capital increases the productivity of the founder. In this sense, people with higher human capital are in the position to set up larger and financially better-equipped business [2]. The academic affiliation and the founder's academic reputation also determine the survival of USOs, because influence their performance and may help their businesses in many ways (attracting equity investments, for example), [18]. In the USOs, the entrepreneur abilities are more important than in other companies, because he/she is the inventor of the technology commercialized by the firm [19] and [20]. However, although the technological capacity of the entrepreneurs is high, they do not use to own enough management abilities [21], because a firm management is very different to a research institution management [22].

The direct consequences of this gap on *management competences* of the founder are a bad coordination of the teamwork, failure in the compromises planned in the Business Plan, lack of right focus on the market needs or absence of competitive networks. And all these factors can condition the USOs growth [23] and [24]. Meanwhile, a smaller growth, joined to a failure of the Business Plan compromises, will affect the future survival of the new firm.

Although the current state of the knowledge on USOs is highly fragmented in Spain, we have used the work of [19] and [21] to have an overview of the differences between USOs and others innovative spin-offs. In the work of [19], primary data related to main characteristics of university spin-offs (USOs) were presented, based on a common survey made to the Spanish Offices for the transference of research of the public research universities (Figure 1). We compare most of the characteristics of USOs founders with those of the control sample used in the [21], made of entrepreneurs from technologic firms not linked to universities (Figure 2). Although the size of the sample and the specific profile

(firms investing in technologic innovations) could be a limitation of the study, these studies let the comparison between USOs to other spin-offs which also sell knowledge and innovation.

Table 1: Research File Rodeiro

Universe	spin-offs supported by Spanish Public Universities
location	Spain
sample process	on-line survey (web supported)
answer rate	15,9%
sample size	454 spin-offs
time of fieldwork	December 2005 - June 2006

Source: [19]

Table 2: Research File Ortín et al

Universe	spin-offs supported by the Spanish Center for Industrial Technological Development (CDTI) business public entity of the Ministry for Science and Innovation.
location	Spain
sample process	on-line survey (web supported)
answer rate	13,77% **
sample size	167 spin-offs **
time of fieldwork	October 2006 - January 2007

Source: [21]

The results of these surveys provided integrated data of the main Human Capital factors of Spanish USOs (Tables 3 and 4):

Table 3: Characteristics of spin-offs, inventors and founders

General characteristics of spin-offs	USOs	other innovative spin-offs
medium number of employees	8,01	18,39
Characteristics of inventors		
knowledge area of inventors´ procedence: technological science	50%	26%
knowledge area of inventors´ procedence: health science	9,2%	8.7%
% of inventors firm-founders	80%	40%
Characteristics of the founders		
medium number of founders	3,57	3,65
medium age (years)	33,8	42,86
% of Phd (employees not founders)	20%	9,89%
% of founders linked to public institutions (professor o full time researcher)	43%	8,8%
% of founders with previous entrepreneurial experience (technology)	59,7%	90,5%

Source: on the premises

Following the focus of this study, we will consider as differential factors between USOs and other spin-offs the following, related to entrepreneur-specific human capital:

a) *medium age of founder*. Founders of USOs are younger, in average, to founders of other spin-offs. This difference would be able to increase in the next years, because according to the [25], the percentage of founders between 18-24 years old has growth in the last two years because the current employment difficulties.

b) *qualification of the founder*. Almost half of the USOs´ founders have high academic qualification (professors or full time researchers with phd in

technological and health sciences). However, this percentage is reduced in the case of others spin-off, due to most of them comes from other firms (38.12%) and their knowledge is related to management skills. We can conclude that USOs´ founders have more depth of knowledge, while other spin-offs´ founders have boarder knowledge. The know-how to run a successful company includes both, in terms of T-shaped people (vertical line, depth of knowledge; horizontal line, board of knowledge), so these data are not conclusive**.**

c) *technological leadership* (in terms of capacity) of the founder. There is a higher percentage of USOs´ founders involved in a previous technology experience (59,7%) than other spin-offs´ founders (38,2%). From our study´s approach, this is an interesting difference because it could be the consequence of the proximity of USOs to the technology academic research.

d) *inventor´s involvement in the company*. Most of the inventors of USOs are involved in the company as founders (80%). This percentage is lower in the case of other innovative spin-offs (40%). In the USOs´ case, founders use to be general managers of the company (17%), functional managers (32%) or consultants (33%). We can find a similar distribution in other spin-offs.

e) *previous experience of the foundation team*. Almost all founders of other innovative spin-offs declare previous entrepreneurial experience (90,5%), a considerable difference with USOs founders (59,7%). This result can be related to other characteristics like age (younger), qualification and links to public institutions.

f) *relation with academic institutions*. A higher percentage of USOs founders stayed linked to public institutions as professor or full time researcher, (43%) compared to those of other spin-offs (8.8%). This factor is related with the USOs´ proximity to the academic community. However, Spanish Labor Law could condition the academic´s permanence and their future involvement in the company.

Table 4: Human Capital Factors

Human capital factors	USOs	other spin-offs
medium age of founder (years)	33,8	42,86
qualification	more depth of knowledge	more broad of knowledge (management skills)
technological leadership (capacity) of the founder	mostly technological (50%)	less technological (38,2%)
inventor´s Involvement	high (80% of inventors are founders)	medium (40% of inventors are founders)
previous experience	medium (59,7% of any founder with previous experience)	high (90,5% of any founder with previous experience)
relation with academic institutions	medium (43% of founders are linked to public academic institutions)	low (8.8% of founders are linked to public academic institutions)

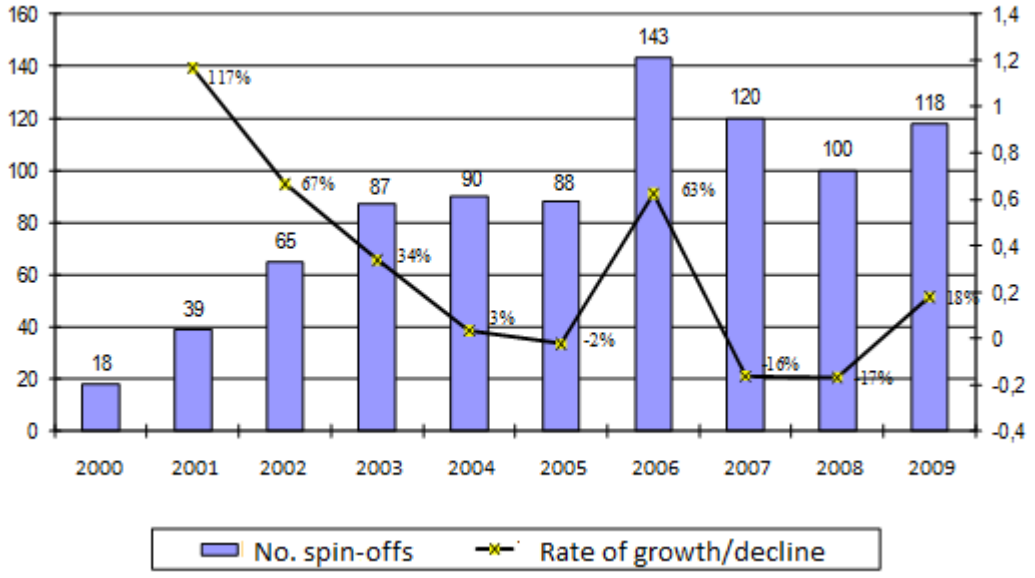
Source: on the premises

2.2 Differential factors from the Organizational Ecology theory

The analysis of organizational mortality has been one of the most active lines of research in the Organizational Ecology Theory, and has related factors as age, size or organizational strategies of the firms to explain their survival [13]. Current research advances the traditional focus of ecology to the study of factors as location of companies, market characteristics or institutional environment [11]. The foundation and development of USOs is influenced by the location of the incubators and parent institutions, resource networks or easy access to qualified staff and new knowledge [26] and [20]. Institutional, political and financial favorable environment also influence both entrepreneurial engagement ad

spin-offs survival. However, is the relationship with universities the main differential factor between USOs and other spin-offs. So, in a comparative analysis developed in USA between 1990 and 2001, the survival ratio for USOs (94,4%) significantly exceed those of other start-ups (87,8) [18].

In the last decades, the spin-offs creation from universities has been one of the most important goals for Spanish Public Administration. Because of it, institutional incentives have been promoted to provide financing support and infrastructures as incubators to facilitate the short term survival of USOs. Figure 1 shows the evolution of the number of USOs created in Spain. This graph reflects how the number of spin-offs increases from 2000 to 2003, the level is maintained until 2006, and later on the number of new spin-offs is reduced to around one hundred firms [27].



Source: [27]

Figure 1: Number of university spin-offs

The growth of USOs is directly related to institutional incentives. However, the number of Spanish new firms is smaller than those of the other countries like

USA, and their impact over the economy is quite low. The Spanish case is related to the main conclusions obtained from the Fostering Entrepreneurship Report [28] and [29]. In this report, most of USOs are created from a very low group of universities with a high level of research excellence, because only these academic institutions have the financial resources to provide infrastructures for the USOs´ support (Table 5).

Table 5: Relation of Spanish USOs and universities

	Number of spin-offs with university participation in capital	benefits returns (miles €)	number of researchers founders of spin-offs	number of spin-offs dependent of technological patent of university	number of participated spin-offs that increased capital
2006	44	416	215	37	13
2007	14	0	197	46	21
2008	22	0	185	27	10
2009	37	32	350	52	33

Source: [27] (2006-2009)

Taking into account the works of [19], [21] and the data obtained from the Spanish offices of innovation transference, we can consider as differential factors of USOs survival from the Organizational Ecology Theory, compared to other spin-offs, the Table 6.

According to these data, the USOs could take advantage over other spin-offs, using the support provided by universities in terms of financial investments, infrastructures like technologic and scientific parks or the involvement of academic experts. At the same time, they would be able to consider commercial alliances with other similar firms taking advantage from their

spatial proximity and academic relations.

Table 6: Environmental Factors

Environmental factors	USOs	other spin-offs
university support	high (95%)	None
staff training in science sector	43%	8,8%
cooperation with institutions of transference of research results (technologic & scientific parks)	6,2%	5,5%
alliances with other firms	9,3%	5,5%

Source: on the premises

2.3 The interaction of university model and USOs

Innovation systems are based on free-flowing relationships between different environments and actors and, in particular, the relationship between public R&D systems, companies and government. If universities follow an interactive innovation model, they can quickly identify problems faced by industry and society and respond by seeking scientific solutions. If they operate with a linear innovation model, their starting point is theoretical research, which is later applied to solving business problems [30]. The interactive innovation model requires an existing relationship with industry in order to identify needs. The linear model requires communicating and marketing work after the research has been carried out. The lack of efficiency of this process has resulted in linear models being replaced by spiral or triple helix models [9] and open innovation models [31], in which coordination between actors in the system (researchers, companies, government, facilitators) becomes crucial.

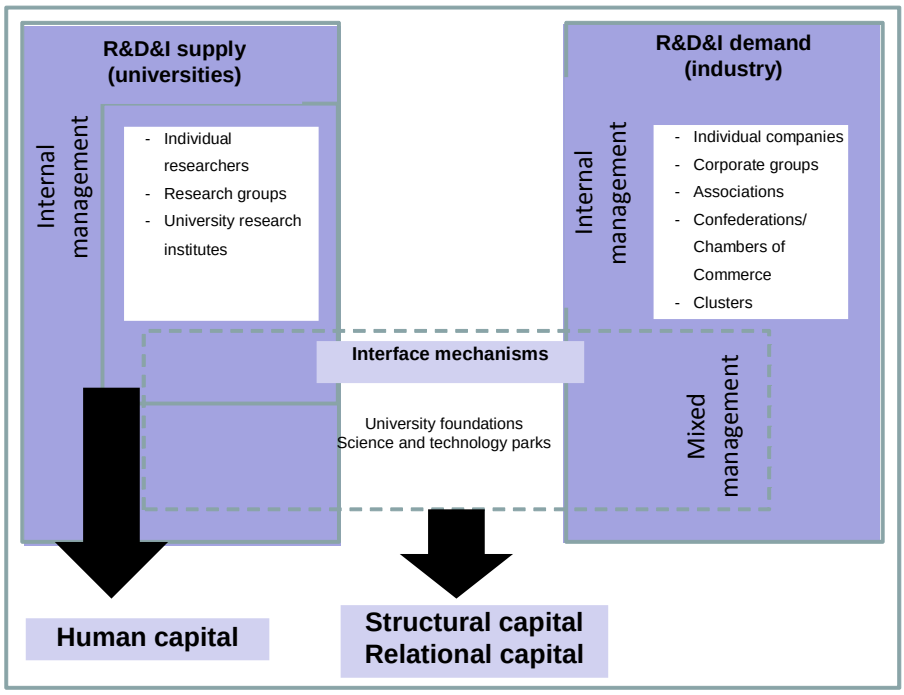
In the innovation system as a whole, universities, which are predominantly funded by the State, supply the necessary human capital for research from innovation to end product through the know-how of researchers (professional services). Companies then identify the demand for innovation and facilitate its implementation, returning some of the government's investment in these research activities.

Companies are aware that their competitive advantage can no longer be calculated in terms of tangible assets, but rather in the management of intangible assets [32], [33], [34] and [35]. The effect is that intellectual capital is now considered to be fundamental to the survival and growth of a country's industrial fabric.

According to [36], there are three main components of intellectual capital: human capital, defined as "*the stock of individual knowledge found in the employees of an organization*"; structural capital, which includes the organization's stored-up non-human knowledge, such as databases, concept maps, process manuals, strategies, routines and anything whose value to the company exceeds its material cost and, finally, relational capital, which encompasses the inherent knowledge of all of the organization's relationships with its clients, competitors, suppliers, external partnerships and government.

Within the above-mentioned theoretical framework, and as illustrated in Figure 2, the R&D&I exchange system is based on the performance of interface mechanisms, which enable the human capital generated by individual researchers, research groups and university research institutes to be channeled towards the production sector (companies and corporate groups).These mechanisms can be managed by university governing bodies (which is the case with research transfer offices, RTOs) or mixed management systems, in which representatives from companies and public institutions, such as university foundations and science and technology parks, participate. It would be the responsibility of these interface mechanisms to provide the R&D&I exchange system with structural capital in the

form of physical and technological infrastructures (matching systems), which enable research supply to be matched to industry demand, and relational capital in the form of collaborative networks [37].



Source: on the premises

Figure 2: R&D&I exchange system

Focusing on the relations between the three areas, scientific, support system (interface) and the market - in the broadest sense of entrepreneurial activity, it would seem necessary to first identify the type of relations that might be established among these areas with respect to the transfer of innovation. Since 1992, when [38] first put forward a framework for university-business collaboration, this idea has gradually become more highly defined. In recent years a series of important lines of collaboration have been classified (Table 7).

Table 7: University-business relations

Area of collaboration	description
research societies	inter-organizational R+D purchase agreements
research services	research contracts and technical assessment
academic venture	commercial development and exploitation of technologies carried out by university personnel or students through firms with whom they participate
transfers of human capital	multi-contextual learning instruments:Training of professionals, transfer of PhD's etc.
informal interaction	informal contacts and the establishment of cooperation networks through academic activities (congresses, conferences etc,)
commercialization of intellectual property rights	transfer of intellectual property generated in the university to industry via licensing.
scientific publications	use of explicit scientific knowledge in industry

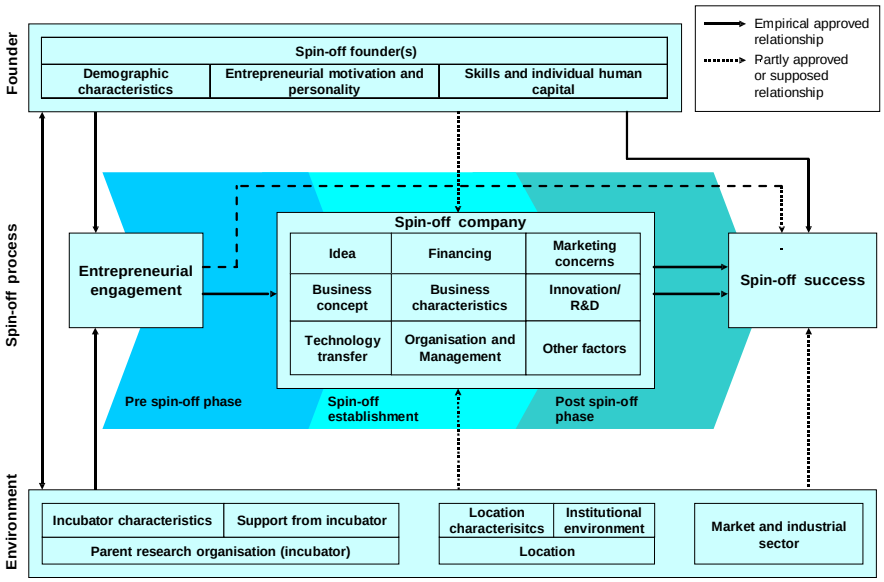
Source: Adapted from [39]

Because of the existence of these lines of collaboration, USOs should be in a better position than other spin-offs to compete in the market.

3 USOs Survival Model

3.1 Influence factors on USOs venturing. The Helm&Mauroner model

In 2007, [11] published a complete review of empirical studies to let them to give an overview of entrepreneurial success factors for USOs. According to these authors, the appearance and long-run success of spin-offs from public research organizations were determined by three classes of factors: the founding person(s), the environment including the parent organization, and the created company itself.



Source. [11]

Figure 3: Influence factors on research-based spin-off venturing

In the Figure 3 the authors show how the influence of the founder is a key factor in the formation process of the spin-off. In the Spanish case, the differences founded between USOs and other spin off are related, on the one hand, to the qualification and motivations of the founder. In the case of USOs, the founders were principally researchers with a very distinctive human capital from a university education in engineering or natural science, and the motivations were more related to their need for independence and need for achievement [21].

With regard to environmental factors, the scientific integration has an important influence on the Spanish USOs´ success. Government subsidies and support, as well as supportive financial market had a proven impact on both the appearance and performance of spin-offs, although there are not enough evidences to consider these subsidies and support as differential factors to distinguish Spanish USOs from other spin-offs. However, in the case of USOs, the existence of a kind of a parental organization as the academic institution could serve to

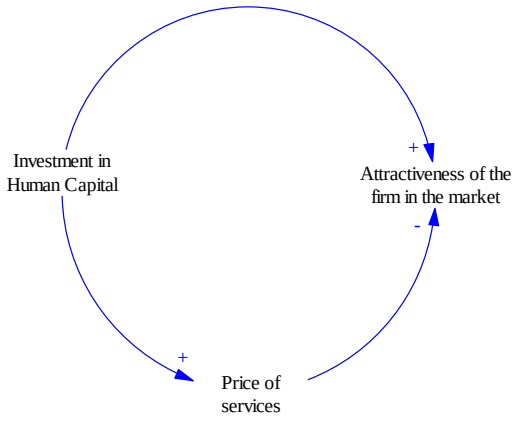
improve their competitive advantage as it was studied in the case of the corporate spin-offs [40].

3.2 Survival dynamic of USOs

The survival of a company in the future will be determined by the attractiveness of this company in the market, from a dynamic point of view. The attractiveness can be estimated using the product cost and perceived value of human capital factors, bearing in mind that each of these factors use to have an opposite effect on demand [41]. In the case of new firms (Figure 4), the higher investment in human capital, the higher the price of the services offered by the spin-off, through the knock-on effect of salary costs or R&D investments, thereby reducing attractiveness of the firm in the market. However, the higher the level of the organization's investment in human capital in comparison with other companies within the sector, the greater will be the market demand. The joint effect of both factors will determine the resulting market share, described as the attractiveness of the company for the client, which will be a key point in differencing USOs from other spin-offs.

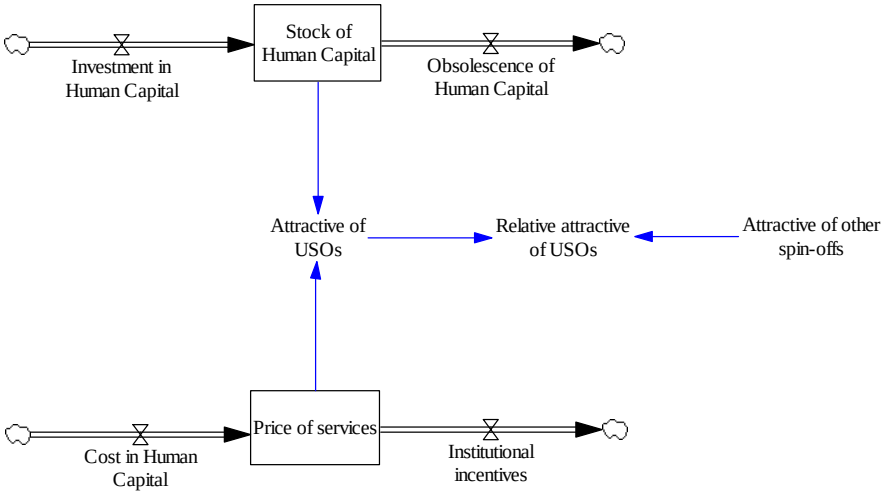
However, the difficulty in understanding the complex relationship between innovation and survival lies in the fact that "unsuccessful" innovative activity is hard to observe [6]. In the case of human capital investments, we propose a flow diagram (Figure 5) that balances the stock of human capital of a firm between human capital investments (input) and knowledge obsolescence (output).

Part of the human capital investment has to be assumed yearly as cost by the companies. In the case of spin-offs, institutional incentives can decrease the total amount of this cost, let the firms to reduce the price of services and increase their relative attractive in the market.



Source: on the premises

Figure 4: Attractiveness of the firm in the market



Source: on the premises

Figure 5: Survival dynamic

This figure shows the survival dynamic of new firms, from a very simplified point of view. However, this picture let us to think about which should be the most effective measures to promote USOs survival, from a dynamic approach. These measures should be focused on promoting more flows of investment in human capital and designing institutional incentives that let the USOs reduce the price of their services, compared to other firms.

3.3 Proposal of an academic model of USOs support

Although since 2007 Spanish Government has tried to follow the strategy of Lisbon Agency for the R&D policy, this Country shows a distribution model of expenses by sectors totally different to those of other European countries. There is a higher participation of public funds to finance innovations and education. Although the Lisbon Agency claimed a 66% of R&D investment financed by private funds for 2010, in Spain this percentage was only the 44% (In UK, France or Germany, this percentage increased until 60%).

As part of the Spanish Strategy for R&D, USOs are considered as a possibility of employment for research teams and post-doc students. However, the lack of an integrated model to support these institutions has caused fragmented initiatives not really productive.

After the comparative between USOs and other innovative spin-offs, we propose the following academic model to support USOs (Table 8), considering the shareholders involved (founders, academic institution, government), the flows entailed in their competitive advantage, a proposal of policies and a set of assessment indicators to control the effectiveness of this model:

Table 8: Academic model for USOs support

Shareholders		flow	Policies	assesment indicators
Direct	*USOs´ founders*	investment in human capital	staffing: - promote outsourcing activities with reseachers (business innovations) and academic staff (training & administrative support) - hire post doc students as trainees in the firm alliances: - use the figure of "relationship promoter" to detect potential business alliances - use the proximity of other USOs to design a "win-win" commercial relation.	• existence of qualified professionals to provide specific knowledge (business, management) • number and economic importance of outsourcing contracts university/USOs • number of trainees and percentage of long-term contracts from academic community • number and economic importance of the potential business alliances (other USOs) • number and economic importance of the contracts with other USOs.
	academic institution	institutional (academic incentives)	staffing: - promote the relation between academic staff and USOs reducing the legal barriers for cooperation (RD 1930/1984, 10th of October)	• number of academic professionals involved in USOs´ support • number and economic importance of outsourcing contracts university/USOs • number and economic importance of the

			- hire the figure of the "relationship promoter" as intermediate agent aimed to stimulate the commercial relation between research groups and firms alliances: - promote the relation with other academic institutions to facilitate the mobility of researchers and professors and their relation with USOs investment/Financing: - participate in social capital of the USOs during the incubation process - provide infrastructures of support (incubators, scientific parks) to reduce their initial costs of production technological support: - develop an USOs database for all public universities to promote network and strategic alliances	potential business alliances (other USOs) • existence of the figure of "relationship promoter" • economic importance and time of financial support of the university in USOs´ capital • economic impact of the infrastructures of support in the cost reduction of USOs • number of USOs located in the incubators/scientific parks • existence of an USOs database • number and economic importance of the potential business alliances (other USOs) • number and economic importance of the contracts with other USOs.

Indirect	*government*	institutional incentives	staffing: - boost tax incentives to collaboration university/USOs - adjust the labourlawframe to promote the participation of the academic staff and students in USOs investment/Financing: - provide financial support for infrastructures of USOs support (incubators, scientific parks) - condition the financial support of applied research to the collaboration with USOs	• number of academic professionals involved in USOs´ support • number and economic importance of outsourcing contracts university/USOs • number of USOs located in the incubators/scientific parks • number and economic importance of research projects between USOs and researchers.

Source: on the premises

This model presents a bunch of policies to be implemented by the main shareholders involved (directly or indirectly) in the USOs´ competitive factors.

According to this model, USOs´ founders should to take advantage from their proximity to university, buying innovations or training to lower costs or doing a better hiring of post doc students than other companies no so related to the academic world (staffing policy). They should also use the support provided by the intermediate institutions (“relationship promoter”) to detect potential business alliances with other firms, and promote favorable collaborations with other USOs (alliances policy).

Academic institutions have an important role to play to increase the institutional incentives flow, in order to reduce the prices of services provided by USOs. Reducing the legal conflicts of interest of participation of academics in spin-offs and promoting specialists in the transference of innovation management should be priorities in the staffing policy. Academic institutions should also encourage the alliances with financial and research organizations to provide an easier access to financial and human capital resources for USOs (alliances and investment/financing policy). From this approach, a USOs database for all Spanish universities should be designed. This tool would let a better communication among USOs, aimed to promote future business alliances (technological support).

Finally, Spanish Government has a lot of work to do to effectively stimulate the creation and survival of USOs. A National Entrepreneurship Policy should be designed, focused on optimizing the number of university spin-offs, and in particular those of aspiring to and achieving high growth. Two proposals are presented: boost tax incentives to the collaboration between academic institutions and USOs (complementary to previous policies), and provide financial support focused on promoting the collaboration between universities and USOs.

In order to control the effectiveness of the measures, a bunch of assessment indicators are presented, grouped by shareholders involved. They will provide evidence of the relation between policies and USOs competitiveness.

5 Conclusion

In order for the innovation system to function correctly, it requires linkage mechanisms to facilitate the transfer of research results from universities to industry and the support of an institutional framework, especially at the commercialization of innovation results.

The survival of University spin-offs (USOs) is directly related to their role as

product innovators and as technology transfer agents for years. Based on the comparative data used in this work, we found that USOs founders are younger, more technologically specialised, higher involved in the firm and less experienced than other spin-offs´ founders. However, USOs count on a better relation with academic institutions, in terms of support. Because of this previous diagnosis, we focused the value of this work on designing an academic model of USOs support, considering the role of shareholders involved, the flows entailed in building a competitive advantage for USOs, a proposal of policies to be implemented and a set of assessment indicators to control the effectiveness of the model.

From our point of view, this work contributes to the study of strategic and organisational determinants in the innovation transfer system and the promotion of university spin-offs from an unconventional approach, and opens up this line of research to future developments that relate the correlation between the assessment indicators of academic support and the USOs´ success.

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