

## **Are Spanish universities entrepreneurial?**

Clara B. Martínez-Meca

*INGENIO (CSIC-UPV)*

claramartinez088@hotmail.com

Adela García-Aracil

*INGENIO (CSIC-UPV)*

agarcia@ingenio.upv.es

Las universidades españolas están tratando de responder a los nuevos retos que se derivan de los cambios sociales, económicos, culturales y políticos, especialmente en el actual contexto, donde la excelencia académica e investigadora está siendo demandada desde organismos supranacionales y nacionales. Los retos adoptados por las universidades han ido evolucionando a medida que éstas han ido asumiendo nuevos roles, pasando de esquemas tradicionales de conservación y depuración del saber y su transmisión académica (modelo clásico de universidad europea) a modelos muchos más dinámicos, e incluso al acuñamiento del concepto de “universidad emprendedora”. A las universidades no solo se las exige un nivel excelente de docencia (primera misión) e investigación (segunda misión), sino también relevancia social, esto es, que contribuyan al desarrollo social y económico (la llamada tercera misión). Como consecuencia, subyace la necesidad de una mayor interacción entre las universidades y su entorno, siendo la transferencia de conocimiento el principal instrumento a través del cual llevar a cabo esta actividad emprendedora. En la literatura se distinguen diferentes posibilidades para realizar esta transferencia: contratos de investigación, spin-offs, patentes, etc. Cualquiera de estas actividades podría usarse como un indicador parcial del emprendimiento académico. Partiendo de la premisa que la investigación es un factor previo a la transferencia de conocimiento, cuanto mayor sea la actividad investigadora de la universidad, mayor será el stock de conocimiento que se transfiere, y dicho stock suele relacionarse directamente con los fondos destinados a financiar la investigación. Así, mientras algunos autores subrayan la importancia de la financiación pública, otros enfatizan el papel de la financiación privada (colaboración universidad e industria). En este contexto, el objetivo de este trabajo es conocer el grado de emprendimiento existente en las universidades españolas y su fuente de financiación -públicas o privadas-, y la influencia de las características internas de las instituciones.

Keywords: entrepreneurship; universities; public funding; private funding.

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## **1. Introduction**

Universities around the world develop their activity in a context where the principles of “efficiency and effectiveness of public services” are being applied, in the new waves of managerialism and economic rationalism (Ho, 2000). Different authors speak about the increasing importance of values related to the market in these educational institutions, which can affect the way in which teaching, research and knowledge transfer is done (Ho, 2000; Gregorutti, 2007; Subotzy, 1997). This represents a challenge for universities, as they need to adapt themselves. Spanish universities are also influenced by this general context. As well, as a result of the current economic crisis, they need to face an additional challenge: cuts in public funding.

How can Spanish universities maintain their current activity despite diminishing public funding? Entrepreneurship has been identified as a positive strategy to face this type of situation, as it allows universities to obtain money from new sources of income.

Until now there has been limited quantitative analysis on this matter. However, it is important to study the extent in which Spanish universities are developing entrepreneurial attitudes, as the current context seems to contain future trends. Without analysing universities’ results, it is difficult for universities to progress and become more entrepreneurial. Governments can also use this information to foster entrepreneurship in universities through policies, regulations, funds... (Sá, 2011; St.John, 1991).

Therefore, this paper explores entrepreneurship in Spanish universities in order to provide universities and governments with the information necessary to make the former institutions more entrepreneurial. This will allow them to become more sustainable, that is, to “operate increasingly on its own with decreasing assistance from outside sources” (Seymour, 1991).

We accept the concept of entrepreneurial university as it is used by Burton R. Clark (2001). He argues that there are five pathways of transformation, which universities can follow in order to become more entrepreneurial. They are: “a strengthened steering core; an expanded developmental periphery; a diversified funding base; a stimulated academic heartland; and an integrated entrepreneurial culture”. In this paper we intend to explore the third issue. An entrepreneurial university –in this vertex– would recognize the context of cuts in governmental funding and would achieve to widen and diversify sources of finance.

For space reasons we will study the third path partially. First, we will not study diversification, that is, we will not analyse the institutional nature (governments at different levels, industry, own resources...) of the sources of finance. Second, of the different sources of finance

mentioned by Clark (2001), we will analyse three of them: competitive research grants, R&D contracts, and license revenue.

Our main objective is to classify Spanish public and private universities according to the income they have obtained from the three sources of finance stated above. We intend to analyse how each particular university is doing at widening sources of finance.

We will accomplish this through three specific objectives, in parallel to the three sources of finance chosen. Our specific objectives are: i) to classify universities according to income obtained from competitive research grants, ii) to classify universities according to income obtained from R&D contracts and iii) to classify universities according to license revenue.

We are interested in testing two hypotheses. First, groups with poorer results will be the biggest groups, that is, they will contain the highest number of universities in comparison to the rest of groups. Second, groups with the best results will be the smallest ones. If this hypothesis is accepted, this means that Spanish universities as a whole are not doing well on this dimension of entrepreneurship. To test this hypothesis we need to control for some variables. These are: the antiquity of the university, its size (measured by the number of students) and the total number of personnel dedicated to teaching and research.

## **2. Description of the Spanish university system**

In Spain there are currently 80 universities, with 50 public and 30 private universities (Ruct, 2012). They do not occupy first places in world rankings; even though in 2008 the mean expenditure per student was comparable to the EU-19 mean (Consejo de Universidades, 2010). Spanish universities are undergoing changes as a result of their adaptation to the European Higher Education Area (EHEA). It is important to notice that public and private universities share some sources of funding, but not all of them. For example, students in private universities participate more directly in paying teaching. On the other hand, private and public universities give a different importance to the three missions: education; research, and transference and social responsibility. Private universities would have a greater weight of the first one in comparison to public universities (Consejo de Universidades, 2010).

In table 1 we show different variables for Spanish public and private universities<sup>1</sup>. These variables have been chosen according to the main objective of the paper. The sources of data are the

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We have not included the International University of Andalucía and the Menéndez Pelayo International University, as no data for the majority of columns was found.

following: the Office for Institutional Relations and Protocol (University of Granada); the Spanish Ministry of Education, Culture and Sport; the Spanish National Statistics Institute (INE), and the most recent RedOTRI survey available (for year 2010).

The first three columns from the table below are the control variables: i) the foundation year allows us to measure the university's antiquity, ii) the number of teaching and research staff (PDI) in full-time equivalent (FTE) talks about the quantity of personnel resources available, and iii) the number of enrolled students is a way of measuring the university's size.

The fourth column is the total amount of money obtained from competitive research grants during 2010. The fifth column shows the total monetary amount of R&D contracts signed during that year, for the whole duration of the project. The last column shows the license revenue obtained during 2010 from licenses contracted that year or before. In relation to these three variables, we have included data for universities which have provided that information to the RedOTRI survey and have explicitly allowed the information to go public. It is important to notice that in our analysis we will not include the 14 universities which have declared their answers to the survey as confidential, as no individual data can be provided. We will use the data from the fourth, fifth and sixth column to explore how well Spanish universities are doing in the third path to entrepreneurship (Clark, 2001), as it has been described before.

Table 1. Description of public and private universities

	Foundation year	2009/2010		2010		
		Number of teaching and research staff (FTE)	Number of enrolled students	Competitive research grants ('000€)	R&D contracts ('000€)	License revenue ('000€)
<b>PUBLIC UNIVERSITIES</b>						
A Coruña	1989	1.346,0	22.493			
Alcalá	1977	1.361,5	21.296	10.935,60	10.231,03	
Alicante	1979	1.794,5	28.908	9.916,33	3.608,47	30,00
Almería	1993	770,5	12.352	6.449,15	4.184,35	16,16
Autónoma de Barcelona	1968	2.648,0	37.694	40.028,22	11.605,05	72,11
Autónoma de Madrid	1968	2.165,5	29.836	20.000,00	15.545,73	46,75
Barcelona	1430	3.912,0	59.275	32.051,74	13.155,10	33,82
Burgos	1994	582,5	8.609		729,00	0,70
Cádiz	1979	1.365,5	22.112	3.875,52	2.434,96	13,83
Cantabria	1972	998,5	10.873	23.377,85	10.436,78	25,37
Carlos III Madrid	1989	1.441,5	18.033	15.701,00	7.400,00	7,48

Castilla-La Mancha	1982	1.982,0	29.573	22.282,00	8.579,00	0,00
Complutense de Madrid	1293	5.416,0	85.596	30.936,04	14.812,35	151,25
Córdoba	1972	1.251,0	18.913			
Extremadura	1973	1.695,0	24.237	5.867,48	2.255,72	1,86
Girona	1991	1.000,0	12.773	6.568,68	2.063,20	0,00
Granada	1531	3.455,0	61.817	20.975,00	5.128,20	7,00
Huelva	1993	797,5	11.832			
Illes Balears	1978	946,0	15.321	6.119,00	1.074,00	87,00
Jaén	1993	997,0	16.778	2.948,62	596,84	10,01
Jaume I Castellón	1991	850,5	14.150	3.990,66	933,35	10,01
La Laguna	1792	1.629,0	23.294	15.497,00	897,00	0,00
La Rioja	1992	415,0	6.182	1.206,00	648,07	0,00
Las Palmas de Gran Canaria	1989	1.426,0	21.527			
León	1979	864,5	13.593			
Lleida	1991	676,0	9.584	5.476,74	470,00	4,00
Málaga	1972	2.036,5	36.002	30,00	5.829,11	0,00
Miguel Hernández de Elche	1996	808,5	12.681	3.718,48	835,22	35,43
Murcia	1915	1.943,5	30.655	7.878,11	3.758,98	137,89
Oviedo	1608	1.946,0	26.323			
Pablo de Olavide	1998	795,5	10.561	115,00	1.292,76	0,90
Pais Vasco	1968	3.939,0	44.639	44.176,64	11.744,53	83,39
Politécnica de Cartagena	1998	501,0	6.501			
Politécnica de Catalunya	1971	2.409,5	34.148	19.768,00	18.001,00	120,00
Politécnica de Madrid	1971	3.060,0	38.075	61.751,26	41.875,76	233,56
Politécnica de Valencia	1971	2.480,0	37.305	17.443,09	13.565,76	340,00
Pompeu Fabra	1990	815,5	11.737	22.377,00	3.830,40	30,10
Pública de Navarra	1987	724,5	8.000	6.283,00	1.358,00	4,00
Rey Juan Carlos	1997	1.399,0	28.215	8.261,00	2.583,00	3,25
Rovira i Virgili	1991	1.141,5	12.927	17.642,00	5.790,47	34,40
Salamanca	1218	2.090,0	29.199	8.563,00	2.836,00	215,00
Santiago de Compostela	1495	2.076,0	31.297	28.718,00	5.599,00	61,50
Sevilla	1505	3.958,0	63.182	26.062,00	28.401,00	60,00
València (Estudi General)	1500	3.100,0	49.872	30.923,62	7.178,19	35,19
Valladolid	1295	2.186,8	26.536	23.184,00	6.223,00	54,00
Vigo	1989	1.357,5	21.241		5.735,00	0,00
Zaragoza	1474	2.903,0	34.711	21.886,00	14.693,00	327,65
<i>Open university</i>						
UNED	1972	1.318,0	148.104		517,18	
<b>Total public universities</b>		<b>84.775,8</b>	<b>1.378.562</b>	<b>632.982,83</b>	<b>298.435,56</b>	<b>2.293,61</b>
PRIVATE UNIVERSITIES						
Abat Oliva - CEU	2003	55,0	1.671			
Alfonso X El Sabio	1993	262,0	10.586			
Antonio de Nebrija	1995	170,5	2.574			
Camilo José Cela	2000	191,0	4.603			
Cardenal Herrera CEU	1999	429,4	5.916			
Europea de Madrid	1995	493,5	9.723	308,18	567,68	

Europea Miguel de Cervantes	2002	102,0	1.355			
Francisco de Vitoria	2002	133,5	3.020	1.156,20	0,00	0,00
IE University	2008	337,0	1.925			
Internacional de Cataluña	1997	210,5	4.149			
Mondragón Unibertsitatea	1998	229,5	3.265	4.764,00	5.077,00	0,00
Ramón Llul	1991	809,5	15.960			
San Jorge	2005	79,5	910			
San Pablo CEU	1993	717,0	9.284			
Vic	1997	366,5	5.273			
Católica Sta. Teresa de Jesús	1996	52,0	1.469	38,00	19,33	0,00
Católica S.Vicente Mártir	2003	369,0	8.952			
Católica San Antonio	1999	303,0	7.042			
Deusto	1886	248,0	8.370			
Navarra	1952	603,5	10.943	9.570,69	1.984,17	37,85
Pontificia de Comillas	1892	415,0	7.211			
Pontificia de Salamanca	1940	177,5	6.237	196,19	428,64	0,00
<i>Open universities</i>						
Oberta de Catalunya	1995	219,0	46.743			
A distancia de Madrid	2006	65,0				
Internacional de la Rioja	2008	41,0				
<b>Total private universities</b>	<b>49655</b>	<b>7079,4</b>	<b>177181</b>	<b>16.033,26</b>	<b>8.076,82</b>	<b>37,85</b>

### 3. Methodology

Our main objective is to classify Spanish public and private universities according to their income in the three dimensions explained above. We carry out a hierarchical cluster analysis with the quantitative secondary data presented. We have chosen the former method because it is appropriate when the number of clusters is unknown beforehand. Variables will be standardized in order to make the comparison possible and the method used will be the furthest neighbour, as it gives a complete linkage solution.

Therefore, we undertake three cluster analyses, one for each source of finance: competitive research grants, R&D contracts, and license revenue. Our analysis includes those 47 Spanish universities which have answered the RedOTRI survey 2010 and have given authorization for the data to go public: 41 public (82% of them) and 6 private (20%) universities in total.

## 4. Results

### 1. University clusters: competitive research grants

The first cluster analysis allows us to classify universities according to the monetary amount of funds obtained from competitive research grants, including competitive research projects. The main variable considered is the monetary amount of this grants obtained during 2010. There were 3 missing values, which implies that from the 47 cases in total we could obtain clusters for 44 of them.

Hierarchical cluster analysis of available data shows cluster of different levels of disaggregation. How many clusters can we then identify for our results? This task is done looking at the level of similarity between cases (Holland, 2006) and the number of cases in each cluster, trying to find a compromise between both criteria. Our aim is to identify clusters with enough cases to have explanatory power and at the same time containing universities which have quite similar results in obtaining competitive research grants.

Following this criteria, we split universities into 5 clusters according to their performance during 2010. Clusters are shown on the table below: cluster A contains 20 universities (including all private universities analysed, which are in bold), cluster B groups 12 of them, cluster C is formed by 4 cases, cluster D includes only 3 universities and, finally, cluster E includes 5 of them.

Table 2. Clusters for competitive research grants obtained

A	B	C	D	E
Almería Cantabria Carlos III <b>Católica S. Teresa</b> <b>Europea de Madrid</b> <b>Francisco de Vitoria</b> Illes Balears Jaén Jaume I La Rioja Lleida Miguel Hernández <b>Mondragón</b> <b>Navarra</b> Pablo de Olavide Pompeu Fabra <b>Pontífica Salamanca</b> Pública de Navarra Rovira i Virigili	Alcalá Alicante Autónoma de Madrid Cádiz Castilla La Mancha Extremadura La Laguna Málaga Murcia Politécnica Catalunya Politécnica Valencia Rey Juan Carlos	Salamanca Santiago Compostela Valladolid Zaragoza	Autónoma Barcelona País Vasco Politécnica Madrid	Barcelona Complutense Madrid Granada Sevilla Valencia

It is important not only to identify clusters, but as well to describe their general characteristics. These are presented on table 3.

Table 3. Characteristics of each cluster for competitive research grants obtained

	Cluster				
	A	B	C	D	E
N of students (mean)	10.330,5	28.798,4	30.435,8	40.136,0	63.948,4
N of teaching and research staff (mean)	703,5	1.855,1	2.314,0	3.215,7	3.968,2
Antiquity in years (mean)	23,3	53,7	639,5	41,0	558,2
Amount competitive R grants (mean)	6.900.322	11.812.844	20.587.750	48.652.040	28.189.680
N cases	20	12	4	3	5

We can accept the first and second hypotheses. Cluster A has the poorest results in obtaining money through competitive research grants (6.900.322€ during 2010) and is the biggest group, with 20 cases. Cluster D has by far the best results (48.652.040€) and is composed only by 3 universities. It is interesting that both groups contain the youngest universities, so it may seem that antiquity is not important in explaining results. This issue should be more deeply analysed, as the difference between results of cluster D and E on the one hand, or B and C on the other side could be related to antiquity. This two pairs of clusters have similar characteristics in size and number of personnel, but differ considerably in when they were founded.

In conclusion, we can argue that Spanish universities as a whole are not very entrepreneurial in this dimension.

## 2. *University clusters: R&D contracts*

In this section we present the results of the cluster analysis according to the monetary amount of funds obtained through research and development contracts. The main variable considered is the monetary amount of R&D contracts signed during 2010. We will apply the same criteria than before in order to define clusters. They are shown on table 4. All cases (47) were valid but we will not consider all of them: Universidad Politécnica de Madrid and UNED were too distant from clusters to group them. Once more, all private universities classified (in bold) are included in the same group.

Table 4. Clusters for R&D contracts

A	B	C	D	E
Almería Burgos <b>Católica S. Teresa</b> <b>Europea de Madrid</b> <b>Francisco de Vitoria</b> Girona Illes Balears Jaén Jaume I La Rioja Lleida Miguel Hernández <b>Mondragón</b> <b>Navarra</b> Pablo de Olavide Pompeu Fabra <b>Pontífica Salamanca</b> Pública Navarra Rovira i Virgili	Alcalá Alicante Cádiz Cantabria Carlos III Castilla La Mancha Extremadura La Laguna Málaga Murcia Rey Juan Carlos Vigo	Complutense Madrid Sevilla	Autónoma Barcelona Autónoma Madrid País Vasco Politécnica Catalunya Politécnica Valencia	Barcelona Granada Salamanca Santiago Compostela Valencia Valladolid Zaragoza

Again, it is important to describe the clusters' characteristics. Our aim is not only to classify universities, but as well to give a general picture of the Spanish university system. An overview of the clusters is included in table 5.

Table 5. Characteristics of each cluster for R&D contracts

	Cluster				
	A	B	C	D	E
N of students (mean)	9.805,9	24.536,6	74.389,0	36.724,4	41.815,3
N of teaching and research staff (mean)	642,8	1.583,7	4.687,0	2.728,4	2.817,5
Antiquity in years (mean)	22,2	50,3	611,0	40,8	589,6
Amount R&D contracts (mean)	1.678.025	5.312.421	21.606.675	14.092.414	7.830.356
N cases	19	12	2	5	7

We must again accept both hypotheses. Cluster A has the highest number (19) of cases and the poorest results (1.678.025€ is the amount of R&D contracts signed during 2010). It includes quite new universities, small in size and with a low number of personnel. Cluster C has the best

results (21.606.675€) but only includes 2 universities, which are big in size, with a high number of personnel and very antique. It is interesting that cluster E has bigger universities and with more personnel than cluster D and, despite of this, it signed R&D contracts for about half of the amount. Maybe this was due to their different antiquity. Cluster B has also low results and is the second biggest group in number of cases (12).

In conclusion, in this dimension the Spanish university system as a whole isn't doing well. Although there are a few very entrepreneurial universities, in the rest entrepreneurship needs to be fostered.

### 3. University clusters: license revenue

The aim of the third cluster analysis is to identify groups of universities according to their license revenue during year 2010. There were 3 missing values, so 44 universities were classified. Universities in each cluster are shown on the following table, in which private universities are marked in bold. For this item, only 4 clusters were chosen.

Table 6. Clusters for license revenue

A	B	C	D
Almería	Alicante	Politécnica Madrid	Barcelona
Burgos	Autónoma de Barcelona	Politécnica Valencia	Complutense de Madrid
Cantabria	Autónoma de Madrid	Salamanca	Granada
<b>Católica S. Teresa</b>	Cádiz	Zaragoza	País Vasco
<b>Francisco de Vitoria</b>	Carlos III		Santiago de Compostela
Girona	Castilla La Mancha		Sevilla
Illes Balears	Extremadura		Valencia
Jaén	La Laguna		Valladolid
Jaume I	Málaga		
La Rioja	Murcia		
Lleida	Politécnica Catalunya		
Miguel Hernández	Rey Juan Carlos		
<b>Mondragón</b>	Vigo		
<b>Navarra</b>			
Pablo de Olavide			
Pompeu Fabra			
<b>Pontífica Salamanca</b>			
Pública de Navarra			
Rovira i Virgili			

What are the characteristics of these four clusters? The table below shows the mean of the variables considered and the number of cases in each cluster.

Table 7. Characteristics of each cluster for license revenue

	Cluster			
	A	B	C	D
N of students (mean)	9.866,4	27.996,0	34.822,5	52.776,8
N of teaching and research staff (mean)	669,3	1.835,9	2.633,3	3.505,4
Antiquity in years (mean)	23,4	50,5	351,5	507,9
Amount license revenue (mean)	15.575	33.321	279.053	60.769
N cases	19	13	4	8

Results lead us to accept both hypotheses. Cluster A with 19 universities is the biggest cluster and has the worst results in license revenue (15.575€). It is composed of young and small universities, with relatively few personnel. On the opposite, cluster C is composed by only 4 universities and has the best results of the table (279.053€). Universities in this cluster are quite big and antique, and have quite a lot of personnel. It is interesting that cluster D has the highest value in the control variables, but its license revenue during 2010 is way behind cluster's C. Cluster B has quite low results in license revenue (33.321€) and is the second biggest group, with 13 universities. Once again, we can conclude that the Spanish university system doesn't seem to be doing well with regard to entrepreneurship.

## 5. Conclusions

Results show that the Spanish university system is in general not very entrepreneurial for the sources of finance studied. For each cluster analysis we have accepted our hypotheses: groups with poorer results are those groups with a higher number of universities, and groups with the best results are the smallest ones.

It is important to notice that those groups with better results tend to be composed by different universities in each source of finance analysed. Only the Universidad Politécnica de Madrid appears in two dimensions: competitive research grants and license revenue. Control variables give a different profile of universities in each cluster analysis.

On the opposite, those groups with poorer results tend to be composed by the same universities, which are –in average– always the smallest, most recent and with fewer personnel. The following 11 public universities (out of 41 analysed) appear always in these groups: Almería, Illes Balears, Jaén, Jaume I, La Rioja, Lleida, Miguel Hernández, Pablo de Olavide, Pompeu Fabra,

Pública de Navarra and Rovira i Virgili. All private universities analysed (Católica S. Teresa, Europea de Madrid, Francisco de Vitoria, Mondragón, Navarra and Pontífica Salamanca) appear in these groups.

We are aware that this paper covers specific aspects of entrepreneurship. Specifically, we have studied one aspect of the third “path to entrepreneurship” (Clark, 2001): how well Spanish universities are doing at widening their sources of finance. We have done this through three variables: amount of competitive research grants received, amount of R&D contracts signed and license revenue. Nevertheless, other sources of finance should be considered in order to obtain a complete picture of the system’s performance at broadening external finance. As well, it is important to study the diversification of these sources, as we share with Clark (íbid.) the importance of this issue. On the other hand, the other four “paths to entrepreneurship” (íbid.) should be studied in the future.

We are also aware that our analysis is transversal (for year 2010), which implies that the generality of our results is limited. A longitudinal analysis could give us a more accurate picture of the situation but this exceeds the objectives of our paper.

Despite these limitations, it seems clear that entrepreneurship within universities needs to be fostered. Universities and governments should work together with the aim of making Spanish universities nearer to the concept of entrepreneurial university. This way, they can face the situation of cuts in funding and be benefited from it. To widen and diversify sources of finance makes universities more connected to their environment and, therefore, potentially better at knowledge transfer.

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