

**RD EXPENDITURE ON HIGHER EDUCATION IN SPAIN, 1990-2015:
INEQUALITIES, AMONG REGIONS AND FIELDS, AND COMPARISONS
WITH EUROPE AND THE UNITED STATES**
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Abstract

In this study we present a comparison of Spain with other 4 major European countries (Germany, France, Italy and the United Kingdom), as well as a comparison of these five EU countries (EU5) with the United States (USA). The main conclusion is that financial aid to university research is very low in Spain in comparison with other European countries and very low in Europe in Comparison with the United States. For the last decades, Spanish universities have experienced an important increase of research production, in quantity and quality, but at the cost of a great effort for researchers due to the precarious financial conditions due to general low levels of support from Spanish Government. The European Union support to university research in Spain has been also very low. We find that Spanish Government should increase support to university research in all the territory, with transparency and better distribution of financial aid among regions and fields, accordingly to the scientific merit of university researchers. In this regard it is very important to improve the channels of communication between researchers and Government, both in Spain and in the European Union.

JEL Codes: I2, I23, O18, O51, O52

Keywords: RD Expenditure in Universities, Higher Education, Research and Development, Spain, European RD Policies, USA, Inequalities by region, Inequalities by scientific field.

1. Introduction

In this study we present a comparison of RD expenditure in Spain with other 4 major European countries (Germany, France, Italy and the United Kingdom), as well as a comparison of these five EU countries (EU5) with the United States (USA).

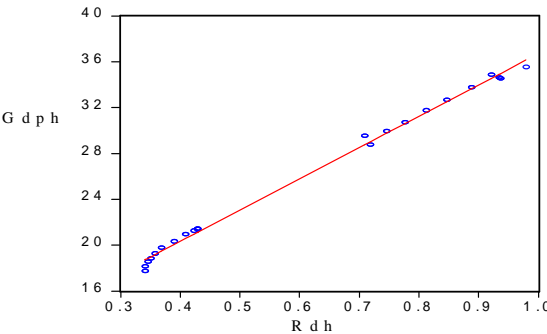
The main conclusion is that Spain shows little support to RD in universities, particularly in the fields of Social Sciences (including Economic Development and other important areas for socio-economic welfare). We find that Spanish Government should increase transparency and better distribution among regions, accordingly to the scientific merit of the researchers. This question is not a secondary one, but a very important one, because a long duration of unfair distribution for a long period like 1990-2015, indicates that there are great failures in the capacity of Government to reply to the demands of university researchers and citizens. In other words, there is a problem of failure on democratic channels for the initiatives addressed to solve those problems.

Section 2 present international comparisons of support to Higher Education in Spain and other European countries and the USA. Section 3 analyzes the inequality distribution of financial support to Spanish universities by regions. Section 4 analyzes the inequality distribution of support to RD by scientific fields in Spain. Section 5 summarizes the main conclusions and the Annex includes supplementary information.

2. International comparisons of RD expenditure per head in Spain, Europe and USA

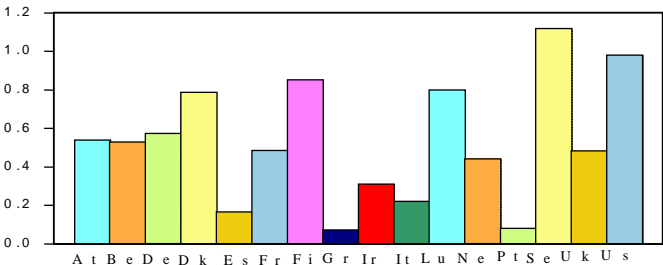
In previous studies, as in Guisan and Aguayo(2005), we have analyzed the relationship between economic development and RD expenditure in the European Union and the USA, and we have found a low general level of RD expenditure per capita in the European Union in comparison with the USA, as it may be seen in the following graphs:

Graph 3. Gdph and Rdh; EU15 and USA, 1993-2003
(\$ per inhabitant, at 2000 prices)



Source: Elaborated by Guisan and Aguayo(2005) from OECD and Eurostat Statistics. The set of points with low values of RDH correspond to the European

Graph 4. RD expenditure per inhabitant in Europe and USA, 2003
(thousand dollars at 2000 prices and exchange rates)



Source: Guisan and Aguayo(2005) from Eurostat and OECD Statistics. Austria (At), Belgium (Be), Germany (De), Denmark (Dk), Spain (Es), France (Fr), Finland (Fi), Greece (Gr), Ireland (Ir), Italy (It), Luxembourg (Lu), Netherlands (Ne), Portugal (Pt), Sweden (Se), United Kingdom (Uk), and the United States (Us).

RD expenditure on universities represents only an small percentage of *total RD expenditure* of each country (23% in the case of Spain) in spite of its very positive impact on economic development and social welfare.

Table 1 presents a comparison of RD expenditure on higher education between Spain and the USA, accordingly to OCDE(2016). We include the value at 2010 prices both in Purchasing Power Parities (PPPs) and Exchange Rates (ER).

Table 1. Financial support to RD in Universities: Spain and USA 1990-2013
(OECD statistics: Dollars at 2010 prices, in Purchasing Parities and Exchange Rates)

	Spain Mill. USD	USA Mill. USD	POP Spain Mill.	POP USA Mill.	RDH USA	RDH Spain (PPP)	RDH Spain (ER)
1990	362	4830	38.851	250.181	19.31	9.32	6.37
2000	679	7702	40.500	282.433	27.27	16.77	11.46
2013	709	14403	47.130	314.112	45.85	15.05	10.29

Source: RD in Higher Education, Population and RD per head (RDH). Elaborated from OECD statistics and other international statistics. Dollars (USD). Data of RDH in Purchasing Power parity (PPP) and Exchange Rate (ER).

Table 2 presents the value of *total expenditure RD per capita* and the value per capita corresponding to the *sector of higher education*, accordingly to Eurostat(2017). In the Annex we include reference to some disagreements of European researchers with the low support to Higher Education research from the European Union institutions.

Table 2. RD Expenditure per capita, year 2014: All sectors and Higher Education
(Eurostat statistics). Dollars at 2005 prices and PPPs.

RD Expenditure per capita in Euros, year 2014	All sectors	Higher Education	Pop 2014
Germany	1045.6	184.9	80646
Spain	275.6	77.5	46771
France	727.3	150.0	64062
Italy	366.7	104.1	61444
United Kingdom	589.9	152.1	63650
Average 5 European countries	644.0	139.7	316573
United States	1087.3	153.9	316497

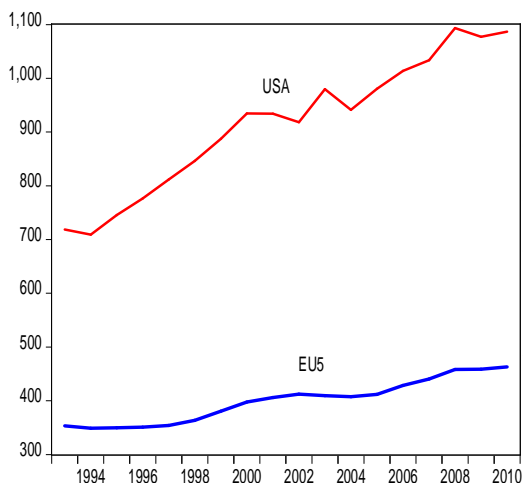
Note: All sectors includes: Business, Government, Higher Education and Prive Non Profit institutions. Last column is Population (thousand). Data for more countries in the Annex. Source: Elaborated from Eurostat, in Dollars per inhabitant at 2005 prices and PPPs. In the Annex we indicate that is important to see what is included in this Eurostat statistics in comparison with other sources, because accordingly to OECD statistics only 18.6 Euros per inhabitant were devoted in Spain, at current prices in year 2013, to financial support to RD expenditure on Higher Education.

Table 2 shows that RD expenditure, as measured by Eurostat Statistics, is lower, on average, in the set of 5 European countries than in the USA, both for all sectors and for Higher Education sector. It also shows that Higher Education, in spite of its great efficiency in RD activities, receives only a small part of the total expenditure on RD. The circumstances vary among universities, what implies even greater differences in financial support among countries and universities, because well financed universities, as many in the USA and in other developed countries, may have, besides grants for research, other kinds of direct or indirect support to RD activities (secretarial staff, teacher assistants, librarian staff, and several facilities) that other poorer universities do not have.

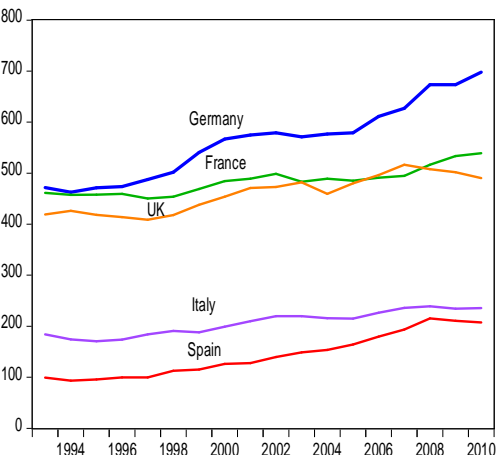
Guisán, Cancelo, Aguayo and Díaz-Vázquez(2001), present international comparisons for the quinquennium 1990-1994. They found Spain spent only the 25% of the European Union average (a little less than 5 Euros at 2013 prices).

Graph 1 shows the evolution of *total RD expenditure per head*, at constant prices, in the set of five European countries (EU5) of this study (Spain, Germany, France, Italy and UK) and the USA, accordingly to OECD statistics. Graph 2 shows the evolution of total RD expenditure per head in Germany, France, Italy, Spain and the United Kingdom.

Graph1. Total RD expenditure per capita in USA and EU5 (USD at 2010 prices and PPPs)



Graph 2. Total RD expenditure per capita in EU5 countries (USD 2010 PPPs)



Source: Elaborated from OECD RD statistics.

We may notice that Spain reached some degree of convergence with Italy, but both countries are very far from the levels of UK, France and Germany, and the average of these five countries of the European Union (EU5) are very low in comparison with the USA.

Differences between European Union policies and the USA

The Natural Science Foundation (NSE) and other institutions of the United States (NIH for Health sciences) provide generally a higher support than the European Union institution to researchers, not only due to more generous budgets but to what seems to be a better distribution, based on the idea that good teams of researchers may be in modest institution all through the country and that they deserve help. In the case of the European Union they usually insist that only the highest teams should lead to deserve help, and usually they do not help to many small and good research teams all through Europe.

We may find a lot of information about NSF and NIH as seen in the Annex. For example we find the following statement:

“NIH devotes 10% of its funding to research within its own facilities (intramural research). The institution gives 80% of its funding in research grants to extramural (outside) researchers. Of this extramural funding, a certain percentage (2.8% in 2014)

must be granted to small businesses under the [SBIR/STTR](#) program.^[17] The extramural funding consists of about 50,000 grants to more than 325,000 researchers at more than 3000 institutions” (See Annex).

In the case of the European Union, the budget for university research, including both EU grants and national grants, is usually much lower than the expenditure of the USA.

This has led to many complains from researchers, like the campaign “trust in researchers of year 2013 and other declarations included in the Annex.

2. Financing RD in Spanish universities and distribution by regions: national and European sources.

Table 4 shows the evolution of national support for the period 2000-2013 at 2013 prices, to Spanish universities. We may notice that the amount was small with only 6.6 Euros per capita in year 2013.

Tabla 4. Financial support from nacional grants to Universities in Spain,2000-2013

	2000	2013
National support (mill.€at 2013 prices)	182	311
Population (million inhabitants)	40.50	47.13
National support per head (Euros per cápita)	4.5	6.6

Source: Elaborado a partir de datos de Sanz et al (2002), CRUE(2014) e INE.

Table 5 shows the sources of financial support to RD expenditure on Higher Education in Spain for the period 2010-2013. As consequence of the European austerity policies imposed to the Spanish Government, in order to diminish budget deficit during the financial and economic crisis of the period, the total amount of RD financial aid experienced a diminution. Although the low level of grants form European institutions to Spain increased during this period, the amount was not enough to compensate for the diminution in national and regional support.

Tabla 5. Sources of support to RD expenditure on Spanish Universtites
Years 2010 y 2013 (million of Euros at current prices)

	2010	2013
National Plan (general Government)	635.8	311.3
European (EU institutions)	176.0	277.1
Regional (regional Government)	286.7	188.1
University Funds	60.6	77.9
Private support	45.3	14.0
Other International	2.8	4.1
Local Administratiobn (cities or provinces)	1.7	2.4
Total expenditure on RD in Higher Education	1208.9	874.9
Total expenditure on RD in HE per capita	25.7	18.6

Sources: CRUE(2013) and news from El País(2013)

Table 6 presents the distribution of the main source of financial aid (National Plan grants) by regions. We may notice that a few regions have a share on RD financing much higher than their weight on population, while many other regions have a share on RD financing from National Plan much lower than their population share. Many of the less favoured regions have a share on indicators, of quality and quantity of scientific research, much higher than their share on National Plan Financing. (See Annex). The last column shows the value of RD support from National Plan per capita of the regional population.

From National Plan data, we may notice important differences among Spanish regions. While Madrid, with less than 14% of population in year 2013 received more than 24% of total expenditure on RD from National Plans, with an average of 6.5 Euros per capita, several regions have received less than 2 Euros per capita. Generally the differences are persistent for decades, and they are not due to differences in the indicators of research production, as some regions with low percentages on RD support have good shares on RD production, at the cost of much stress for researchers. A remarkable feature is that regions that receive less than their share (both accordingly to population and to indicators of research activity) suffer a persistent discrimination in all the years where we can find data, as seen in the studies cited in the Annex.

Tabla 6. Regional Distribution of RD on Higher Education: National Plan grants, year 2013

	RD (thousand Euros)	Popula tion (thousand)	% of RD Support	% of Popula tion	RDH (Euros)
Com. Andalucía	31454.9	8440.3	17.99	17.97	3.7
Com. Aragón	9048.4	1347.1	5.17	2.87	6.7
Com. Canarias	895.9	2118.6	0.51	4.51	0.4
Com. Cantabria	4003.0	591.8	2.29	1.26	6.8
Com. Castilla-La Mancha	6313.7	2100.9	3.61	4.47	3.0
Com. Cataluña	18139.4	7553.6	10.37	16.08	2.4
Com. Extremadura	1913.0	1104.0	1.09	2.35	1.7
Com. Galicia	4089.5	2765.9	2.34	5.89	1.5
Com. Rioja	840.1	322.0	0.48	0.69	2.6
Com. Islas Baleares	1632.5	1111.6	0.93	2.37	1.5
Com. País Vasco	8119.1	2191.6	4.64	4.67	3.7
Com. Castilla y León	9838.1	2519.8	5.63	5.37	3.9
Com. Madrid	42475.3	6495.5	24.29	13.83	6.5
Com. F. Navarra	1737.2	644.4	0.99	1.37	2.7
Com. Valenciana	22174.3	5113.8	12.68	10.89	4.3
Princ. Asturias	6242.9	1068.1	3.57	2.27	5.8
Región Murcia	5932.1	1472.0	3.39	3.13	4.0
Total	174849.4	46961.0	100	100	3.7

Source: Elaborated from CRUE(2014). Total of universities “presenciales”. Other to universities “no presenciales” (national open university). Support from National Plan grants to universities 176255.4 thousand Euros). The last column is the support per capita.

Regarding information about regional distribution from all other sources, we may find data about regional financing of total RD activities in Spain from regional institutions, with some regions with percentages of RD expenditure on Gross Domestic Product higher than national average, as seen in the Annex: País Vasco, Navarra, Madrid and Catalunya are outstanding in this regard. Regarding European financial support, there are little information but available indicators show also many differences at regional level.

We may notice that the regional distribution, included in table 6, only refers to the part of National Plan in form of grants to research teams, which amounts to 176 million Euros for regions and national open university. How is distributed the difference between 311 and 176 million. There are, approximately 12.5 million devoted to Human Resources Formation (FPI and FPU), grants for young researchers and support technicians (8.2 million for grants “Ramón y Cajal”, “Juan de la Cierva” and other ones), and other activities.

Por lo que respecta a la financiación autonómica, el informe de la CRUE(2016) muestra grandes diferencias entre CCAA, destacando el País Vasco como la Comunidad que más aporta a la I+D regional.

Según los datos de la CRUE(2013) en el año 2010 las universidades un total de 1208.9 millones de Euros (25.7 Euros per cápita), de los cuales algo más de la mitad era de ayuda nacional, mientras que en 2013 recibieron sólo 874.9 millones de Euros (18.6 Euros per cápita). En el año 2013 la financiación nacional aportaba sólo un 35% (6.6 Euros por habitante), la ayuda europea un 32% (5.9 Euros por habitante), y la ayuda autonómica un 21% (3.9 Euros por habitante).

3. Inequal distribution of National Plan grants by scientific field in Spain

Table 7 shows the distribution of National Plan grants in Spain between two groups of scientific fields, in thousand Euros, and table 8 the values per capita in Euros.

The values of RDH expenditure, on Humanities and Social Sciences, vary between values lower than 0.15 Euros per capita in several regions and higher than 0.60 in the highest cases. The values of RDH expenditure, on Natural Sciences and Engineering, vary between values lower than 1.50 per capita in several regions and higher than 5 in the highest cases. Some regions are clearly below Spanish average without any scientific reason for that. In the Annex we comment on the problem of lack of enough channels to guarantee protection of Spanish researchers in this regard.

The group of Humanities and Social Sciences accounts for only 13% of this expenditure and NSE for the 87%. In Germany, accordingly to OCDE(2017) the percentage of H+S accounts for 20%.

The low values devoted to Social Sciences implies a high percentage of rejections on grants applications for many good teams of researchers, with percentages of rejection higher than 90% in some cases.

Table 1. Expenditure on RD by scientific fields in Spain: National plan grants in year 2013 (thousand Euros)

Region	RD H+S	RD NSE	Popu lation	% H+S	% NSE	% Popula tion
Com. Andalucía	4700.3	26754.6	8440.3	20.58	17.60	17.97
Com. Aragón	3096.6	5951.8	1347.1	13.56	3.92	2.87
Com. Canarias	197.0	698.9	2118.6	0.86	0.46	4.51
Com. Cantabria	278.1	3724.9	591.8	1.22	2.45	1.26
Com. Castilla-La Mancha	613.8	5699.9	2100.9	2.69	3.75	4.47
Com. Cataluña	1080.6	17058.8	7553.6	4.73	11.22	16.08
Com. Extremadura	136.7	1776.3	1104.0	0.60	1.17	2.35
Com. Galicia	312.6	3776.9	2765.9	1.37	2.48	5.89
Com. Rioja	129.0	711.1	322.0	0.56	0.47	0.69
Com. Islas Baleares	710.0	922.5	1111.6	3.11	0.61	2.37
Com. País Vasco	604.8	7514.3	2191.6	2.65	4.94	4.67
Com. Castilla y León	1994.6	7843.5	2519.8	8.73	5.16	5.37
Com. Madrid	4875.9	37599.4	6495.5	21.35	24.73	13.83
Com. F. Navarra	276.0	1461.2	644.4	1.21	0.96	1.37
Com. Valenciana	2602.9	19571.4	5113.8	11.40	12.87	10.89
Princ. Asturias	571.1	5671.8	1068.1	2.50	3.73	2.27
Región Murcia	657.1	5275.0	1472.0	2.88	3.47	3.13
<i>Total</i>	22937.1	152012.3	46961.0	100	100	100

Source: CRUE(2014). Table 1.III.1.7

Table 2. Expenditure on RD per capita (RDH) in Spain, year 2013 (Euros per inhabitant)

Region	H+S	NSE	All
Com. Andalucía	0.56	3.17	3.73
Com. Aragón	2.30	4.42	6.72
Com. Canarias	0.09	0.33	0.42
Com. Cantabria	0.47	6.29	6.76
Com. Castilla-La Mancha	0.29	2.71	3.01
Com. Cataluña	0.14	2.26	2.40
Com. Extremadura	0.12	1.61	1.73
Com. Galicia	0.11	1.37	1.48
Com. Rioja	0.40	2.21	2.61
Com. Islas Baleares	0.64	0.83	1.47
Com. País Vasco	0.28	3.43	3.70
Com. Castilla y León	0.79	3.11	3.90
Com. Madrid	0.75	5.79	6.54
Com. F. Navarra	0.43	2.27	2.70
Com. Valenciana	0.51	3.83	4.34
Princ. Asturias	0.53	5.31	5.84
Región Murcia	0.45	3.58	4.03
Total	0.49	3.24	3.73

Source: Elaboration by author from table 7.

As seen in the Annex, Social Sciences, and particularly Economics research, has generally received little support in Spain for decades, in spite of their increase in quality and quantity at national and international level.

Table 9 shows the distribution of recognition of “Sexenios” among researchers by scientific fields, accumulated for the period 1987-2013, conceded by national authorities accordingly to the rules of the Ministry of Education. This distinction implies several advantages for the areas with highest recognitions and many problems for the areas with low recognition: besides a personal gratification on the wage, the researchers with higher number of “Sexenios” generally have more chances to get grants in the National Plan.

Accumulated Sexenios, until year 2013	N° Sexenios	N° Teachers	Average	% Sexenios	% Teachers
Humanities (including Art)	13520	7073	1.91	16.45	14.94
Social Sciences	15646	13063	1.20	19.04	27.59
Natural Sciences (excluding Health)	28785	11590	2.48	35.03	24.47
Health Sciences	10175	5677	1.79	12.38	11.99
Engineering and Architecture	14038	9952	1.41	17.09	21.02
Total	82164	47355	1.74	100	100

Source: Elaborated by the author from CRUE(2014). Tablas 1.II.2.5 y 1.III.1.7.

We may notice that Natural Sciences is highly favoured by the Ministerial rules, and reaches an average recognition of 2.48 Sexenios per teacher, while the areas less favoured (Social Sciences And the group of Engineering and Architecture) reach less than 1.5 recognized Sexenios per teacher. These differences are not due to differences in research quality but to wrong rules from the Ministry that favour the recognition of research merits in some areas but are not enough to recognise the research quality in other ones.

5. Conclusions

Accordingly to the economic literature financing RD is important for economic development and quality of life, both in Humanities and Social Sciences (H+S) and in Natural Sciences and Engineering (NSE).

The data analyzed in this study show that the USA performs better than the European Union and that among the European Union countries there are important differences.

We find that European Union institutions should increase their support to university research.

Regarding the particular problems of Spain, we find that besides the low level of national expenditure on RD in Universities, there are problems of unequal distribution among regions, particularly in the less financed scientific fields like some subjects of Social Sciences (including the Economy).

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Annex (provisional, to be updated on September of 2017)

RD Expenditure per capita in Euros, year 2014	All sectors	Higher Education
European Union (28)	564,4	132,0
Euro area (19 countries)	643,1	142,5
Belgium	881,3	178,2
Bulgaria	46,9	4,1
Czech Republic	294	74,7
Denmark	1398,4	496,7
Germany	1045,6	184,9
Estonia	217,9	96,5
Ireland	634,3	148,6
Greece	136,2	50,6
Spain	275,6	77,5
France	727,3	150
Croatia	80	20,6
Italy	366,7	104,1
Cyprus	98	50,9
Latvia	81,3	33
Lithuania	128	66,7
Luxembourg	1145,8	188,1
Hungary	144,7	19,5
Malta	142,3	49,5
Netherlands	788,4	253,3
Austria	1187,2	288,7
Poland	101,6	29,6
Portugal	214,1	97,6
Romania	28,8	4,4
Slovenia	431,9	45,2
Slovakia	123,6	42,6
Finland	1194,6	273,2
Sweden	1411,3	408,9
United Kingdom	589,9	152,1
Iceland	801	263,1
Norway	1262,3	391,8
Switzerland	1930,6	572,4
Montenegro	20,2	7,6
Serbia	35,9	16,5
Turkey	79	32

Bosnia and Herzegovina	9,3	2,5
Russia	115,8	11,3
United States	1087,3	153,9
Japan	979,6	123,2
South Korea	904	81,8

Source: Eurostat(2017)