POLITICAL PROCESSES AND REGIONAL R&D POLICIES*

Laura Cruz Castro and Luis Sanz Menéndez**

This article describes, from a comparative perspective, the science and technology policies adopted by regional governments in five Spanish regions between the mid-eighties and the turn of the century. Drawing upon the five case studies, it first describes these policies in terms of the academic versus the industrial approach measured by the objectives of budgetary investments, resource appropriation and institutional options. It then goes on to analyse the main explanatory factors to present a series of conclusions regarding the circumstances in which regional governments are able to implement policies with a greater emphasis on one type of approach or another.

Key words: *regional R&D policies, resources, political preferences, model diffusion, interests and institutions.*

Abstract

* This research was funded by the EU Framework R&D Programme, the Madrid PRICIT Plan and specific funding from the Third National R&D Plan for Spain (SEC 1999-0829-C02-01); María Fernández and Marta Romero, co-authors of various preceding articles, Mikel Olazarán and Mónica Moso also participated in the project. Earlier works on the same subject, quoted in the bibliography, were used as material for this article.
** Researchers with the CSIC Unit on Comparative Policy (UPC). Research Group on Policies for Innovation, Technology, Training and Education (SPRITTE) (Madrid).

1. Introduction

In its relationship with science, politics has traditionally been identified with national governments although the emergence of intermediary bodies[1] and new actors and policy makers, such as non-governmental organisations and parliaments,[2] has transformed this area of politics.[3] One of the agents in the new system of multi-level government in the science and technology system[4] is the region or, more specifically, regional governments, and the analysis of the role they play is one of the current challenges facing research into policies for science, technology and innovation.[5]

The role of the regions in R&D policies in federal states like Germany, Austria and Belgium is today very obvious and their importance and that of their R&D strategies policies is also growing in traditionally centralised countries like the United Kingdom and France.[6] It has likewise become one of the core areas for action in European R&D regional development policies.

The autonomous regions (*comunidades autónomas*) in Spain today have an increasingly important and often decisive role to play in the dynamics of the institutions and actors involved in research. For example, the public universities (with two exceptions) have been controlled and overseen by the autonomous regions through the budgetary funding they receive since the mid-nineties; more recently, competence regarding the entire public hospital system, together with all of the research carried out there, was transferred to the autonomous regions; agricultural research centres have been the responsibility of the regional governments since the mid-eighties; and the majority of the autonomous regions have set up R&D policies for science and technology and even regional research and innovation plans and, with their budgetary spending, contribute to funding the equivalent of 60% of the non-fiscal budgets allocated by the Central Government to R&D.

Not much attention has been paid by the bibliography on science and technology policies to the importance of the political game, although some

[1] Braun, 1993.
[2] Cruz-Castro and Sanz-Menéndez, 2004.
[3] Baumgartner and Jones, 1993.
[4] Edler, Kuhlmann and Behrens, 2003.
[5] Larédo, 2003.
[6] Muller, Heraud and Zenker, 2003.

work was carried out in the early eighties[7] and again recently.[8] In Spain, apart from the work of the authors of this article,[9] various attempts have been made to explain the R&D policies of the governments of the Basque Country[10] and Catalonia.[11]

The autonomous regions in Spain today have an increasingly important and often decisive role to play in the dynamics of the institutions and actors involved in research.

This article deals with science, technology and innovation policies that have been adopted by different regional governments and the endeavour is made to explain the factors that have determined these, together with their stability and development. The validity of different hypotheses is tested and checked using the comparative method. An analytical structure is developed that explains why regional governments, when confronted with similar challenges, have often chosen very different policies. This study fits into the context of more general issues concerning research, including: Why, and in what circumstances, does regional government intervention in R&D take place? What form does this take? What are the most influential factors regarding the form of this policy or the options that are definitively adopted? and Why are policies changed? Five regions were selected for the study, each of them having begun R&D policies during the eighties that have since become consolidated and institutionalised: Andalusia, Catalonia, Galicia, Madrid and the Basque Country. These regions have been governed by different political parties and their economic structures, general characteristics and size show a certain degree of diversity; these five regions, on the other hand, concentrate almost 80% of all R&D activities in Spain.

Science and technology policy is essentially a policy whereby the government allocates budgetary resources, a policy that quite expectedly gives rise to a political game of distribution,[12] the system being one for distributing public resources, between the actors in the R&D system and innovation that, while seeking to attain certain general objectives, is in fact of direct benefit to these actors.

Our analysis here characterises the science and technology policy of regional governments (the dependent variable) based on the approach of who it is aimed at and who directly benefits from it. Policy more or less corresponds to two basic models, which often combine together although always with a predominance of one or another: the academic model, the aim of which is to promote academic research, with the main beneficiaries being the universities and public research centres, and the entrepreneurial model, which gives greater importance to applied research and the process of technological innovation in private industry. While both models seek to increase and

[7] Gummett, 1980; Dickson, 1984-1988.
[8] Guston, 1999.
[9] For regional R&D policies for Andalusia, see Romero, Cruz Castro and Sanz Menéndez, 2003; for Catalonia, Cruz Castro, Fernández and Sanz Menéndez, 2003; for Galicia, Fernández, Sanz Menéndez and Cruz Castro, 2003, and for Madrid, Sanz Menéndez, Cruz Castro and Romero, 2001.
[10] Moso, 2000; Moso and Olazarán, 2001; Cooke, Gómez-Uranga and Etxebarría, 1997.
[11] Vilalta, 2000.
[12] Lowi, 1972.

stimulate the production of new knowledge and capabilities, in one model there is financing of academic activities with no direct connection with results in the short term, whereas in the other, encouragement is given to private investment and increasing the technological standards of private industry, with public research being linked with the transfer of results to the private sector. Answering Lasswell's well-known question[13] is, in the opinion of the authors, the first necessary step in characterising these policies and the political game that goes on around them.

The distinction between different regional policies,[14] on the basis of the two proposed models, was undertaken empirically using the following indicators: 1) the volume of the regional government's budgetary appropriation for funding academic research and industrial research; 2) the nature and beneficiaries of the actions (such as laws, plans, programmes, etc.); 3) policy for the regional government itself to set up centres and infrastructures according to linkage and type of activity; 4) the institutional organisation designed to either separate or integrate the different government departments with interests in science and technology policy, as well to channel access by different groups (researchers, research organisations and enterprises) to this policy.

There is an abundant bibliography that has sought to explain why governments choose one policy or another; generally speaking, and for the purposes of the analysis covered by this article, the following have been considered as explanatory factors (independent variables): the regional government's political preferences, existing ideas and models of R&D policy used and upheld by the various actors, the interests in relation to this policy and institutional design and definition.[15] The importance and composition of the scientific and technical potential concentrated in the region as a conditioning structure has also been considered. The explanation adopted in this article, however, gives politics and the political game a central role in this process.[16]

2. Models of science and technology policy

Activities of scientific research and technological development, as well as policies for science, technology and innovation are shared competences within the Spanish regulatory context. The Central Administration retains the functions of promotion and general co-ordination of scientific and technical research[17] while the autonomous regions can develop and promote R&D in their respective territories;[18] the statutes of regional autonomy clarified these principles and opened the door to regional governments initiating R&D policies.

The state science and technology policy became institutionalised on approval of the so-called Science Act (*Ley de la Ciencia*).[19] The autonomous regions have the capability to intervene although, in contrast with the cases of agricultural research

[13] Who gets what, when and how?, LASSWELL, 1936.
[14] For a summarised description of the methodological characteristics, see CRUZ CASTRO, SANZ MENÉNDEZ and ROMERO, 2004.
[15] This model has been applied elsewhere (SANZ MENÉNDEZ, 1997) to explaining the institutional building of the Spanish science and technology policy.
[16] HALL, 1986; MARCH and OLSEN, 1984; STEINMO, THELEN and LONGSTRETH, 1992.
[17] Article 149.1.15 of the Spanish Constitution.
[18] Article 148.1.17 of the Spanish Constitution.
[19] Law 13/1986 of 14 April on the promotion and general co-ordination of scientific and technical research.

and the universities, there was no transfer of competences and butgets in R&D policy; the decision to set this policy in motion and how to implement it was therefore left to the regional governments themselves, according to their preferences and available financial resources. Regional governments allocating budget funds to promote R&D activities passed specific laws and created frameworks for science and technology policy, but the peculiar thing, concerning the models for science and technology policy that they adopted, is that, faced as all these governments were with similar challenges (Spanish under-development with regard to R&D capabilities compared to other EU countries), they chose quite different models for action.

This section distinguishes the approach of science and technology policies adopted by the regional governments according to the two defined models. Regional plans for R&D and, more recently, for innovation are the instruments used to define the policies. In some cases, these plans were similar in rhetoric and structure to the national R&D plans, especially with regard to the recent emphasis on technological development, innovation and the transfer of results from the public to the private sector.

Policies have evolved beyond the mere modification of discourse since the fifteen year period between 1985-2001 although, in spite of changes in Andalusia, Madrid and Catalonia, the realities of regional policies continue to be more aligned with the academic model. Science and technology policies in Andalusia fit the academic model although emphasis was put on launching measures to promote technological change, innovation and encourage collaboration between public R&D centres and private industry in the nineties. Research policies of the Government of the Madrid region have also undergone a profound change as far as political discourse is concerned since the mid-nineties but, even so, the priorities of policy are still oriented toward the academic sector. The preferences of the Catalan Government (*Generalitat*) were originally more in line with the industrial and private enterprise model but in fact, over the last two decades, the policy model has been more academic in approach than entrepreneurial. In Galicia, science and technology policy was transformed in the mid-nineties from what was an exclusively academic model to one that takes great account of the private industry sector. The policy of the Basque government has always been more heavily orientated towards industry although important endeavours were made to create university R&D capabilities, and the focal point has shifted from the supply and transfer of technology (a technology centres-based model) to technological demand.

The volume of budget appropriations allocated by the regional governments to R&D is a reflection of political priority. The first dimension considered as an essential characteristic of the models is the volume of budgetary allocation set aside for actions orientated towards financing academic research or alternatively for promoting R&D and industrial innovation. In this respect, the clearest example of an academic regional policy is that of Andalusia. Although not representing a significant part of the Andalusian budget, the funds explicitly set aside for the innovation and technology policy[20] by pu-

[20] 260 million pesetas were set aside for the technological innovation development programme included in the Economic Development Plan for Andalusia (PADE) (1987-1990), whereas the PAI budget for 1990-1993 was 18,000 million. The PAI budget for 1996-1999 was 34,404 million pesetas; in the first Industrial Programme for Andalusia (PIA) (1994-1997), 12,370 million pesetas were set aside for the technological modernisation policy, or 13% of the total.

blic funding allocated to the Research Plan for Andalusia (*Plan Andaluz de Investigación*, PAI) increased threefold throughout this period; moreover, this amount generally formed part of funds set aside for technological modernisation in private industry so its classification under the label of R&D does raise some doubts.

The distribution of resources in Madrid and Catalonia also reveals the academic nature of the respective policies. In the regional R&D plans for Madrid, research into new technologies and R&D projects in private industry accounted for 11% of all resources during the nineties[21] and, more recently, technology innovation policies still only account for 32% of budget appropriations allocated to the R&D policy, as compared to 60% that goes to academic research (mainly public), research policy and human resources policy.[22] The situation is very similar in Catalonia where actions financed for the purposes of industrial innovation in the mid-nineties accounted for approximately 8% of funding in the First Research Plan.[23]

The orientation of R&D policy in Galicia was academic from the mid-eighties into the nineties although by the end of the decade the distribution of resources was somewhat more balanced: 63% and 37% respectively for academic research and the private industry approach[24] and, in recent years, policy has evolved into a model that is more favourable to the latter, where the promoting of basic research only accounts for 36% of the financial resources in the latest regional Plan for research and innovation.[25]

Two lines of action distinguish the private industry approach of R&D policy in the Basque Country: the financing of private technology centres and the promotion of R&D activities in private industry, although mention should also be made of the endeavours to provide support for research capabilities to be set up in the universities, which was perhaps less important in policy terms. Up until the mid-nineties, the research policy accounted for 0.7% of the Basque Department of Education's budget whereas the technology policy accounted for 16% of the Department of Industry's budget;[26] through the use of other indicators, it can be seen that research policy accounted for 0.2% of the total regional budget compared to 1% accounted for by the technological policy.[27] This means that,

[21] The new technologies research programme received funding to the value of 550 of the 7,115 million in the first Regional Research Plan for Madrid (1990-1993). Out of the 8,028 million allocated in the second Plan (1994-1997), only 900 were set aside for research projects in private industry.
[22] Percentage figures refer to the Third Regional Plan for Scientific Research and Technological Innovation (PRICIT) for the Madrid region (2000-2003), which had a budget ceiling of 38,985 million pesetas.
[23] Spending in the First Research Plan (1993-1996) for Catalonia came to 13,677 million pesetas, 7,112 of which were set aside for grants in Catalonia and 1,060 for grants for study abroad, 3,233 for improvements to infrastructure in universities and public R&D centres, and 2,272 for recruiting auxiliary staff and PhD holders in research groups. Funding through CIRIT-CIDEM awards during the same period for both graduate placement and the development of innovation projects in private industry totalled 921 million pesetas.
[24] In Galicia, the implemented budget of the First Research and Technology Development Plan for Galicia (1999-2001) was 6,066 million pesetas during the first year, 63% of which was accounted for by general programmes and 37% for technological programmes. 39.5% went to private industry research, 33% to basic research and 27.5% to applied research. In the second year, the implemented budget was 6,974 million, with the same distribution between the programmes. In terms of grants, R&D projects at public centres and universities still accounted for 36.4% (1,460 million). Funds for scholarships and training increased from 17.7% to 19.7% of funding; the most outstanding aspect however was the increase in grants for private industry projects, which came to 1,087 million in that year and accounted for 27.1% of total funding, compared to 24.9% in the previous year.
[25] Anticipated available funding for 2002 in the Second Research, Technology Development and Innovation Plan for Galicia (2002-2005) was 48 million euros, 24% of which was set aside for the general promotion of knowledge, 48% for sector programmes and 12% for strategic actions; the remaining 12% were earmarked for horizontal actions (especially human resources).
[26] Moso, 2000, p. 336.
[27] Moso, 2000, p. 406.

over the years and in the Basque Government's budget, funds allocated to technological policies have been approximately three to four times higher than those assigned to science policy (doctoral awards, research projects and equipment). The Basque Science and Technology Plan (1997-2000) allocated 17% of funding to basic research and 83% to technology programmes.[28]

One of the mainstays of the industrial model in the Basque Country has been financial support for and also the promoting of private technology centres, the objective being to create a structure for production and the transfer of technology and consolidate the technological capabilities that serve private industry. In terms of the funding of these centres (between 30% and 50% of which came from the regional government), it was assumed that half of the activities of the technology centres would have to be directed at acquiring strategic technological capabilities to provide support for local small and medium-sized enterprises (SMEs).[29] This clearly contrasts with what occurred in the three cases where the academic model has predominated; in these cases, the setting up and financing of research and technology centres has been linked to the public universities or the activities of other regional government departments, such as agriculture and industry. This dimension of policy has been more active in Catalonia than in Andalusia or Madrid. The majority of centres set up and promoted as part of the regional R&D policies in Catalonia have been integrated into one public university or another. In Andalusia, in addition to new R&D centres being set up through agreements with the universities,[30] competence regarding agricultural R&D centres that had previously been under the auspices of the State Government was transferred to the regional government.

In spite of the academic orientation of the regional research policies in Andalusia, Madrid and Catalonia, there were also actions, in each of these three autonomous regions and parallel to scientific policy actions, to promote technological development and innovation, generally as part of another policy domain; even so, neither the budget appropriations received by these actions nor the level of political priority were any way comparable. These technology policy actions fitted into the context of either industrial policy measures, regional development or regional economic policy. This organisation is important for comprehending the separation of domains and also for understanding that, in situations of economic crisis, technological development and industrial innovation can lose ground to issues like underemployment and industrial rationalisation.

The governmental Departments of Education in Andalusia, Madrid and the Basque Country had control over science policy, whereas measures concerning technology and innovation were promoted by the Department of Industry or the Department of Economy. This was also the case with Catalonia during the fifteen year period studied,[31] even though in the early eighties both areas

[28] Moso, 2000, p. 489.
[29] Test and service laboratories in different industrial centre and training institute environments were used to set up so-called *tutelary technology centres*. The legal framework was laid down in Decree 92/1986 of 26 April on procedure for tutelary entities of technological research, formulated jointly by the Departments of Education and Industry (Moso, 2000; p. 233).
[30] The Regional Government of Andalusia (Junta) signed agreements with the Andalusian universities to set up institutes and R&D centres in the following areas, amongst others: environment, scientific documentation and elemental particles (University of Granada), fine chemistry and animal health (University of Cordoba) and metrology (University of Seville).
[31] At least until April 2000, when the Ministry for Universities, Research and the Information Society was established.

were being «co-ordinated» by an interministerial organisation. The Government of Galicia was the only case of institutional and administrative integration, where, following an initial separation, one sole institution was set up (Secretariat General for R&D)[32] under the Department of the Presidency of the Regional government to develop R&D policy; this institutional change was highly important in the process of implementing a regional R&D policy orientated more towards private industry.[33]

3. Why are regional R&D policies different?

This section analyses the sequence of factors that are perhaps decisive for explaining policy orientation, together with their relative influence, and ends with a series of conclusions concerning the circumstances according to which regional governments may apply one type of policy or another.

3.1. Socio-economic factors

Regional socio-economic conditions, the relative level of development and, above all, the influence of the different actors in R&D in the region are the key factors in explaining the orientation of regional government science and technology policies. A comparison of the five case studies shows that being able to predict the structural factors is not sufficient for being able to predict policy orientation, and so other circumstances must be taken into account. Table 1 shows this diversity of socio-economic contexts. In terms of the relative wealth of these regions, per capita income in Catalonia, Madrid and the Basque Country (20% above the average in all three regions) in the mid-eighties was clearly higher than in Andalusia and Galicia, where it was around 75% of the Spanish average.

In terms of productive specialisation, the Basque Country and Catalonia had more than one third of their GDP from industrial sectors, compared to 20% in the case of Andalusia and Galicia; industry in Andalusia and Galicia was also more traditionally based than in Catalonia, Madrid and the Basque Country.

In the same period, as can be seen from table 2 and 3, the disequilibrium in research efforts in private industry was significant; the scarcity of industrial actors in the game of R&D policy, in the cases of Andalusia and Galicia, was a very important factor in the prominence of public actors at the outset, although it was not determinant in every case in influencing the ultimate orientation of policies. Galicia and Andalusia formed part of the scientific and technological periphery; in relative terms, the share of university spending of total regional spending on R&D was higher than the average for Spain as a whole and accounted for 34.6% and 36.7% respectively, whereas private industry accounted for 35.4% and 30.5% respectively. The influence of private industry in scientific and technological activities was therefore not significant in either Andalusia or Galicia. The corresponding values for the Basque Country and Catalonia were 83.5% and 72.4%. For Spain as a whole, the equivalent figures were

[32] This was true up until the beginning of 2003, when the Research, Technology Development and Innovation Plan for Galicia was transferred to the Department of Innovation, Industry and Trade.
[33] The Department of Innovation, Science and Enterprise was recently established, following the 2004 elections in Andalusia.

Table 1
Socio-economic indicators of five autonomous regions and Spain as a whole (average values 1987-1989)

	Andalusia	Catalonia	Galicia	Madrid	Basque Country	Spain
Population	6,936,110	6,067,727	2,880,314	4,905,655	2,152,024	39,161,906
% total population of Spain	17.7	15.5	7.4	12.5	5.5	100.0
GDP (million pesetas)	4,798,061	6,605,768	2,038,334	5,497,909	2,372,506	35,889,650
% total GDP of Spain	13.4	18.4	5.7	15.3	6.6	100.0
GDP per capita (thousand pesetas)	692	1,089	708	1,121	1,102	916
GDP per capita of the average for Spain (100)	75.5	118.8	77.2	122.3	120.3	100.0
Industrial value added (million pesetas)	876,094	2,243,148	416,268	1,176,080	942,290	8,947,920
% total industria value added for Spain	9.8	25.1	4.7	13.1	10.5	100.0
Industrial value added as a % of the regional GDP	18.3	34.0	20.4	21.4	39.7	24.9

Source: the authors, using different INE sources.

Table 2
R&D spending by sectors in five autonomous regions and Spain as a whole (averages 1987-1989)

	Andalusia	Catalonia	Galicia	Madrid	Basque Country	Spain
Total (in euros)	132,060	319,197	36,001	740,315	146,633	1,717,937
% total for Spain	7.7	18.6	2.1	43.1	8.5	100
Business entreprise	46,735	231,011	10,981	415,764	122,458	964,083
% total for Spain	4.8	24.0	1.1	43.1	12.7	100
Government	39,657	34,472	11,784	249,316	4.329	404,702
% total for Spain	9.8	8.5	2.9	61.6	1.1	100
Universities	45,663	50,948	13,201	71,965	19,725	337,174
% total for Spain	13.5	15.1	3.9	21.3	5.9	100
Expenditure on R&D as % of GDP	0.40	0.70	0.26	1.96	0.92	0.70

Source: R&D activities statistics, INE.

19.6% for university spending and 56.1% for private industry.

Resource appropriation and structural factors do not appear to directly explain the effective orientation of policies although they may account for the initial orientation of the political preferences of the governing parties in each autonomous region in the mid-eighties. Other elements therefore need to be introduced to explain continuity and change, the attempts of transformation and policy trends.

3.2. Political preferences, and the diffusion of models and ideas

Various authors have associated the forming of political preferences with the ideological course followed by the governing parties. In the case of science and technology policies, left-wing parties

Table 3
Distribution of R&D spending by sectors in five autonomous regions and Spain as a whole (averages 1987-1989) (as % of the total for each autonomous region)

	Andalusia	Catalonia	Galicia	Madrid	Basque Country	Spain
Business entreprise	35.4	72.4	30.5	56.2	83.5	56.1
Government	30.0	10.8	32.7	33.7	3.0	23.6
Universities	34.6	16.0	36.7	9.7	13.5	19.6

Source: R&D activities statistics, INE.

would thus be expected to orientate policy towards the public sector whereas conservative right-wing parties would orientate them towards private industry. From the examination of the cases set forth here, the ideological course followed by the governing parties would not appear to explain political preferences in this respect.[34] In Andalusia and, during the first few years, in Madrid, Socialist governments chose academically orientated policies; likewise, the minority Government of the Partido Popular (PP) in Galicia also decided on an academic orientation during the first few years. In the case of the Basque Country and Catalonia, with the conservative governments of the Partido Nacionalista Vasco (PNV-EAJ) and Convergència i Unió (CiU) respectively, the initial preferences tended towards the private industry approach, although this was soon changed in Catalonia.

Having ruled out the ideological orientation of the governing parties as a sole factor for explaining policy, the remainder of this section goes on to examine other elements: problem definition; imitation and inspiration, and models and experience in other places; and the professional career and experience of the policy makers who, behind the politicians, take on the responsibility of defining and carrying out policy.

3.2.1. Defining the problems

Defining what the problem is[35] in science and technology policies, as in other public policies, and finding the way to introduce this into the political agenda[36] are important; moreover, policy domains exist in which inertia or a certain course of development can be predicted.[37] In the cases under study in this article, the problems associated with R&D were numerous, and the way that each government codified and selected them on the basis of higher or lower priority or incorporated them into the agenda had an influence on the result.

In Galicia, in the initial period of the policy and with the conservative Partido Popular (PP) in power, the problem was the non-existence of a true research system in the region and so setting one up became the priority objective. This policy coincided moreover with the university development strategy, which culminated in the setting up of two new universities (La Coruña and Vigo) in 1989.

[34] For details of the governing parties and coalitions, see Cruz Castro, Sanz Menéndez and Romero, 2004.
[35] Schön and Rein, 1994.
[36] Kingdon, 1984-1995.
[37] Weir, 1992.

In Andalusia, the strategy for intervention as regards science policy was also associated with the expansion of higher education that was also being used as a support to deal with unemployment, which was the main problem in the region.[38] The fact that state finance for R&D was seen to be insufficient in Andalusia, as well as and particularly so in Madrid and Catalonia, all three autonomous regions having a certain degree of concentration of research centres and universities, the idea began to take shape of the involvement of the regional government in additional funding for R&D as a solution. In the cases of Andalusia and Madrid, research policy was based fundamentally on three ideas: one, that the context and driving force behind scientific research was academic and public; two, that the scientists had to play a fundamental role in research policy; and three, that regional policies had to complement (and not compete with or replace) the actions of the State.

In contrast, the ideas of the Basque R&D policy were related to an underlying model based on the role of research in the innovation process and, in practice, to the development of private industry-based measures, either through demand or supply policies.[39]

3.2.2. The diffusion of policies

The passing of the Science Act[40] in 1986 and the launching of the First National R&D Plan in 1988 served as a point of reference for the regional governments, with their incipient science and technology policies. In various of the regional policies, as in the cases of Andalusia and Madrid, the source of «inspiration» for the models adopted would appear to consist very directly of the National R&D Plan and the central Government's policy, where the same political party (PSOE) was also governing; a very fast convergence with the ideas proposed in the National R&D Plan also took place in the Galician government in the period from 1987-1989, with a tripartite government that included the PSOE.

Regional research measures and plans in Andalusia, Madrid and Galicia were originally complementary and even subsidiary or subordinate to the State government's policy. The same left-wing party in power in Andalusia and Madrid was also the governing party in the central Government up until the mid-nineties. The fact that the model for science and technology policy being backed by the central Government[41] had an academic orientation therefore served as reinforcement to this same approach being applied to the policies in Andalusia and Madrid.[42]

Unlike the three preceding cases, the emergence of research policies in both Catalonia and the Basque Country corresponded more to the political option of these regions building their own framework of competence, which included research and development activities. In these two cases, investment in research policies of an academic nature, which was much higher in the case of Catalonia than in the Basque Country, com-

[38] This is when the universities of Almeria, Jaén, Huelva and the second university in Seville (Pablo de Olavide) were established.
[39] Moso and Olazarán, 2001.
[40] See note 19.
[41] Sanz Menéndez, 1997.
[42] Party influence can perhaps be seen more clearly by associating the ideological position of the regional government with the presence or not of the same party in power in the state Government, given that model imitation is greater when the same party is in power in the state Government; this occurred in Andalusia and Madrid in the mid-eighties with the Socialists (PSOE) and in Galicia and Madrid with the Conservative *Partido Popular* from 1996 onwards.

plied with the desire to not replicate the actions and programmes in the national Plan. The accent was put above all on the training of human capital and of making their own research groups more competitive in Spanish and European programmes, as to developing more traditional measures like project funding.

In the Basque Country, the Department of Industry played the decisive role of building the R&D policy, with the accent on technological aspects. A model for action soon emerged –in the incipient technology centres– for industrial organisation that brings to mind the actions of the Fraunhofer Gemeindschaft (FhG) in Germany, where applied research was combined with development activities and services contracted with industry, the purpose being to set up an appropriate production structure to supply technology for the needs of the industrial environment.[43]

If this process of diffusion and imitation was determinant in orientating policy, one could predict there would be academically orientated policies in regions that were more keen on imitating the national R&D Plan, with different policies in those that had consciously avoided doing so. This relationship is more or less clear in the cases of Andalusia, Madrid and the Basque Country although not so much in the case of Catalonia; the case of Galicia, however, is an anomaly, even though the shift by the Galician government to a private industry-based policy in 1997 did take place at a time when a change in course was occurring in the central Government's science and technology policy, with the reinforcement of measures being aimed at private industry.[44]

3.2.3. The previous experience of the decision-makers

The «assimilation of ideas» may be highly conditioned by who is providing the ideas and models and who is learning them;[45] it is normally considered that weak bureaucracies –as is the case with the regional administrations in these fields– tend to receive more influences from outside, from both individuals taking up positions of responsibility and controlling interests.[46]

In the cases where regional R&D policies have acquired a fundamentally academic point of view, it has been shown that the origins and professional career of those in charge of regional R&D policy have been closely linked to the world of academic research and its organisations.

Amongst the relevant factors for explaining the different approaches to regional policy, one therefore also finds the preferences of those who are politically responsible (ministers and director ge-

[43] Moso and Olazarán, 2001.
[44] Galicia is also an anomaly when it comes to explaining policy orientation with regard to the influence of dominant resources in the region and the (academic) interests of those in charge. Preferences would thus appear to be more important here.
[45] Heclo, 1974; Hall, 1993.
[46] Sabatier, 1988.

nerals) and the prevailing ideas on how research systems work.

In the cases where regional R&D policies have acquired a fundamentally academic approach, it has been shown that the origins and professional career of those in charge of regional R&D policy have been closely linked to the world of academic research and its organisations.[47]

In Andalusia and Madrid, the Ministers of Education who set up the regional research policies in the mid-eighties originated from public research centres or university[48] and saw the problems in the system as being problems associated with the lack of funding.

Senior officials in the Basque Department of Education had predominantly scientific backgrounds and origins that were linked to the university, whereas in the Department of Industry, which had much more influence in defining regional R&D policy, the majority of political posts were filled by officials with an industrial background either in test laboratories or technology centres.[49]

In Catalonia and Galicia, the professional career and background of the decision-makers was also university-based, even though the political preferences of the respective governments and the respective regional policies did on occasions follow an industry-orientated model. Aspects that stand out in this respect are the experience of certain key decision-makers in Catalan politics gained in the central Administration's university policy and the influence of politicians with university associations in the Interministerial Commission for Research and Technological Innovation (CIRIT) during the eighties and even more so during the nineties, during which time the Commission came under the Department of Education.[50] In Galicia, both of the Directors-General of Universities in the first period of regional policy and the Secretary general for R&D in the second period had a university background.[51]

Although this factor may reasonably explain the cases of Madrid, Andalusia and the Basque Country, it is not so important for explaining the cases of Catalonia and Galicia and, as a result, there is no general correspondence, as far as the fives cases being analysed here is concerned, between the background and professional career of policy decision-makers and their preferences regarding a desirable orientation for regional R&D policies. Its influence therefore needs to be understood in combination with other factors.

[47] Although there is a significant difference between those with a career in the traditional faculties and those from schools of engineering.
[48] The second Minister for Education in the Madrid region, Jaime Lissavesky, was appointed in 1985 and held the post until 1995. Prior to his appointment, he was a researcher with the CSIC and based at the University of Alcalá de Henares and the Universitat Complutense in Madrid. He succeeded another member of the PP Government, Gustavo Villapalos, who had been Rector of the Universidad Complutense. Likewise, when the First Research Plan for Andalusia began to be administered, the Minister for Education was Antonio Pascual, who had been the Dean in the Faculty of Mathematics at the University of Granada; his entire team, on the other hand, had a university background.
[49] Moso, 2000, p. 257.
[50] Gabriel Ferraté, vice-president of the CIRIT until 1988, was Rector of the Technical University of Catalonia (UPC) from 1972 to 1976 and 1988 to 1994 and subsequently of the Catalan Open University (UOC). Josep Laporte, Minister of Education and president of the CIRIT between 1988 and 1992, and Commissioner for Universities and Research between 1992 and 1995 had previously been Rector of the Autonomous University of Barcelona (UAB).
[51] Luis Castedo, Director General for Universities and Science Policy from 1987 to 1989, was Professor and had also been Dean of the Faculty of Chemistry in Santiago. José Manuel Touriñán, head of the Directorate General for Universities and Research until 1997, had also come from academic background. Miguel Angel Ríos, Secretary-General for Research and Development from 1997 onwards, was a theoretical chemist at the University of Santiago.

3.3. Institutional design and the role of interests in the political game

Various authors in the bibliography on the subject have shown that the organisation of government and public administration, and how the relationship with the actors is institutionalised, are also important elements for understanding the pressures on the government.[52]

3.3.1. Interministerial co-ordination

The background and professional careers of senior officials in the Departments of Education in certain autonomous regions had a significant impact on how problems were delimited and particularly on the institutional mechanisms and instruments for intervention that were chosen in this field. Interministerial co-ordination occurs in almost all regional governments. Prior experience of the regional decision-makers in national R&D policy and, from 1986 onwards, the regular exchanges and dialogue between national and regional decision-makers[53] facilitated their adopting organisational models similar to national structures (to facilitate co-operation), where an essential role was played by the co-ordinating (decision-making, planning, etc.)[54] and advisory bodies.

Despite the existence of these co-ordinating bodies in all of the autonomous regions as well, in actual fact there was a considerable degree of institutional division and even isolation between the scientific and technological areas of these policies, which in the majority of cases had different bureaucracies and clients and in overall terms were characterised by the level of influence in «R&D policy» of one government department or another. The degree of institutional division or integration of the two main areas of the regional R&D policies was not directly related with one course of policy or another. In Madrid, Andalusia and Catalonia, science and technology policies were separate and in all three cases there was an academic orientation; they were also separate in the Basque Country, however, where the orientation of regional policies was industrial. Institutional integration in Galicia between 1997 and 2003 appears to have allowed the implementation of increasingly private-industry oriented policies, in accordance with the political preferences of the Government; on the other hand, attempts to manage the Research Plan for Andalusia by the Department of Industry between 1994 and 1996 were thwarted. Despite integrated co-ordination and the initial political preferences expressed by the Catalan Government, the policy that was actually carried out in Catalonia during the eighties was academically orientated. One thing that can be

[52] SKOCPOL and FINEGOLD, 1982.
[53] The institutional framework for the diffusion and exchange of practices as regards R&D policy was the *Consejo General de Ciencia y Tecnología* set up under the Science Act (Law 13/1986 of 14 April on the fostering and general co-ordination of scientific and technical research), which was made up of representatives of the State and autonomous regional governments. It is worth pointing out that the representatives of the autonomous regions in this body were usually the ministers of Education, with the sole exception of the Basque Government, which was represented by the representatives of the Ministry of Industry in charge of its technology policy.
[54] The Interministerial Commission for Science and Technology, which came under the Department of Education, had already been set up in Madrid in 1986. In Andalusia, the Interministerial Commission for Science and Technology came under the Ministry of Education and Science. In Galicia, the Interministerial Commission for Science and Technology (CICETGA) was set up by the Department of Education. In Catalonia, where at the beginning of the eighties an interministerial institution linked to the Department of the Presidency of the Catalan Government (CIRIT) had been set up –similar to the former Advisory Commission for Scientific and Technical Research (CAICYT)–, a new institutional design was decided on at the end of the eighties similar to the aforementioned ones, where the CIRIT became incorporated into the Department of Education, together with the chairmanship. In the Basque Country, a co-ordinating institution for the different areas of R&D policy, the Basque Science and Technology Council, was only set up at the end of the nineties.

demonstrated, on the basis of comparison, is that institutional division between the two areas strengthened the dominant interests in regional policy, irrespective of whether these were academic or industrial.

In Madrid, the decreasing influence of the research institutions in the region in terms of national R&D funding from the nineties onwards precipitated political activity by academic interests in the universities and public research centres, which were highly concentrated in the region, directed at the regional Administration.

3.3.2. The role of interests and budgetary trends

The absence of alternative sources of funding (in the public budget) for the research activities of certain (fundamentally public) R&D actors creates a context of higher «pressure». The degree of dependence on public resources by actors in the R&D system is very diverse, which is partly the result of the different way in which the actors directly benefiting from these policies are mobilised. The analysis of this dependency nevertheless needs to take into account the relative presence of each type of actor in each autonomous region, as seen under the first heading of this section. In the Basque Country, industrial interests, through institutional interlocutors, constituted the CAIDT and, as a result of the mobilisation of various technology agents and, above all, the priority of industrial policy, science policy was relegated right from the outset to a position of less importance in the Basque political agenda.

In Madrid, on the other hand, the decreasing influence of the research institutions in Madrid in terms of national R&D funding from the nineties onwards precipitated political activity by academic interests in the universities and public research centres, which were highly concentrated in the region, directed at the regional Administration.

Likewise, in Catalonia, when competence regarding the public universities was transferred to the Catalan Government in 1985, which then lost the appeal made to the Constitutional High Court (*Tribunal Constitucional*) regarding the transfer of competence in research in 1991, pressure from the universities began to increase on the CIRIT for it to abandon the minimum policy that it had been maintaining up until that time and to contribute to increasing the resources available to Catalan researchers. Universities and public research centres in Andalusia also developed regional fundraising strategies for research.

The substantive content of research policies promotes the involvement of the actors in the workings and legitimating of these policies, as a result of which they form a substratum that is prone to the formation of policy communities[55] where interests and interest groups play an important role.[56] Andalusia and the Basque Country are the clearest cases of how, during the eighties, policy communities formed and where, in one case, academic interests and, in the other, industrial interests were

[55] RICHARDSON and JORDAN, 1979.
[56] WALKER, 1991.

interlinked with the institutions and in time acquired a leading role and considerable influence in defining and giving form to the regional R&D policy. In both cases, this leading role and greater importance were in line with the preferences and objectives of the respective governments during the eighties. The close links between the Basque national and conservative party (PNV-EAJ) and industrial interests in the region, and the preferences of the governments in Andalusia for an academically orientated model in line with the policies of the central Government, stimulated and assured the consolidation of policies in these autonomous regions, a consolidation that, on the one hand, gave greater stability to policy but on the other subsequently made changes in orientation much more difficult.

The case of Andalusia, and even that of Madrid as well, shows that it is difficult for a change in political preferences towards more industrially-orientated models, as occurred in both regions from the nineties onwards, to be carried out once certain institutional structures have been established and filled for the most part by academic researchers who build up certain expectations concerning regional R&D policies. This process of academic scientists raising expectations concerning the potential role of regional administrations as sources of funding for public research was particularly clear in the cases of Madrid and Catalonia.

In Catalonia, academic interests in addition played a key role which culminated in 1988 in a process of redefinition of preferences and institutional transformation, which saw the transferral of the co-ordinating body for regional R&D policy, the CIRIT, from the Department of the Presidency to that of Education, which thwarted the initial preferences of the conservative CiU governments to carry out a private-industry orientated policy. From that point onwards, the CIRIT became an almost exclusive instrument of the Department of Education, together with the resulting policy model, which was fundamentally academic. A similar process in the behaviour of interests within the context of raising expectations occurred in Madrid as a result of the relatively high concentration of public resources for R&D in this autonomous region, which, together with a relative drop in the participation of this autonomous region in the distribution of state funds, created very high expectations regarding the compensatory role of the regional Administration in this field.

In the Basque Country, the technology centres also became mobilised in the face of political and institutional calls for reductions in public funding by a Minister with an academic background in the Department of Industry who was closely linked to the Socialist PSOE party and not the PNV-EAJ, during the third legislature (1987-1991).[57] The next legislature saw the return of the PNV-EAJ to the Department of Industry and the definitive consolidation of the technology centres, with the signing of a multi-annual agreement (1993-1996) and high level funding, which has been maintained in recent years.

One additional aspect conditioning the possibilities of success in policy reorientation, in the context of action by political interests, was determined by the regional governments' available budgetary resources. Economic recessions (such as the one

[57] The central role of the technology centres in the policy community of regional R&D policy, and their relationship with the Department of Industry that was based on consensus and informal relationships, was replaced in this legislature by a top-down approach as a result of the help from foreign experts and advisers (Moso, 2000, p. 349).

between 1992 and 1996) and political crises (in Andalusia, between 1994 and 1996) in general create contexts in which public spending tends to contract and where R&D spending becomes less of a budgetary priority. In general, a minimum policy was applied to the scientific community in universities and public R&D centres at times like this and, where grants were awarded to private industry, these grants were allocated not to R&D but to restructuring, employment, etc. This is what happened in Catalonia in the eighties, when there were expectations of the transfer (devolution) of competences (and corresponding budgets) that never actually transpired. In Galicia, the growing political priority of R&D on the regional Government (Xunta)'s agenda resulted in a considerable budgetary increase in the area of R&D, which was helpful in making the shift towards a policy model more orientated towards industrial innovation a success, because the changes were not interpreted by the academic community as being a relative loss of resources.

The confrontation between the initial preferences of the Catalan governments for an industrially orientated policy and the heavy pressure from academic interests, in particular the universities, for a policy to be applied that satisfied their needs, would possibly have had another result in a context of increasing budgetary appropriations, a situation which did not occur until the nineties, by which time the political preferences and institutions had become consolidated along the lines of the academic model.

Likewise, in Andalusia and Madrid, the crisis during the mid-nineties helped to thwart the change in orientation of the academically-oriented policy. In Andalusia, the political crisis was one of the factors constricting the success of the institutional change that took place with the transfer of the Research Plan for Andalusia from the Department of Education to the Department of Industry between 1994 and 1996. In the overall context of funds being frozen, the community academic perceived these changes in terms of competition for public resources and the incipient reorientation of policies as one more loss instead of a gain resulting from co-ordination. The sectors linked to industry believed that, in spite of its intentions, a government department involved with employment and faced with an economic crisis should put the emphasis on private industry that was in crisis instead of technology policy. In 1996, the Research Plan for Andalusia was retransferred to the Department of Education and, in budgetary terms, most of the scarce resources continued to be set aside for academic research.

Various parallelisms can be established with the case of Madrid. When the change in government in the Madrid region took place in 1995, the preferences of the governing Partido Popular party were inclined more towards industrial innovation, and the new political leaders began to leave their institutional imprint on the field of education by creating the Directorate General for Research, eliminating the Science Council and replacing it with a Science and Technology Council that, unlike the former one, included representation from private industry. These changes in approach also coincided with a cutback in funding. The institutional design was different although there was no substantive change in the way that interests influenced policy.

The conclusion that one can draw from these experiences is that changes in orientation of R&D policy for the benefit of private industry are difficult in contexts of crises and spending cutbacks. Conditions that make reform possible, on the other hand, are generally associated with an in-

crease in appropriations available for policy, whereby interests that end up making a loss do not identify reforms with being a zero-sum game.

4. Conclusions

Two different models of regional R&D policies are described in this article, each with a dominating academic or industrial approach, and a comparison made of five autonomous regions. In addition, the endeavour has been made to establish the circumstances according to which certain explanatory factors are more influential in determining the type of orientation of these policies compared to others. On the basis of analyses that have been carried out, it has been shown that, while in certain regions like the Basque Country, the domain of industrial interests (and particularly the technology agents) in the R&D system may enable the industrial orientation of regional policy to be predicted, the presence of powerful industrial interests in a region, as in the case of Catalonia, is not a sufficient condition for governments to be able to develop policies dominated by such an orientation, even though these are in line with their preferences; the case of Catalonia shows that, in the presence of powerful academic interests, the orientation of policy cannot be explained merely on the basis of the government's preferences.

It has also been shown that, when the government's preferences are clearly in favour of a reorientation in policy, this can be carried out by way of appropriate institutional agreements that transcend specific government departments, especially in the context of significant budgetary increments, as in the case of Galicia at the end of the nineties. When changes in favour of a more industrial orientation are proposed at times of recession in the economic cycle or cut-backs in these policies, it is much more likely for interests linked to academic research to associate these changes as being a zero-sum game with industrial interests than in a context of overall growth in resources. The cycle of regional public spending on R&D is thus an intervening variable that would suggest an answer to the question of what conditions are necessary for changes in the orientation of policies to be implemented, given the presence of academic interests.

It has also been shown that institutional division in both of these areas strengthens the dominant interests in regional policy, irrespective of whether these are academic or industrial, and that the neutralisation of certain interests deriving from the setting up of politically influential interministerial institutions is possible in a context of increasing resources and more doubtful in times of diminishing resources and cut-backs, as can be seen in the comparison between Catalonia in the eighties and Galicia in the nineties.

It can be stated that it is unlikely that a pro-industrial policy originates from a Department of Education (and Universities). As we have seen, the movement of the scope of such a policy towards «interministerial» structures dependent on the Department of the Presidency, as in Catalonia and Galicia, resulted in a non-exclusive academic orientation.

In general, it can be seen that the more developed the academic system in the region (irrespective of the level of development of the industrial system), the more difficult it is for regional governments to impose the objectives of a research and innovation policy orientated primarily at stimulating economic growth and, therefore, to give priority to an industry-orientated approach. Moreover,

the cases of Madrid, Andalusia and Catalonia show how difficult it is for governments, once institutional structures have been established and then filled by academic researchers, who are a central part central of the policy community, to significantly reorientate their strategies towards industrial interests, despite changes in discourse and a certain shift in preferences in this regard. These cases ultimately show the importance of institutional agreements in distributive policies like R&D policy, and how mobilised interests can apply pressure to check the institutional change and reorientation of policy when it appears that this is a threat to their interests.

Nevertheless, the policies proposed by some regional governments (Andalusia, Catalonia and Madrid) were also slow to develop, with models that either emphasised the funding of academic research or the processes of technological transfer and innovation and developing collaborations with private industry; in the case of Galicia, however, change was quite significant. Governmental preferences have seemingly transformed over the years although the setting in motion of changes was also made difficult not just because of the economic situation and cutbacks in the mid-nineties but also because of the consolidation of different policy communities in this field.

Bibliographical references

BAUMGARTNER, F. R. and B. D. JONES. *Agendas and instability in American politics*. Chicago: University of Chicago Press, 1993.

BRAUN, D. «Who Governs Intermediary Agencies? Principal-Agent Relations in Research Policy-Making». *Journal of Public Policy*, 13 (1993), 2, p. 135-62.

COOKE, P., M. GÓMEZ-URANGA and G. ETXEBARRÍA. «Regional innovation systems: Institutional and organizational dimensions». *Research Policy*, 26 (1997), p. 475-491

CRUZ-CASTRO, L., M. FERNÁNDEZ and L. SANZ-MENÉNDEZ. «La importància dels interessos acadèmics en la política científica i tecnològica catalana». *Papers. Revista de Sociologia*, 70 (2003), p. 75-105.

CRUZ-CASTRO, L., L. SANZ-MENÉNDEZ and M. ROMERO. «Convergencia y divergencia en las políticas de ciencia y tecnología de los gobiernos regionales». *Revista Española de Ciencia Política*, 11 (2004). [in print]

CRUZ-CASTRO, L. and L. SANZ-MENÉNDEZ. «Politics and institutions: European parliamentary technology assessment». *Technological Forecasting and Social Change,* vol. 72 (2005), 4, p. 33-72.

DICKSON, D. *The New Politics of Science*. 2nd ed. Chicago: The University of Chicago Press, 1984-1988.

EDLER, J., S. KUHLMANN and M. BEHRENS (ed.). *Changing governance of research and technology policy. The European Research Area*. Cheltenham (United Kingdom): Edward Elgar, 2003.

FERNÁNDEZ, M., L. SANZ MENÉNDEZ and L. CRUZ-CASTRO. «Diseño institucional y preferencias políticas: O cómo equilibrar los intereses académicos en la política de ciencia, tecnología e innovación gallega». *Inguarak, Revista Vasca de Sociología y Ciencia Política*, 35 (2003), p. 33-68.

GUMMETT, P. *Scientists in Whitehall*. Manchester: Manchester University Press, 1980.

GUSTON, D. *Between Politics and Science*. Cambridge: Cambridge University Press, 1999.

HALL, P. A. *Governing the Economy. The Politics of State Intervention in Britain and France*. Cambridge: Polity Press, 1986.

HALL, P. A. «Policy paradigms, social learning, and the State». *Comparative Politics*, 25 (1993), p. 275-296.

HECLO, H. *Modern Social Politics in Britain and Sweden*. New Haven (Connecticut, USA): Yale University Press, 1974.

KINGDON, J. W. *Agendas, Alternatives and Public Policies*. 2nd ed. Nova York: Harper-Collins, 1984-1995.

LARÉDO, P. «Six major challenges facing public intervention in higher education, science, technology and innovation». Science and Public Policy*, 30 (2003), 1, p. 4-12.*

LASSWELL, H. «Politics. Who gets What, When and How». A: The Political Writings of Harold D. Lasswell*. Glencoe (Illinois, USA): Free Press, 1936, p. 295-461.*

LOWI, T. J. «Four systems of policy, politics and choice». Public Administration*, XXXII (1972), p. 298-310.*

MARCH, J. G. and J. P. OLSEN. «The New Institutionalism: Organizational Factors in Political Life». The American Political Science Review*, 78 (1984), 3, p. 734-749.*

MOSO, M. *Origen y evolución de las políticas científicas y tecnológicas en la Comunidad Autónoma del País Vasco (1980-1998)*. Bilbao: Universidad del País Vasco, 2000. [Doctoral thesis read on 22 December 1999].

MOSO, M. and M. OLAZARÁN. «Actores, ideas e instituciones: políticas tecnológicas regionales y creación de un sistema regional de I+D en la Comunidad Autónoma del País Vasco». A: M. OLAZARÁN and M. GÓMEZ-URANGA (ed.). *Sistemas regionales de innovación*. Bilbao: Servicio editorial de la Universidad del País Vasco, 2001, p. 406-432.

MULLER, E., J.-A. HERAUD and A. ZENKER. «Introducing regions and innovation–related needs in the multi-layer logic of the ERA». A: J. EDLER; S. KUHLMANN and M. BEHRENS (ed.). *Changing governance of research and technology policy. The European Research Area*. Cheltenham (United Kingdom): Edward Elgar, 2003, p. 230-254.

RICHARDSON, J. J. and A. G. JORDAN. *Governing under Pressure. The Policy Process in a Post-Parliamentary Democracy*. Oxford: Martin Robertson, 1979.

ROMERO, M.; L. CRUZ CASTRO and L. SANZ MENÉNDEZ. «Estabilidad y cambio en las políticas andaluzas de ciencia, tecnología e innovación». *Revista Internacional de Sociología,* 35 (2003), p. 7-52.

SABATIER, P. «An Advocacy Coalition Framework of Policy Change and the Role of Policy-Oriented Learning Therein». *Policy Sciences,* 21 (1998), p. 129-168.

SANZ-MENÉNDEZ, L. *Estado, ciencia y tecnología en España: 1939-1997*. Madrid: Alianza Universidad, 1997.

SANZ-MENÉNDEZ, L., L. CRUZ-CASTRO and M. ROMERO. «Recursos, intereses y difusión de modelos para la política regional de I+D: la Comunidad de Madrid». A: M. OLAZARÁN and M. GÓMEZ-URANGA (ed.). *Sistemas regionales de innovación*. Bilbao: Servicio editorial de la Universidad del País Vasco, 2001, p. 375-403.

SCHÖN, D. A. and M. REIN. *Frame reflection. Towards the resolution of intractable policy controversies*. Nova York: Basic Books, 1994.

SKOCPOL, T. and K. FINEGOLD. «State capacity and economic intervention in the early New Deal». *Political Science Quarterly*, 97(1982), 2, p. 255-278.

STEINMO, S.; K. THELEN and F. LONGSTRETH (ed.). *Structuring Politics. Historical Institutionalism in Comparative Analysis*. Cambridge: Cambridge University Press, 1992.

VILALTA, J. M. «Polítiques de Ciència i Tecnologia a Catalunya». A: R. GOMÁ and J. SUBIRATS (ed.). *Govern i polítiques públiques a Catalunya 1980-2000*. Bellaterra: Universitat Autònoma de Barcelona (2000), p. 61-84.

WALKER, J. L. Jr. *Mobilizing interest groups in America*. Ann Arbor: The University of Michigan Press, 1991.

WEIR, M.. «Ideas and the politics of bounded innovation». A: S. STEINMO, K. THELEN and F. LONGSTRETH (ed.). *Structuring Politics. Historical Institutionalism in Comparative Analysis*. Cambridge: Cambridge University Press (1992), p. 188-216.