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## **Public Policies in the Science Field and the “divide et impera” Issue**

### *Abstract*

**RESEARCH OBJECTIVE:** The purpose of this article is to present the main characteristics of the science public policies in France, Italy and Spain and at the same time the article aims at showing that it is need a strong state coordination over the public R&D stakeholders so to increase efficiency.

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**THE RESEARCH PROBLEM AND METHODS:** The presented research problem concerns the effects of the so called multilevel governance on the science public policies in France, Italy and Spain.

The methodology applied consists in the analyses of main pieces of legislation of France, Spain and Italy and the observation of the main consequences on the fundamental G.E.R.D. statistics, combined with the analysis of the reference literature.

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**THE PROCESS OF ARGUMENTATION:** The argumentative process of this paper is so divided: it is given to every state a section of the paper; The analysis of the countries systems starts with France, being France the country with the strongest state control; then Spain and Italy.

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**RESEARCH RESULTS:** Spain presents the most interesting approach to R&D considered the percent of GDP dedicated to R&D and the obtained results; thanks to the important role played by Inter Ministerial Commission on Science and Technology.

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**CONCLUSIONS, INNOVATIONS AND RECOMMENDATIONS:**

State control over science public policies is still very needed in order to define policies priorities. The form of this control changed in the time but it is still present; even if an initial analysis could produce in the reader the sensation that nowadays the French, Italian and Spanish science public policies are without a relevant state control; under a more prudent analysis, it is perceptible how the central government's hand is still strong and powerful. Central governments still use their steering power (Imperium); but this power is now put into use in a less coercive way.

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**KEYWORDS:**

innovation, innovation policies, B+R

**POLITYKI PAŃSTWOWE W DZIEDZINIE NAUKI ORAZ  
ZAGADNIENIE „DIVIDE ET IMPERA”**

*Streszczenie*

**CEL NAUKOWY:** Celem artykułu jest przedstawienie głównych cech polityk państwowych w dziedzinie nauki w trzech państwach: we Francji, Włoszech i Hiszpanii oraz pokazanie, że nadal potrzebna jest silna koordynacja państwowa, aby zwiększyć efektywność polityki badań i rozwoju.

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**PROBLEM I METODY BADAWCZE:** Przedstawiony problem badawczy dotyczy skutków tzw. wielopoziomowego zarządzania, występującego w działaniach trzech wymienionych państw w obszarze nauki.

Metodologia polega na analizach głównych aktów prawnych z Francji, Hiszpanii i Włoch oraz obserwacji statystyk G.E.R.D. w połączeniu z analizą literatury przedmiotu.

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**PROCES WYWODU:** Analiza rozpoczyna się od Francji, gdyż jest ona krajem o najsilniejszej kontroli państwowej, następnie omawiana jest sytuacja w Hiszpanii i we Włoszech.

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**WYNIKI BADAŃ NAUKOWYCH:** Wyniki badań wskazują, że Hiszpania prezentuje najciekawsze podejście do B&R ze względu na procent PKB przeznaczony na tę politykę w stosunku do uzyskanych wyników; istotą rolę w tym procesie odegrała Międzyresortowa Komisja Nauki i Technologii.

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**WNIOSKI, INNOWACJE, REKOMENDACJE:** Kontrola państwa nad polityką publiczną w nauce jest nadal bardzo potrzebna w celu określenia priorytetów tej polityki. Forma kontroli uległa zmianie w czasie, ale wciąż jest obecna.

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**SŁOWA KLUCZOWE:**

innowacja, polityka innowacji, B+R

## INTRODUCTION

The central issue in this paper is to show the importance of government policies and institutional interaction in the field of Public Financing of Science. The European Union and its member states is generally moving towards a multilevel governance; however, this tendency in regard to science public financing should be partially moderated.

The mentioned multilevel governance determines that nowadays a devolution process is frequent in the science public funding field and that this devolution is not a homogeneous process. For this reason in this paper I will argue that an effective national coordination aiming to rule over this decentralisation is “a *condicio sine qua non*,” otherwise an inefficient fragmentation of policies can arise.

Moreover I will argue that the relation between the centralised (state) and the decentrilised (regions) policies of public science funding can be expressed in the Latin phrase “*divide et impera*.”

The process of weakening state’s direct control of the science activities (“*divide*”) needs to be followed by a stronger coordination (“*et impera*”); so to control the this activities by other means and so to avoid the effects of an uncontrolled vacuum of state authority

To make the abovementioned more transparent, it is possible to use the following:

Historically, science policies were a direct emanation of governments’ decisions. The state directly crafted policies which had to implement an efficacious methodology for financing science; for example the nuclear projects or the concorde project were a direct expression of specific policies of the French governments (Laredo, 2001).

This demonstrates what the general theory of law defines as the “state supreme power” (Kelsen, 1991) or “state imperium.” The state used its unconditioned power (imperium) to determine the most proficuous decisions in the science field. Currently, states tend less to directly

exercising this sort of supreme decisional power and leave more “self-determination” to the science stakeholders. An uncontrolled autonomy poses a concrete threat: for example a proliferation of similar projects which subsequently would risk being under financed (in such a case I would use the aforementioned Latin word “*divide*”).

The state may find a remedy to this perilous proliferation through the implementation of its “coercive power;” i.e. state’s authority determines policies for funding science in a more subtle way. For this reason the phrase “*divide et impera*” is still a valid description of mentioned state’s coercive power. The state cedes power of choice to individual institutional actors; at the same time, the coercive power allows the state to balance the proliferation and to preserve its authority over the science field.

This paper will focus on the analysis of French, Spanish and Italian experiences in public funding of science. These three countries present some elements in common; they have a resembling legal system, similar languages and very connected histories and economies, but at the same time they have their own peculiarities and differences.

The article is composed by an introduction to the legal definition, in the EU, of multi-level government and subsidiarity; it will analyse at first France, being France the state characterized by the strongest centralistic power, then the analysis will pass to the Spanish case because even if historically the country was characterized by a high level of centralization, nevertheless it has now a state system which is semi federal. Finally we will focus on the Italian case which present a form of decentralization distinguished by a strong concurrent competence between state and the decentralised entities. More specifically this article will focus on the Spanish experience because in the opinion of the author, the evolution of the Spanish R&D system is an example of positive achievements produced by an excellent capacity of adaptation. In the Spanish case is interesting to note the importance of tax incentives as tools for promoting public-private cooperation in the field of science financing.

It is common knowledge that the European Union is gradually implementing a certain kind of multilevel governance. Although this concept mainly concerns political-administrative aspects, nevertheless it influences a vast amount of different fields, among them the science funding field. Multi-level governance, in the EU legal system,

is a concept with more than two decades of history (Draetta, 2015), it is a notion very popular in many fields. To better understand this specific concept and its relevance in the R&D field, a short discussion of its major components is needed.

The idea of multilevel governance was created in regard to the European integration process (Adam, 2014). It starts from the consideration that the “state imperium,” i.e. authority, is shifting not only from states up to the European Union, but also down to sub-national authorities<sup>1</sup>. Multilevel theory is strongly connected to polycentrism, as a way to stay closer to the real need of the society (Piattoni, 2009). Multilevel governance is generally understood as sharing responsibilities and cooperating between the various levels of governance and it is often associated with the principle of subsidiarity (Draetta, 2015). Due to this interconnection, it is not possible to completely understand multilevel governance without introducing the subsidiarity concept (European Parliament, 2015).

Subsidiarity is based on the belief that the decisional chain should be flexible to better fit the particular problematic which is addressed. In our case the decisional chain should be as short as possible in the meaning that the decision making process should be as close as possible to the citizens, so that the implementation of the decision process could be the utmost effective, and related to the real needs of society (European Union-Committee of the Regions of the European Union, 2009).

For example, if a given social policy is to be implemented, it should be decided, thought and implemented from a decisional entity as close as possible to the beneficiaries, (i.e. a construction of a school should be decided by a regional government and not by a ministerial meeting).

In practice, subsidiarity and multi level governance are based on the idea that the best policies are chosen and implemented when decisions are taken with the participation of the final beneficiaries of such policies.

An effective multi-level governance has to contain a quantity of subsidiarity, but at the same time coordination can not be missing. In fact, the policy results depend on good coordination between all

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1 I.e. regions, provinces...

levels of government, both in the decision making process and in the implementation process. In such a sense, “mutatis mudandis<sup>2</sup>” an efficient plan for financing science policies has to be based on a previous knowledge of the current conditions of public science funding in a particular state.

France, Italy and Spain have dealt with developing policies for the public financing of science . All three of those states had a slightly different approach which hugely effected the characteristic of the public policies implemented in their respective countries.

History influences the future, hence Spain and France<sup>3</sup> had a system definable as very centralistic. Both countries have been, for a period, the centre of vast empires; those empires were characterised by a strong centralisation and control over possessions. Phrases as “L’État c’est moi”<sup>4</sup> allegedly mentioned by king Luis XIV or the phrase, “el imperio en el que nunca se pone el sol”<sup>5</sup> related to the vast amount of the dominions of the Spanish empire. Those phrases are much more than simple expressions; these phrases are a representation of an immaterial concept which transcend the words and explain what kind of political and administrative systems they represent. These systems were mainly hierarchical, i.e. decisions came from the political centre and were implemented by local authorities. Therefore, taking into account all the aforementioned, it is true (as we will see) that French and Spanish system shifted from a state centric system to a more “shared system.” Nevertheless in this new system there are visible traces of “centralised control” (Reppy, 2000).<sup>6</sup>

An efficient plan for financing science policies has to be based on a previous deep knowledge of the concrete situation in the State;

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2 Mutatis mutandis can be translated as the necessary changes having been made.

3 Italy had a different history, it was unified only during the second half of the 19<sup>th</sup> century

4 “I am the State” allegedly told by Louis XIV of France; this phrase express in few words the tradition of the French centralised form of power

5 The empire on which the sun never sets allegedly told by Carlos V of Spain as the above mentioned quote express how likewise in Spain there is a strong tradition of centralised control over the domains

6 This control activity may appear in different form, lighter or not nevertheless this control activity is always present.

## FRANCE

France with “Colbertism” was the first state to codify state intervention in the economy. “Colbertism” was an economic and political doctrine of the seventeenth century, created by Jean-Baptiste Colbert.<sup>7</sup> Colbert’s central principle was that the wealth and the economy of France should serve the state. Hence today France with other European countries was and partially is still today an example in the field of state intervention in crucial national fields (Rich and Cole, 1964).

In France, during the 1960’s a new vogue for “Colbertism” started in every field of economic activities. This “neo Colbertinism” did not remain without pronounced effects on the French policies of public financing of science<sup>8</sup> (Laredo, 2001). The French government often directed public policies to promote scientific research among the so called “champion national.”<sup>9</sup> Moreover it is worth noting that the national defence and military sector is still today considered a key field in science policy sector and the national defense expenses are used as a lever for growth (Guichard, 2003).

In other words, the French science system is based on strong state coordination, which is expressed by the construction of the French national innovation system (NIS). This concept emerged over the past decades as a response to the recognition that innovation within a national economy needs a plan so to increase positive scientific outcomes (Piettre, 1986).

Traditionally, French technology and innovation relied on the targets decided by the central state, performed and implemented in the framework of grands programmes (Piettre, 1986).<sup>10</sup> The main actors have been the national champions,<sup>11</sup> however, this general pattern has

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7 French Minister of Finance under Louis XIV.

8 In such a sense it is possible to use the term “technological Colbertism,” cf. Larédo/Mustar, 2001).

9 A national champion is a firm chosen by the state to become the dominant producer or service provider on the national market and overtake or hinder foreign competitors in this market.

10 It is admissible to consider that the grand programmes spirit is still present in the nowadays in the so called La stratégie nationale de la recherche.

11 In french champions nationaux.

changed over the last years. French science policy nowadays focuses on the assessment and transfer of research results generated in universities, public scientific and technological research organisations.

A national innovation system is based on the assumption that the better planned the system is, the better results will be reached (OECD, 1997). Science stakeholders, are part of the same system, and as part of a same system they are equally needed altogether as no part of the body can live separated. In such a sense the French national science system connects the science stakeholders so to underline the interdependence among them; moreover the stakeholders play the main role thanks to their linkage, mutual commitment and their own interactions.

France had set a national R&D intensity in 2012 of about 2.29<sup>12</sup> percent of gross domestic product, which conferred a top position within the EU states. As expressed above the French science system relied on the targets set by the central state, performed and implemented in the framework of “grands programmes.” These programs were mainly concentrated in and implemented by the national champions (Laredo, 2001). The state created a mechanism which had to support the national champions in an effort to maintain or gain an international leadership role in the given field of activity.<sup>13</sup> During the last decades of the 20<sup>th</sup> century the aimed result was to some extent reached. In fact France has always had a gross domestic product intensity proportionally higher than other direct competitors (European Commission, 2014), and the fields on which French science sector was the utmost significant were those fields whose national champions companies were operating in (Directorate-General for Research and Innovation, 2014).<sup>14</sup>

France reached such positive results during the last two decades of the 20<sup>th</sup> century thanks to the fact that two main changes occurred: the political side created new agencies, entities devoted to fostering

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12 Research and Innovation performance in the EU Innovation Union progress at country level 2014 edited by Directorate-General for Research and Innovation

13 The Government set special legislative and financial aid in order to defend the national champions against the international concurrence.

14 For example: Aeronautics, energy ,transport and defence.



an increment in the science field;<sup>15</sup> France, keeping a centralised form of power, opened the way to a feeble regionalisation<sup>16</sup> (Boudon, 2014).

The second occurrence which significantly changed the French “modus operandi” in the science sector was the importance that the regional level acquired in the French political system, the so called “regionalisation.”<sup>17</sup>

The 26 French regions (which do not have legislative power), receive part of the national tax income and have a budget to bestow in their priority areas. Regions negotiate their priority fields with representatives of the state and they have an elected council (conseil régional) which is responsible for the regional administration. Regions are competent for social questions, transport, education, culture, local development, for this reason, to a certain extent Regions have competence in the field of science policies (Office of the Prime Minister, 2012).<sup>18</sup>

Nowadays the French science system is characterised by an unequal dichotomy between central government and regional government. France passed from a *dirigiste* system to a new form of science governance where the function of the state is to facilitate<sup>19</sup> the science development. In this cooperation between central and regional authority the so called “contrat de plan État-région” (CPER) has a salient importance. CPER is in a state-region plan contract, a document in which the state and region are committed to a multi-year

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15 For example: Agence Nationale de la Recherche, Agence d’Evaluation de la Recherche et de l’Enseignement Supérieur, Pôles de Recherche et d’Enseignement Supérieur.

16 Please notice that regionalisation doesn’t have to be understood as a federalisation of the state.

17 It is important to clearly express that regionalisation is something different from the so called devolution federalisation or power devolution. Federalisation has never been in the French political agenda.

18 It may be of some interest that in 2014, the French Parliament passed a law that will reduce the number of regions in Metropolitan France from 22 to 13. The new regions will take effect on 1 January 2016.

19 Also known as Etat facilitateur “State facilitator.” In such a sense it is possible to affirm that from the 70’s definition “l’Etat entrepreneur” we passed to “l’Etat facilitateur.”

programming and funding major projects (among which science related projects).<sup>20</sup>

In this path of regionalisation via state-region plan contract, many centers for scientific research<sup>21</sup> were created. The fundamental idea of such a policy was to create over the country a fertile soil for science, so those centres were established not in a single city or in the capital, but in different cities of the country. It is quite interesting that although these national centres had to spread science over the state so to foster a diffused pro R&D environment.

The obtained results of this regionalisation were not adequate to the central government's expectations; important differences in results within regions were observed (Beatson, 2007). In 2005 a shift in the French *modus agendi* occurred; previously there was the so called principle of regional equality (it consisted in sharing the same quantity of funds to all the regions). Nevertheless this drive for equality brought extreme differences in results. Therefore, the central government shifted towards rewarding networks and clusters of scientific excellence; it was set as a science system, which had as common base that to the regions were given an equality of opportunity to compete for scientific resources, and not a simple equality in resources. The regions were given the possibility to compete for obtaining higher financial means. This reflected a more gradual evolution in French policy towards equity rather than equality as a precondition for competitiveness;<sup>22</sup> in such a sense the system drifted towards the so called "Pôle de compétitivité" technology clusters characterised by the presence of given zones of highly qualified R&D players (i.e. research centres, universities, highly specialised factories).

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20 Along with the CPER are there other different project where regions have a key role in the R&D implementation, nevertheless due to unity matters this paper concentrates on the CPER importance.

21 In French Centre National de la Recherche Scientifique.

22 Equity represents a means of striving for equality within the reasonable limits of efficiency' (Baudelles & Peyrony, 2005).

## SPAIN

As mentioned above, this article gives special space to the Spanish experience, because in the opinion of the author, Spain among the other countries had the capacity to craft science policies which deeply innovated and changed the Spanish science system; in fact despite the low gross domestic product percentage on R&D, Spain concentrated its financial means on specific technological fields, obtaining among others important results in the field of new sustainable sources of energy.<sup>23</sup> The Spanish science system is composed of two major elements:

- national plan (which changed consistently in time);
- incentives tools which we may define as a group of combined law provisions.

The national plan is a direct expression of the government’s guidelines, instead the group of combined provisions of law, is an instrument orientated forward creating a common ground which is created to foster financing of science , beyond the limits set by government guidelines.

In Such a sense Spain created two parallel systems for financing science, which under different paths had to provide the same result; augmenting science activities quality and quantity (Muñoz, 2006).

The “Plan Nacional de Investigación Científica y Desarrollo Tecnológico (National Plan of Scientific Research and Technological Development) is the main instrument used by the Spanish government to coordinate and encourage scientific and technical research.

The 1986 Science Act, created a better coordination among the different relevant players. The Spanish government, developed science and technology policies; these policies were and still are carried out in accordance with the national scientific research plan. In order to reach the desired results many important administrative bodies were set out by the Science Act. The inter ministerial commission on science and technology (CICYT) is the leading national agency for scientific and technological policy and the angular stone on which the national plan system is based. The CICYT is responsible for planning,

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<sup>23</sup> Summary of the Renewable Energy Plan (REP) 2005-2010 at Instituto para la Diversificación y Ahorro de la Energía, [www.idae.es](http://www.idae.es)

drafting, coordination and follow-up. The CICYT is presided by the office of the prime minister and includes the ministries <sup>24</sup> involved in scientific and technological policy (Muñoz, 2006).

The CICYT is assisted by the following bodies:

- a general council for science and technology, which is the CICYT's consultative body devoted to promote coordination among the different autonomous communities and the central administration;
- a support and monitoring committee which is led by the prime minister's Economic Office and it is responsible body for inter ministerial coordination in planning the follow-up policy on R&D;
- the Spanish Foundation for Science and Technology (FECYT), which is part of the ministry of science and innovation, it is the responsible body for providing technical support to the scientific and technological decision-making bodies in Spain.

The 1990's mark a turning point in the science system in Spain. The pursued idea by the Spanish government was to strength a set of laws to promote R&D activities outside the National Plan. With this reform the Spanish government tried to implement in Spain what in France is defined as "etat facilitateur"<sup>25</sup> in the meaning that the state had to maintain a role, but this role had to be less evident. The state had to prepare fertile conditions allowing an independent but at the same time controlled "scientific blossom." The main idea was that the state showed the path to succeed but at the same time the state left more freedom on how to implement R&D activities.

The Spanish system during the 1990s appeared well framed, with pieces of legislation, providing a system on research more reliable; this system was based on a strong legal basis (Gutiérrez Lousa, 2008). It is worthy of attention the combined provision of Law 43/1995 after modified with the law 55/1999 on corporate tax.

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24 Minister of Economic Affairs and Competitiveness; Minister of the Treasury and Public Administrations; Minister of Foreign Affairs and Cooperation; Minister of Defense; Minister of Public Works; Minister of Education and Culture; Minister of Employment and Social Security; Minister of Agriculture, Food and Environmental Affairs; Minister of Industry, Energy and Tourism; Minister of Health, Social Services and Equality.

25 State with a [://www.idae.es](http://www.idae.es) "En."

It is extremely significant that Spain shifted to a science financing system characterised by vigorous tax incentives; in such a sense the Spanish government tried to limit its direct “imperium,” desisting from imposing government central will as occurred before. The choice carried by the Spanish government was to leave more decisional space to the science stakeholders and to the market (Navarro, 2009).

The reform was based on the principle that the state had mainly to set the scientific framework but the national plan tool had to be to some extent less invasive; for this reason R&D tax incentives were implemented as well through a broadening of fiscal incentives in accordance with the mentioned laws (Gutiérrez Lousa, 2008). The Spanish government wanted to create a science system based on tax incentives through which also private investors could finance public science research.

The base principles applied to this regulation, deserve to be mentioned for the liberalism which distinguish them :

- the deduction application had to be neutral, it could not radically modify the conditions of the entity subject to incentive, unless it contributed to overtake market inefficiencies;
- tax deduction had the main intent to increase the competitiveness of the Spanish Economic System;
- the main fiscal ease consisted in what was generally known as “Amortization freedom” (Libertad de Amortization).

The difference between tax reduction and amortisation freedom lies in the slight distinction that tax reduction reduces tax debt settlement. Instead amortisation affects tax base, allowing a “tax deferral,” but not a reduction. It entails that it was possible to amortise the science research expenses qualified as intangible assets; but it is important to notice that it was not possible to extent such ease to expenses relating to innovation matters. Tax reduction had a very large extent, depending on the investigation activity set. According to corporate law, development may be defined as follows: “application of the research results in order to produce new materials or commodities.”

I would like to underline the words “application of the research results.” This affirmation implicates a strong connection with the research result, which had to be classifiable as positive. Hence it was obligatory that the antecedent research, gained a positive result so

that the new product or material could be defined as a direct consequence of research.

It was not clearly defined, if a development process consisted in something that could be defined as new; a closer contact was set between the research institution and the ministry for research and the tax administration (Muñoz, 2006).

Because of the above mentioned the Law 55/1999 modified the Spanish science policies panorama and it surly represented a change compared to the Law 43/1995. Before 1999, technological development was quite peculiarly not considered a science activity. It was connected to industrial activities more than science activities. In this regard, only from the beginning of this century, the words “investigación (research), desarrollo (development) y innovación (innovation)” were used together to express the Spanish R&D policy, earlier the words “Investigación, desarrollo” were used and the so called *innovación tecnológica* was a concept treated separately.

It is possible to define technological innovation as the activities whose result is a step forward in the technological field, which help in obtaining new products, new productive procedure or consistent improvements in the existing ones.

Discerning simple science activities from activities involving technological innovation is not always possible; it may occur that technological innovation is a positive final step of a scientific research.

Under the earlier Spanish law provision, research activities, were not conditioned by the result reached. This means the research could even not reach a positive result but still the activity carried out would be qualified as “research.”

Instead technological innovation required new products or innovative procedures or consistent improvements in the existing ones, and reaching a positive result was obligatory (Muñoz, 2006).

The scientific research, producing a positive result, was defined as an objective innovation, instead the TI (technological innovation) activities could produce a result which was qualified as a “subjective Innovation.” The innovation has to be new in regard to the subject which has promoted and supported the TI research. Incentives on technological innovation activities were a further implementation of what was already set throughout the science policies. Technological innovation activities were compared to all other science activities with

no additional distinction provided, and reaching a positive result was not anymore an obligatory requirement .

The Parliamentary strongly believing in the *État facilitateur*<sup>26</sup> against the concept of *État dirigiste* characterised by a strong economic planning (Galindo Martín, 2003), increased the size of the tax deduction percentage. However this decision did not produce the expected results; it did not reached a concrete improvement in the Spanish gross domestic product percent dedicated to R&D; unfortunately the expectations before set, were not entirely met.

In 2006, the Spanish government started to make relevant change on Spanish science policies. The change was as vast that it is possible to define it as revolutionary. It was decided to leave the deduction system, which was characterised by large freedom given to the R&D players. The government created a new scientific policy once again based on National Programs set by the government itself. The emanation of this new Law 35/2006 represents a fundamental change in the science field. This is very well explained in the law preamble which in few words explain the limits of the previous policy. Citing the exact words is due to to the semantic pregnancy of the text

en muchos casos, los estímulos fiscales a la inversión son poco eficaces, presentan un elevado coste recaudatorio, complican la liquidación y generan una falta de neutralidad en el tratamiento fiscal de distintos proyectos de inversión,<sup>27</sup>

which says

In many cases the fiscal stimulus to investments is not cost effective; high collecting costs complicate settlements and generate a lack of neutrality in the fiscal treatment of different investment projects.

This new policy consisted in leaving “the incentives era;” the government focused on developing a system based again on national and regional programs (Buesa, 2014). There are great differences between the two approaches. The incentives form is more market respectful, creating new national and regional programs allows the government

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26 Please see the note above.

27 <https://www.boe.es/buscar/pdf/2006/BOE-A-2006-20764-consolidado.pdf>

to address the efforts in financing science activities. In such a sense the government decided, through national plans, which scientific fields were worth to be financed. This new policy was generated by the government belief that a public science system, more based on national plans, is capable of reaching far better results. Through this new national plan the government set the goals to be achieved and the priorities to be followed in the R&D field.

The 2008/2011 R&D National Plan introduced a new structure and new way in managing the R&D issue. It was decided to create a new version of the Comisión Interministerial de Ciencia y Tecnología (CI-CYT), which is possible to define as a reinforced CICYT; this new version of CICYT entered into service in 2006; the pyramidal structure of the commission, formed by the science key actors, allowed to set a better performing national plan, the commission was formed as follows:

- a chairing body responsible for the elaboration processing of the plan. This sub commission had the key role to supervise all the procedure, and a group responsible about the concrete elaboration of the plan. The first group is a group formed by experts of administration having the main task of policy coordination. The second group formed by science and technology experts,
- three consulting sub commission designed to analyse specific problems,
- a commission for institutional and budgetary matters,
- a commission on financial instruments. This commission is responsible for finding the financial means to be used in order to implement the national plan.
- a commission on key topics, devoted to determine the main topics to be discussed,

The purposes of the National R&D&I Plan (2008-2011), which was set up in line with the provisions of the National Strategy for Science and Technology, were: placing Spain at the European cutting edge of knowledge, and creating a favourable environment for investment in the science field (“Erawatch Spanish National R&D&i Plan 2008-2011 [+2012]”).

This new form of national plan for science has a structure based on three areas directly related to the plan’s general objectives and linked to instrumental programs which pursue specific objectives:



- generating knowledge,
- fostering Public-private cooperation cooperation,
- strategic actions.

Due to the importance of the Spanish experience, it worth to summarise the evolution in the time of such experience. The Spanish science financing system has been for a long period a sort of “work in progress.”

The results of the first national plans were not as positive as expected, the Spanish gross domestic product percent on R&D did not meet expectations previously set.

This is the reason why the Spanish government at the end of the 1990’s tried a fresh start through the adoption of a set of laws overcoming the limits of the national plan system

Thanks to the consistent increase of the Spanish gross domestic product during the 1990s the total amount spent on R&D increased (Muñoz, 2006) .

During the same period a privatisation process occurred; the “Spanish national public champions,” companies such as Endesa, Acciona and Telefonica were privatised. The state (however was, and in some cases still is) owner of a majority of shares, characterised by special powers allowing the government special competences. Thanks to the so called “golden shares” the ministry of economy had the possibility to orientate the companies main decisions. The Adoption of the national plans and the clever use of the golden shares allowed a significant concentration of the science funds in key sectors, structurally fundamental to the Spanish development. Year by year, the gross domestic product percent on R&D was increasing and results as well. Between 2000 and 2008 the gross domestic product percent on R&D continued to increase.

Thanks to a clever and efficient use of the national plans, Spain obtained vast and concrete results in the renewable energies field. Spain pursued with tenacity research on renewable energies. In 2006, 20%<sup>28</sup> of the total electricity demand was produced with renewable energy sources, and in January 2009 the total electricity demand produced with

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28 <http://www.energia.jcyl.es/>

renewable energy sources reached 34.8%.<sup>29</sup> Some autonomous regions in Spain lead Europe in the use of renewable energy technology and they plan to reach 100% renewable energy generation in a few decades<sup>30</sup>. Castile and León and Galicia are especially near this result, producing in 2006 70%<sup>31</sup> of their total electricity demand from renewable energy sources, and 5 communities produce more than 50% from renewable.

The Spanish national plan system permitted a better and more profitable use of financial means; a coordinate direction is the heart of the R&D Spanish system; that however does not mean just a “hierarchical passiveness,” instead it means a virtuous cooperation, made possible by an “illuminated direction.” The inside organisation of the national plan system is an effective mix of check and balances allowing tangible and pragmatic results.

Sole tax incentives do not represent an adapt answer in case of shortage of means; providing companies with economic aids is, for sure, important, but not as crucial as providing with a structure capable to back the scientific research effort.

Spain created a flexible and supporting structure composed by all relevant players in the scientific field: government, universities, research centres. In short terms the government opens the way for a round table to decide which goals have to be achieved, after that, thanks to a strong connection between universities and research centres, the most capable institution to perform the research is chosen by an ad hoc commission (García-Quevedo, 2008).

When the scientific research is performed by a private institution the national plan consents to establish cooperation between the private institutions and public ones. Cooperation is the main factor leading to scientific success.<sup>32</sup> Equally important is the moment when the government decides which research fields qualify as research fields of national interest.

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29 Summary of the Renewable Energy Plan (REP) 2005-2010 at Instituto para la Diversificación y Ahorro de la Energía, [www.idae.es](http://www.idae.es)

30 <http://www.regions202020.eu/cms/>

31 <http://reregions.blogspot.com/2009/10/region-of-castilla-y-leon-spain.html>

32 <http://www.idi.mineco.gob.es/portal/site/MICINN/menuitem.7eeac-5cd345b4f34f09dfd1001432ea0/?vgnextoid=83b192b9036c2210VgnVCM-1000001d04140aRCRD>

An effective research field determination is vital, for this reason the Spanish government, within the national plan, created the mentioned permanent round table formed by political and technical members in order to determine the field of research classifiable of national interest.

This kind of structure produces beneficial effects on scientific activities of small dimensions, because small research centres which have limited resources, may find in the national plan a way to overcome dimensional obstacles and they have the possibility to move toward new types of cooperation that can lead to positive results.

In a world characterised by perfect competition, no scientific financial aid would be needed. Nevertheless, basic research, due to the not direct commercial effects, in absence of a concrete state financial aid and incentives, risks a critical slowing down. This is the reason why Spain used the tax incentives methodology.

Quality is the key word in the evolution of the Spanish public financing of science. Spain concentrated energies on specific areas taking into account relevance; so there is not an inconsistent division of financial means, on the contrary, there is a selection<sup>33</sup> which allows reaching concrete results.

For all the reasons expressed above, a strong collaboration among the science stakeholders is an imperative. Costs and benefits considered, there is no doubt about the positive effects produced by the public financing system of Spain.

## ITALY

Although Italy is trespassing a period of economic austerity, the country is still among the ten most developed countries in the world for gross domestic product and it is the third market for magnitude in the Euro area, this makes it possible for Italy to have a discreet science national system which needs to be improved (European Commission, Directorate-General Enterprise & Industry, 2014).

The Italian scientific legal system is based on two main pillars, the national research plan (Piano Nazionale per la Ricerca now on PNR)

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<sup>33</sup> The word selection has to be intended more in a sense of structure than with a sense of procedure.

and productive clusters (*distretti produttivi*) (Italian government, 2014).

The PNR is set by the Parliament and the Council of Ministries. Its coordination within the government is under the responsibility of inter-ministerial committee for economic planning. The Ministry for Education, University and Research (MIUR) coordinate national and international scientific activities, distributes funding to universities and research agencies, and establishes the means for supporting science. The Ministry of Economic Development supports and manages industrial innovation (Italian government, 2014).<sup>34</sup>

The PNR<sup>35</sup> defines the objectives and modes of implementation of specific interventions in priority areas, disciplinary sectors, actors involved, and projects which qualify for funding. The goal is to ensure the coordination of research with other national policies, bringing Italian research into alignment with the strategic vision defined at European level and creating the conditions necessary for a progressive integration of public and private research. The PNR is formulated by the Ministry of Education, Universities and Research (MIUR), after extensive consultation with the actors of the innovation systems (e.g. scientific and academic communities, economic powers and competent administrations). It is implemented after approval by the Inter – ministerial Committee for Economic Planning. The first PNR was formulated during the period 2001-2003. Assessments have indicated that in order to obtain tangible effects on the country's scientific environment, simultaneous action on several levels were necessary. To achieve its objectives, the first PNR proposed a set of integrated actions, each of which involves various initiatives over the short, medium and long term. The main objective was to simplify funding mechanisms, rationalise the administration *modus operandi*, and identify forms of monitoring to ensure that funding is efficiently applied in pursuit of the stated objectives.<sup>36</sup>

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34 Other Ministries (Health, Agriculture, etc) manage research funding in their specific fields.

35 The new PNR [http://www.istruzione.it/allegati/2014/PNR\\_online\\_21feb14.pdf](http://www.istruzione.it/allegati/2014/PNR_online_21feb14.pdf)

36 PNR aims too at encouraging technology transfer between the actors in the innovation system.

A weakness of the first Italian PNR was a lack of a permanent scheme or structure comparable to the Spanish or French ones, meaning for that, a general lack of a steady plan and continued in the time (Belussi, 2004). This fact does not mean that Italy was gravely lacking on public scientific research, but it means that the approach was different, the Italian system was not based as much as French and Spanish on a national R&D plan.<sup>37</sup> For many years the PNR hugely changed in scopes and terms, moreover before 2014 The Italian national PNR was an instrument through which the government substantially performed a very light and inconsistent activity of fund distribution.

Based on historical data the Government was distributing scientific research funds for generic projects or studies.<sup>38</sup> Those funds quite often were used for covering personnel costs, which had very little in common with public scientific research.

Moreover is due to be noticed that from the second half of the 1990 Italy shifted from a centralised form of administration, similar to the French system, to a federal administration which has some characteristics in common with the Spanish autonomous regions system. The central government shared part of its competences within the regions; Science is a field on which central government and regions have the so called “*competenza concorrente*” (concurrent competence). This concurrent competence in the scientific field produces a risk of overlapping regulation and discrepancies in the policies implementation.

There is a relevant divergence in level of gross domestic product of the different regions. The North and the Centre of the country have a gross domestic product per capita which is about 115-125% of EU average, with the North being one of the industrial cores of Europe, while the South has a gross domestic product per capita which is the 70% of EU average. This federalization produced positive results in the decentralisation process and increased stakeholder consultation; however at the same time increased the risk for a not effective coordination between policy-makers (national and regional)

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37 The Italian PNR structure highly changed during the years, not allowing a consistence in the long run.

38 Projects which often coincided with regular Universities programs and funds were used to support the universities.

and produced the above mentioned risk of overlap. In my opinion the major deficiency is the short-term view on policy-making, and a subsequent decrease of efficiency of the mentioned policies. Even if regions on the basis of their local specialisation and areas of expertise, participate and provide their contribution to projects of national importance, this participation is strongly lacking of coordination; the division of competences for the implementation of the public scientific policy is fragmented into three levels: central competence, regional competence and in some cases interregional competence.

Beside the national plan and the mentioned federalized structure, the Italian Scientific system is strongly based on the so called "Distretti Produttivi" productive districts (Bertamino, 2011). These Districts are characterised by a virtuous cooperation amid the private and public sector. These districts are sort of self sufficient systems where, leading science players have a direct linkage within universities and schools established in the mentioned district. This represents a virtuous linkage that fosters positive cooperation. Companies need research activities which are performed by public universities/research centres in the districts with which the mentioned companies have a "trust linkage." At the same time companies take specialised labour work force from the territorial public schools.

The so called productive districts for all intents and purposes are to be considered as public policy instruments to foster innovation (Coletti, 2007). Based on the theory "the closer it better" it implements competitiveness of local production systems by creating synergies between companies, universities, research centres and "local authorities"<sup>39</sup> located within limited territorial boundaries. A quite important characteristic is that often these districts are "self created," in the meaning that the main players located in the given zone, start a stronger public-private cooperation and the local authority recognising such stronger cooperation try to assist through a better administrative cooperation (Italian government, 2014).<sup>40</sup>

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39 To be interpreted in *lato sensu*. Territorial administration is divided between, Regioni, Provincie and Comuni, and often they have a concurrent competence on R&D matters.

40 Other times are regions that a priori propose the creation of productive districts so to foster investments in the territory.

## FINAL REMARKS

In conclusion, even if in many cases science financing is left to the free will of the science stakeholders; state control over such an important subject is still very needed to define science priorities. The form of this control changed in the time but it is still present; even if an initial analysis could produce in the reader the sensation that the French System is characterised by a multilevel governance where the main actors have to play in a multilevel system without a relevant state control. Under a more prudent analysis, it is perceptible how the central government’s hand is still strong and powerful.

In terms of forms of public interventionism; new modes of steering and management are noticeable. In such a direction the French government is creating frameworks leading to more selective action and leading to a resources concentration.

In other words the central government still uses its steering, power (Imperium) to lead science public financing; this power is now put into use in a less *dirigiste* way, but still is visible a hint of *neo Colbertinism*. At the same time both in Spain and in Italy even if to a less degree than France, are going into the same path of a modern “Etat facilitator” where the state while letting freedom simultaneously creates a framework where the state is the entity which directs the main line of the policy of science public financing through a “moral suasion” given by the national plan; because it is the national plan which encourages the stakeholders to follow a determined path.

In such regards the path followed by the Spanish scientific system is remarkable. Even if exiting from a dictatorship, the Iberian country started a very interesting implementation of national plans which had as main function augmenting the scientific activity in the country. No doubt the result was to some extent achieved. Afterwards the Spanish government in the 1990’s, tried without the expected results, to swift to a system characterised by incentives. This incentives were planned to be sort of a neutral tool in the meaning that the market had, in the idea of the legislator, to determine the path on which proceed to promote and help scientific research.

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