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## ENVIRONMENT DIRECTORATE CENTRE FOR TAX POLICY AND ADMINISTRATION

Taxation, Innovation and the Environment - The Spanish Case

This paper was prepared by Ignasi Puig Ventosa of the consultancy firm ENT Environment and Management, Barcelona, during a secondment to the OECD, as a contribution to the project on Taxation, Innovation and the Environment of OECD's Joint Meetings of Tax and Environment Experts.

The paper discusses the environmental impacts of tax incentives for innovation, and the innovation impacts of tax incentives for environmental expenditures, in the Spanish corporate income tax system.

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#### **FOREWORD**

This paper was prepared by Ignasi Puig Ventosa of the consultancy firm *ENT Environment and Management*, Barcelona, during a secondment to the OECD, partly financed by the *Institute for Fiscal Studies* of the Ministry of Finance in Spain, as a contribution to the project on *Taxation, Innovation and the Environment* of OECD's Joint Meetings of Tax and Environment Experts.

The paper discusses the environmental impacts of tax incentives for innovation, and the innovation impacts of tax incentives for environmental expenditures, in the Spanish corporate income tax system.

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## TAXATION, INNOVATION AND THE ENVIRONMENT – THE SPANISH CASE

#### **EXECUTIVE SUMMARY**

Deductions for R&D and technological innovation expenses, and for environmental investments, in the Spanish Corporate Income Tax

The Spanish Corporate Income Tax includes a deduction for expenses on R&D and technological innovation (R&D&I) and a deduction for environmental investments. This report focuses on the environmental effects of the R&D&I deduction and on the effects on innovation of the environmental investments deduction.

The R&D&I deduction applies to expenditures – both current and capital – incurred on R&D and technological innovation, whereas the environmental investments deduction benefits investments devoted to avoiding air pollution from industrial facilities, prevent water pollution and reduce, recover or adequately treat industrial waste. It also benefits purchases of new land-based means of transportation for commercial or industrial use and some investments for the use of renewable energy sources.

Even if the amount deducted has been generally increasing in absolute terms for the last years for both deductions, they are used by a limited number of companies. Their importance is relatively low in terms of the percentage of the total revenue raised by the Corporate Income Tax, and slightly declining. For both deductions, the percentage of companies making use of them grows as their size increases, along with the average size of the deductions. The average deduction for R&D&I is higher, whereas the number of applicants is slightly lower. However, the scope of the environmental investments deduction is significant and, for 2005, it was estimated that most of the investment in environmental protection undertaken in Spain was supported by the tax credit.

Autonomous Communities have the role of validating the environmental investments eligible for this tax deduction in relation to prevention of air and water pollution and management of industrial waste. Despite this participation, regional dispersion of this tax credit is virtually the same regarding the number of declarations presented and much lower when analysing the amount deducted, compared to the deduction on R&D&I, for which Regional Authorities play no role.

In 2005, investments to avoid air pollution accounted for 62.5% of the total investments validated by Autonomous Communities (17.5% for water and 20.0% for waste). This is coherent with the predominance of investments in prevention of air pollution among companies' expenditure on environmental protection (54.7%), but not regarding the other two areas (28.6% for water pollution and 16.7% for industrial waste).

In 2006, a progressive phasing out of the two tax credits was decided. The R&D&I deduction will disappear in January 2012, whereas the other one will disappear in January 2011. It was also stipulated that, by 2011, the Government has to evaluate the effectiveness of the different R&D and technological innovation incentives and support measures in place between 2007 and 2011 and, if necessary, amend them to better adapt to the needs of the Spanish economy. Some of the issues raised in this case study may be relevant for the evaluation that is to take place.

## The tax deduction on R&D and technological innovation leads to higher investments on environmental protection

For 2005, it was found that companies that received support for technological innovation activities from the Spanish central administration tended to declare higher positive environmental effects of the innovation activities they undertook. However, the public support refers not only to the R&D&I deduction.

As regards the specific effects of the R&D&I deduction, for the period analysed (2000–2005), it was found that the percentage of companies making use of the environmental investments deduction in the year after applying the R&D&I deduction was systematically greater (on a year-to-year comparison) than the percentage of companies making use of the R&D&I deduction the year after applying the environmental investments deduction.

For the same period, it was also found that the application of the R&D&I deduction increased slightly but significantly the application of the environmental investments deduction in subsequent years. Analogously, for the same period, the use of the R&D&I deduction was relatively higher before the use of the environmental investments deduction than when this deduction was not used. These results can be attributed to additional environmental investments being induced by the R&D&I deduction.

This is also supported by the fact that the proportion of environmentally motivated projects among projects supported by so-called *reasoned reports* is higher than the proportion of environmental expenditures among total investment in machinery and equipment expenditures by Spanish industrial companies. *Reasoned reports* can be applied for to the Ministry of Industry, Tourism and Trade and their purpose is to state the compliance of the criteria required to qualify for the deduction on R&D&I.

Finally, it seems that the relative presence of environmentally related R&D&I projects taking benefit of this tax deduction is similar to that in the other public measures to support R&D&I at the national level. In both cases, these percentages are higher than the percentage of internal R&D expenditures dedicated to environmental control and protection by private companies, which suggests a positive environmental bias in the innovation activities that receive public financial support.

Nevertheless, possible negative environmental effects of not environmentally motivated R&D&I activities were not considered. Apart from direct effects, possible indirect negative effects should be also considered. Innovation may lead to more efficient production in terms of energy or materials use per unit of product, which may reduce the cost of production and lead to increased consumption, counteracting totally or partially the environmental improvements achieved per unit of production.

## The tax deduction for environmental investments has no significant consequences for R&D and technological innovation

For 2005, the Spanish Autonomous Communities were asked to classify validated investments between "end-of-pipe" and "cleaner production" solutions, the former accounting for 67.8% of the entire invested amount. This is clearly higher than in average environmental investments in Spain. Since environmental innovations are more often identified with cleaner production, the present weight of end-of-pipe technologies in the investments taking benefit of the environmental investments deduction suggests a limited incidence of this deduction in terms of innovation. Rather than accelerating the on-going change towards cleaner production, the deduction keeps favouring end-of-pipe technologies.

The evolution in the number of EPO patent applications in the areas of air, water and waste did not change significantly with the introduction of the environmental investments tax deduction. Furthermore, the relative number of Spanish patents in the areas of air, water and waste is very different from the relative importance of these investments within the amounts deducted. This poor correspondence again suggests a low incidence on innovation of the environmental investments.

### Some amendments are recommended to overcome some of the present limitations

The tax credits examined have a number of limitations that reduce their efficiency. Some of them are *lack of stability* in the legal framework, *uncertainty* about their future due to progressive phasing out, *insufficient awareness* by companies of their existence, significant *administrative costs*, insecurity regarding possible tax audits due to *not sufficiently clear legal definitions* or the fact that a positive tax payable is necessary in order to benefit from them. Some of these limitations could be overcome and this could lead to a greater use and effectiveness of these two deductions.

### No deductions should be granted to actions that are anyway compulsory to undertake

The environmental investments deduction considers as eligible investments that simply aim to fulfil existing regulation. This is not according to the polluter-pays principle, results in inefficient public expenditure and hampers a potential side-effect of this deduction on innovation. Since environmental standards are often established considering the capabilities of best available technologies, innovation required to just fulfil the legislation is moderate. If only measures going beyond legal obligations were eligible for the environmental tax deduction, investments making use of the deduction would essentially pursue cost savings, which tend to favour clean production and, therefore, innovation.

While this indicates the need of reformulating the tax deduction, it does not in itself justify complete phasing it out. There are also positive aspects of these deductions that could argue for a continuation. For example, they constitute a form of public support that distorts the market the least, since is not the Public Authority that decides what specific projects to subsidise, but companies that decide whether to make use or not of the tax deduction. In principle, they also entail less administrative costs than subsidies, both for public administrations and for companies.

If the environmental investments deduction remains, other reforms could be considered, such as the possible inclusion of other areas eligible for the environmental investments or a more explicit support to investments in the service sector or to logistics. Also a limitation of the deduction on the purchase of new land-based means of transportation should be evaluated, particularly considering that there are other governmental measures that foster substitution of older vehicles.

#### Programmes addressing environmental R&D and technological innovation could be reinforced

In any case, and despite the estimated positive environmental consequences of the R&D&I tax deduction, it seems that if environmental R&D and technological innovation is to be fostered, stimulating R&D and technological innovation and environmental investments separately is not the most efficient option. Several programmes specifically addressing environmental R&D and technological innovation could be reinforced or new ones could be created.

#### TAXATION. INNOVATION AND THE ENVIRONMENT – THE SPANISH CASE

#### 1. Introduction

#### 1.1 Background

- 1. Innovation has been widely recognised as a driver of better economic performance. The OECD has long been emphasising the importance of innovation to improve productivity, job creation and wellbeing. For example, the Directorate for Science, Technology and Industry prepared the report "Tax Incentives for Research and Development: Trends and Issues" (OECD, 2003), which explored the potential of economic instruments to promote innovation. Later, the OECD published the report "Innovation Policy and Performance: A Cross-Country Comparison" (OECD, 2005), which examined in detail innovation policy and performance in six member countries. More recently, the eighth edition of the Science, Technology and Industry Scoreboard (OECD, 2007e) explored the latest developments in these areas, and compared characteristics of OECD member and major non-member countries.
- 2. Innovation has also been regarded as essential to address environmental challenges, and in particular, as a means to advance towards more eco-efficient technologies. Thus, "Innovation and the Environment" (OECD, 2000) acknowledged the crucial role innovation can play in shifting the development path towards environmental sustainability, and called for a greater role of public policies in stimulating innovation for the environment. Since pollution is a negative externality and innovation is viewed as a positive one, in the absence of public policies, the former is produced in excess and the latter not sufficiently. In the case of innovation for the environment, these two market failures reinforce (Johnstone, Labonne, 2006). Consequently, public support for environmental innovation is particularly justified.
- 3. In turn, the need to achieve more stringent environmental goals, and the emergence of a growing environmental sector, may act as drivers for innovation (OECD, 2008; Johnstone *et al.*, 2007).
- 4. The OECD has long advocated for a coherent and coordinated application of environmental and innovation policies. For example, in its Ministerial Council Meeting of May 2007, "Ministers agreed that innovation performance (...) is an important key to addressing global challenges such as climate change and sustainable development. (...) Ministers particularly welcomed the incorporation of cross-cutting work on innovation to address global challenges, notably in the environmental and health domains" (OECD, 2007c).
- 5. The OECD Joint Meetings of Tax and Environment Experts decided in November 2007 to carry out a project on *Taxation, Innovation and the Environment*. The aim of the project is to analyse the interlinkages among these aspects, and particularly to focus on:
  - The innovation impacts of environmentally related taxes and incentives;
  - The environmental impacts of innovation-motivated tax incentives.
- 6. The project also builds on previous OECD reports dealing with taxes and environmental policies, such as *Environmentally Related Taxes in OECD Countries* (OECD, 2001) and *The Political Economy of Environmentally Related Taxes* (OECD, 2006).
- 7. The project on *Taxation, Innovation and the Environment* includes several case studies of individual countries, particularly focusing on the political economy of the instruments applied. This document presents a case study on Spain.

- 8. The Spanish case study focuses on two tax credit schemes regulated within the Spanish Corporate Income Tax; the first aims at stimulating expenditures on research and development (R&D) and technological innovation; the second is designed to foster investments for environmental protection. Similar instruments are in place in other OECD countries.
- 9. There are various other economic incentives applied in Spain to promote R&D, such as accelerated depreciation of research and development expenses in the Corporate Income Tax (art. 11, Royal Decree 4/2004, of 5 March) and a 40% reduction in the employers' social security contributions for full-time researchers (20th additional disposition, Law 35/2006, of 28 November). There are also several subsidy programmes, which according to OECD (2007b) "have increased very sharply and have become the main tool for encouraging corporate research and innovation" in Spain.
- 10. This case study starts with an introduction that describes the situation of both innovation and the environment in Spain, and synthesises the main policies currently applied in each area. It also provides an overview of the Corporate Income Tax, to subsequently analyse the two tax credit schemes that are the focus of this report. Chapter 2 then describes the tax credit on R&D and technological innovation (R&D&I) and discusses its environmental consequences, both in quantitative and qualitative terms. Chapter 3 describes the tax credit on investments for environmental protection and evaluates its impacts on R&D and technological innovation activities. Finally, Chapter 4 draws some conclusions and recommendations.

## 1.2 Main innovation policies in Spain

- 11. In 2005, Spain spent 1.13% of its Gross Domestic Product (GDP) on research and development activities (1.2% in 2006) (INE, 2008a). This level is significantly below the EU–25 (1.8%) and OECD (2.3%) averages (OECD, 2007e), but it has increased significantly over the past two decades (it was 0.85% in 1990 and 0.94% in 2000) (INE, 2008a).
- 12. The last OECD Economic Survey of Spain (OECD, 2007b) recommended strengthening research and innovation performance, as one of the key components for stimulating productivity growth.
- 13. In 2005, and following the renewed Lisbon Strategy, the Spanish Government presented its *National Reform Programme* (Ministerio de la Presidencia, 2005), as the fundamental guide for Spain's economic policy for the period 2005–2010. The fourth pillar of this *National Reform Programme* was the INGENIO 2010 programme, which established the goal for R&D expenditures to reach 2% of GDP in 2010.
- 14. In 2005, public administrations financed 47.1% of R&D expenditures (INE, 2008a). To help accomplish the INGENIO 2010 objectives, the State's R&D and innovation budget (excluding military research) increased by 32% in 2006, 34% in 2007 and 19% in 2008 representing 2.22% of the State Budget in 2008, as compared to 0.52% in 1999.
- 15. In 2005, 53.8% of Gross Domestic Expenditure on R&D was performed by the business enterprise sector in Spain (55.5% in 2006) (INE, 2008a), compared to an average of 67.9% for the OECD, and 62.5% for the EU–27 (OECD, 2007a). This same year, the business enterprise sector financed 46.3% of all R&D investment (INE, 2008a). The INGENIO 2010 Programme also fixed an objective to increase the sector's financial contribution to 55% in 2010.

<sup>1.</sup> This reduction cannot be applied simultaneously with the tax credit on expenses on R&D and technological innovation, regulated in the Corporate Income Tax Law (Section 2.1).

- 16. The *Business Promotion Plan* another of the seven pillars of the *National Reform Programme* was designed with the aim to foster innovation and competitiveness in small and medium-sized enterprises (SMEs). It also contributes to the goal of increasing the development of R&D and technological activities by the business sector. One of its five action lines is to "Measures to promote innovation", which includes several measures, such as financial support for technological projects or support for innovative clusters.
- 17. In 2007, the *National Strategy on Science and Technology* was launched (Comisión Interministerial de Ciencia y Tecnología, 2007a), establishing the general guidelines and goals for subsequent planning in these areas. The strategy also advocates for the use of R&D&I tax deductions to stimulate investments by private companies.
- 18. The main element of the regulatory framework in relation to research is Law 13/1986, of 14 April, on the Promotion and General Coordination of Scientific and Technological Research, which has been amended on several occasions. This Law obliges the Government to elaborate National R&D Plans (since 2000, National R&D&I Plans, with "I" standing for Technological Innovation), setting the priorities, objectives and policy instruments for the corresponding reference period. Such plans have been elaborated every four years since 1998.
- 19. The ongoing National Plan (Comisión Interministerial de Ciencia y Tecnología, 2007b) was approved in September 2007 and covers the period 2008–2011. It is structured on four areas, one of which is Strategic Actions, and addresses the highest Government priorities in relation to R&D. This area is divided into five Strategic Actions, one of which is Energy and Climate Change.
- 20. The National R&D&I Plan 2004–2007 created the Integrated Monitoring and Evaluation System (SISE), which controls public programmes supporting R&D&I, and increases transparency and public awareness of the actions undertaken. The system also enables continuous review of the R&D policies, and helps to improve the planning process.

## 1.3 Main environmental policies in Spain

- 21. Spain's GDP has grown rapidly in the last years (44% between 1995 and 2005) (INE, 2007a). This growth in the scale of the economic system has generally resulted in higher total levels of environmental pollution. For example, greenhouse gas emissions increased by 52% between 1990 and 2005, mainly due to higher overall economic activity, higher energy intensity (Ramos, 2003) and due to emissions in the transport sector, which increased 78% over the same period. NO<sub>x</sub> and NH<sub>3</sub> emissions also increased, whereas emissions of SO<sub>2</sub>, CO and NMVOC were reduced. As regards municipal solid waste, generation per capita rose by 62% between 1990 and 2004 (Ministerio de Medio Ambiente, 2007a). Although recycling levels have been generally increasing, they are still low, and biowaste remains largely collected as refuse.
- 22. Higher pressures have also been exerted on the use of natural resources. Water is one of the most critical resources in Spain. Agriculture accounts for more than 75% of total water consumption, although it almost stabilised in absolute terms during the period 1997–2004. On the other hand, water used for public supply (households, non-agricultural economic activities and municipal uses) increased by 31% between 1996 and 2004, without any progress being made in terms of reducing water use intensity. Significant improvements have been achieved in recent years as regards of water quality in rivers and coastal areas, and in developing waste-water treatment infrastructure (Ministerio de Medio Ambiente, 2007a).
- 23. Spanish biodiversity is one the strongest in Europe; however, many threatened habitats and species have deteriorated considerably, and still need to be conserved (Ministerio de Medio Ambiente, 1998). Between 1987 and 2000, the developed land area increased by 29%, with estimated projections for

2005 and 2010 being 41% and 52% higher than in 1987 (OSE, 2006), to a great extent due to the construction of new low-density urban developments.

- 24. The most recent OECD Environmental Performance Review of Spain (OECD, 2004) synthesised the environmental situation and highlighted the importance of tourism and construction activities in explaining a number of critical environmental pressures. In 2005, these two sectors accounted for 10.9% and 10.4% of GDP, respectively.
- 25. The broadest public programme regarding sustainability at the national level is the *Spanish Sustainable Development Strategy* (Ministerio de la Presidencia, 2007), which includes action lines regarding economic prosperity, environment protection and social cohesion. As regards environmental sustainability, the Strategy develops from three interrelated sections: Production and Consumption (efficient resource use, responsible production and consumption, sustainable mobility, sustainable tourism); Climate Change (clean energy, diffuse sectors, sinks, market instruments, adaptation); and Conservation and Management of Natural Resources and Land Occupation (water, biodiversity, land use).
- 26. More specific programmes have also been adopted for some of the key environmental areas, such as biodiversity (*Spanish Strategy for the Conservation and Sustainable Use of Biodiversity*) (Ministerio de Medio Ambiente, 1998), water (*Programa AGUA*) (Ministerio de Medio Ambiente, 2004), air quality (*Estrategia Española de Calidad del Aire*) (Ministerio de Medio Ambiente, 2007b) and climate change and energy (*Estrategia Española de Cambio Climático y Energía Limpia*, Horizonte 2007 2012 2020) (Ministerio de Medio Ambiente, 2007c).
- 27. All these strategies and programmes explicitly mention both economic instruments and technological innovation. However, in the actual development of the environmental policies, these two action lines have only played secondary roles.
- 28. Environmental legislation has also evolved significantly, due largely to the need to adopt European Union (EU) Directives. Some of the most important recent legislative advances refer to: forestry (Law 43/2003, of 21 November), the assessment of the effects of certain plans and programmes on the environment (Law 9/2006, of 28 April), environmental liability (Law 26/2007, of 23 October), air quality (Law 34/2007, of 15 November) and biodiversity (Law 42/2007, of 13 December), among others.
- 29. Besides the basic common grounds established by national legislation, much of the environmental legislation in Spain is regional. Significant differences can be observed between the Autonomous Communities, particularly in fields such as land use planning, protected areas, waste management, and environmental taxation.
- 30. The use of economic instruments to influence environmental behaviour is very limited at the national level (OECD, 2004). Apart from fuel taxes (which were not originally conceived as environmental taxes), and from the Greenhouse Gas Emission Trading Scheme (which derives from an EU Directive), tax deductions for investments in environmental protection are one of the few economic instruments aimed at influencing environmental practices. In December 2007, environmental incentives were also introduced in the Vehicle Registration Tax (in Law 34/2007, of 15 November, as an amendment to Law 38/1992, of 28 December). However, at the regional level, several Autonomous Communities apply environmental taxes, particularly on air pollution, water consumption and discharges, and waste disposal.<sup>2</sup>

<sup>2.</sup> For more details, see OECD/EEA database on instruments used for environmental policy and natural resources management, <a href="https://www.oecd.org/env/policies/database">www.oecd.org/env/policies/database</a>.

- 31. The Environmental Performance Review of Spain recommended that Spain "strive for implementation of the *polluter-pays* and *user-pays principles* to improve the efficiency of environmental policies and secure financing environmental services" (OECD, 2004).
- 32. To face the above-mentioned challenges and to achieve more stringent environmental goals, both public authorities and private companies are increasing their budgets dedicated to environmental actions. The consolidated budget of the Environment Ministry rose from EUR 3,030 million in 2004 to 4,289 in 2008 (Ministerio de Medio Ambiente, 2008). Expenditures by regional and local authorities are in addition to these figures, and they account for approximately 40% of the total budget dedicated to environmental policies by public authorities (COTEC, 2003).
- 33. According to the *Survey on Company Expenditure on Environmental Protection*, conducted annually by the Spanish National Institute of Statistics (INE, 2008d), in 2005, private industrial companies invested EUR 1,033 million on environmental protection.<sup>3</sup> 48.3% of this investment was in "Independent equipment and facilities" (which can be considered a proxy for "end-of-pipe" solutions), whereas the remaining 51.7% was in "Integrated equipment" (a proxy for "cleaner production" solutions). Companies also had current expenditures equal to EUR 1,327 million (4% more than in 2004). According to some estimates, in 1997, the overall environmental investment in Spain was EUR 3,800 million, and it could lie between 6,800 and 16,866 million Euros in 2010 (COTEC, 2003).
- 34. According to Fundación Entorno (2000), in 1998 there were 135,000 people working in the environmental sector in Spain. The total turnover of the sector was EUR 8.1 billion. 46% of this was on water provision and treatment, and 23% on waste management. It was estimated that, by 2002, the sector would employ about 220,000 people, and would have an annual turnover of EUR 13.2 billion.

#### 1.4 Inter-linkages between innovation and the environment in Spain

- 35. There is a clear interrelation between innovation and the environment. Innovation and research can provide knowledge and opportunities for improved environmental performance, and more stringent environmental goals can act as drivers for further research and technological innovation (Johnstone, Labonne, 2006). Hascic *et al.* (2008) found a strong relationship between patenting in environmental technologies and general propensity to patent, government expenditures on environmental R&D, and private (but not public) pollution abatement and control expenditures. For the case of Spain, COTEC (2003) reviewed the evolution of innovations related to sustainable development.
- 36. However, only part of the R&D and technological innovation activities are directly related to the environment. As the importance attributed to the environmental questions has been increasing during the last decades, so has environment gained importance within research and innovation priorities. As shown in Figure 1, R&D expenditures dedicated to environment in Spain have not only been growing in absolute terms, but also in relative terms (from 1.0% in 1980 to 10.5% in 2001).

<sup>3.</sup> This was 9.1% more than in 2004. Data is also available for 2006 (EUR 1,210 million), but data of 2005 is used for consistency, since this is the last year for which data is available for some of the main variables analysed in this report.

In all cases, this refers to investments by industrial companies [i.e. NACE (General Industrial Classification of Economic Activities within the European Communities) sections C, D and E].

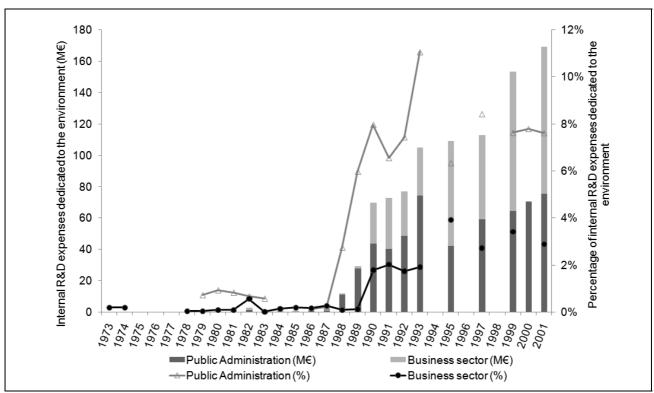


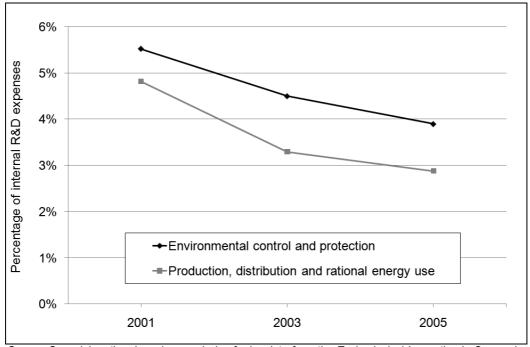
Figure 1.Internal R&D expenditures dedicated to the environment in Spain 1973 -  $2001\,$ 

Source: INE, 2008b.

37. For recent years, some contradictory evidence has emerged from the *Technological Innovation in Companies Survey*, conducted by the National Institute of Statistics (INE, 2008c). According to data from this Survey, also provided by the Spanish National Institute of Statistics, from 2001 to 2005, the percentage of internal R&D expenditures dedicated to "Environmental control and protection" by private companies fell from 5.5% to 3.9%, along with a decline in the internal R&D expenditures devoted to "Production, distribution and rational energy use" (Figure 2). No significant differences are found when analysing these results according to company size.

Figure 2.Percentage of internal R&D expenditures dedicated to environment and energy by companies in Spain

2001 - 2005



Source: Own elaboration, based on analysis of microdata from the *Technological Innovation in Companies Survey* for 2001, 2003 and 2005 as provided by the Spanish National Institute of Statistics.

- 38. Although the original source for Figures 1 and 2 was the same (the *Technological Innovation in Companies Survey*), the data are not directly comparable, because the results in the second case derive from the analysis of microdata, for which no weighting factors have been applied.<sup>4</sup>
- 39. In relation to public R&D expenditures, SISE (2007) further reported that between 1995 and 2005, the Spanish public R&D budget devoted to "Control and care of the environment" increased from 2.6% to 3.0%.
- 40. The Instituto de Innovación Empresarial (2005) also conducted a survey of 25 innovative Spanish companies and asked them to select which was the main impact of their innovation practices. Among improved processes/products, quality of life and sustainability, 26% chose the latter.
- 41. Some evaluation of the possible environmental consequences of R&D and technological innovation may be derived from the *Technological Innovation in Companies Survey*, conducted annually by the National Institute of Statistics, and from the *Panel on Technological Innovation* (PITEC) (SISE, 2008b), which is based on this Survey. This provides micro panel data for recent years on companies' behaviours in relation to R&D and technological innovation. Data undergo a process of anonymisation, which removes information that could be used to identify the respondents. However, according to FECYT (2007): "in view of the anonymisation method applied, the expected estimation bias is small".

5. As defined by the Eurostat Nomenclature for the Analysis and Comparison of Scientific Programmes and Budgets (NABS).

<sup>4.</sup> Microdata provided were also anonymised by the National Institute of Statistics, but this should not have a significant incidence on the conclusions.

- 42. The 2005 microdata are analysed here. The Survey was conducted among 12,179 companies.<sup>6</sup> Companies were asked about the importance of several effects of innovation in the company in the period 2003-2005.<sup>7</sup> Among the possible effects were: "Use of less materials and energy per unit produced" and "Reduced environmental impact or improvement in health and security". The average answer was 2.97 for the former and 2.85 for the latter,<sup>8</sup> which indicates a low incidence of innovation on these two positive environmental effects (incidentally, these impacts were the two lowest ranked from the 9 possible effects: higher quality, increased production capacity, lower labour costs per unit, etc.).<sup>9</sup> It is also interesting to note that companies undertaking simultaneously R&D and technological innovation activities have slightly lower average values for these two effects *i.e.* better environmental consequences but the incidence is still low.<sup>10</sup>
- 43. It has also been found that, as companies get bigger (measured as the number of employees), the relevance of the environmental effects of their innovation strategies tends to increase (Figure 3). However, this can be observed in most of the effects covered by the Survey, since big companies generally tend to have more technological innovation anyway.

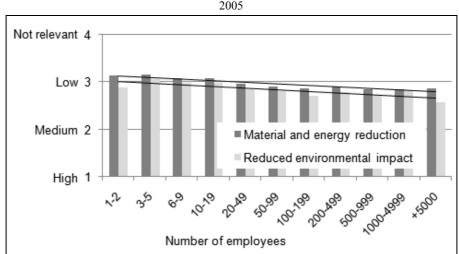


Figure 3. Environmental effects of innovation, according to company size

Note: Possible answers for each one of the effects are: 1=High, 2=Medium, 3=Low, 4=Not relevant. Companies have been classified according to the number of employees and for each category the average answer has been calculated for each of the effects.

Source: Own elaboration, based on microdata from the Panel on Technological Innovation (SISE, 2008b).

<sup>6.</sup> From these, only data from on-going companies have been analysed (12,099 companies) -i.e. firms that have closed down or merged with others have been excluded from the analysis.

<sup>7.</sup> The questionnaire can be downloaded at: <a href="http://sise.fecyt.es/Estudios/PITEC/cuestionario05.pdf">http://sise.fecyt.es/Estudios/PITEC/cuestionario05.pdf</a>. The definition of "innovation" in the questionnaire refers to innovation as for the company, not necessarily for the sector or the market, and no matter if the innovation was initially developed by the company or by others.

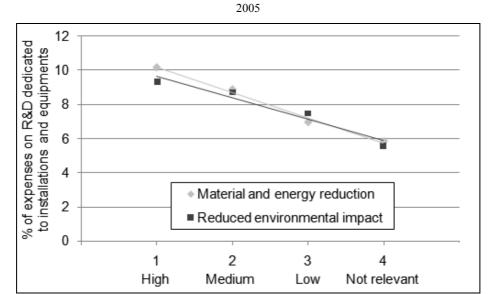
<sup>8.</sup> Possible answers are: 1=High, 2=Medium, 3=Low, 4=Not relevant.

<sup>9.</sup> Similar conclusions are obtained if respondents replying "Not relevant" are not considered.

<sup>10.</sup> According to data provided by the National Institute of Statistics from the *Technological Innovation in Companies Survey*, in 2005, average values for the two mentioned effects of innovation were in both cases 5.7% lower for companies undertaking R&D and technological innovation, than for companies undertaking innovation alone.

44. On the other hand, companies were asked to classify their internal R&D expenditures in four categories (current expenditures; equipment and instrumentation; land and buildings; and specific software). As shown in Figure 4, the percentage of expenditures dedicated to equipment and instrumentation correlates positively with the importance attributed to the two environmental effects analysed, which is coherent with their importance within the total environmental expenditures.

Figure 4. Percentage of internal R&D expenditures dedicated to equipment and instrumentation, and environmental effects



Note: Possible answers for each one of the effects are: 1=High, 2=Medium, 3=Low, 4=Not relevant. For each of these answers, the value of the percentage of expenditures dedicated to equipment and instrumentation has been averaged.

Source: Own elaboration, based on microdata from the Panel on Technological Innovation (SISE, 2008b).

45. The declared number of patents in the *Technological Innovation in Companies Survey* also correlates with the two positive environmental effects of innovation asked for in the Survey (Figure 5). This suggests positive environmental consequences of innovation. However, these results are influenced by the amount of technological innovation undertaken by companies (because companies which patent more often tend to exhibit a higher number of the effects asked for in the survey).

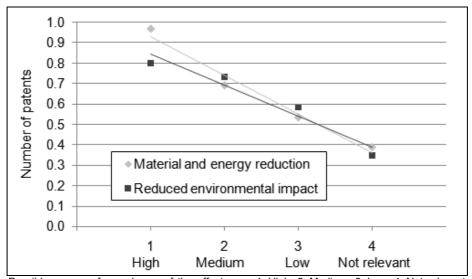


Figure 5. Number of patents by companies and environmental effects of innovation 2005

Note: Possible answers for each one of the effects are: 1=High, 2=Medium, 3=Low, 4=Not relevant. For each of these answers, the value on the number of patents has been averaged.

Source: Own elaboration, based on microdata from the Panel on Technological Innovation (SISE, 2008b).

- 46. Environmental policies are also a driver for R&D activities. In the *Annual Survey on Company Expenditure on Environmental Protection* (INE, 2008d), companies were asked about their R&D expenditures related to the environment. This could potentially be analysed by economic sectors and by company size, and would probably lead to some conclusions regarding environmentally driven R&D. Unfortunately, these data have not been made available by the National Institute of Statistics, due to confidentiality problems associated with there being an insufficient number of respondents.
- 47. Innovation and environmental policies are also in some aspects interrelated. Improving environmental performance is one of the goals of some research and innovation programmes (such as the *Strategic Action on Energy and Climate Change*, within the National R&D&I Plan; or the thematic area on Environment, Sustainable Development and Renewable Energies, within the Cenit Programme). In parallel, some environmental actions are promoted through the use of R&D resources, such as the subsidy programme of the Ministry of the Environment for the development of R&D and technological innovation environmental projects (regulated by Orden MAM/960/2005, of 30 March, plus annual calls for proposals) or the technology-related projects financed by the Centre for Industrial Technology Development (CDTI). However, the interrelation between innovation and environmental policies could still be further strengthened.

### 1.5 The Spanish Corporate Income Tax

48. The Corporate Income Tax is the third most important source of revenue for the Spanish State Budget, after the Personal Income Tax and the Valued Added Tax. Table 1 shows the recent evolution of the number of taxpayers and the revenue raised. From 2000 to 2005, the number of declarations increased by 43.4%, whereas the revenue collected rose by 93.7%.

<sup>11.</sup> The CDTI has financed over 50 environmental technology-related projects, with an average budget of around EUR 40 million and a financial contribution of EUR 20 million to environmental projects only (OECD, 2008).

Table 1. Number of declarations and revenue raised by the Corporate Income Tax 2000-2005

Year	Number of declarations	Revenue (net tax payable) (Thousand Euros)
2000	876,530	19,591,205
2001	928,897	22,648,911
2002	1,008,744	23,673,726
2003	1,083,564	27,841,384
2004	1,167,974	32,695,452
2005	1.256.998	37.955.307

Source: Ministerio de Economía y Hacienda (2008).

- 49. The Corporate Income Tax is regulated by the Royal Legislative Decree 4/2004, of 5 March. More recently, a number of amendments were introduced by Law 23/2005, of 18 November, Law 35/2006, of 28 November and Law 16/2007, of 4 July. This Section explains the main characteristics of the tax as of 2008.
- 50. Taxable income includes any profit from the business activities (art. 4). The Law establishes several methods for determining taxable income (art. 10.2). Under the direct assessment method (which generally applies), taxable income is defined as the difference between period revenues and expenses, as disclosed in the financial statements, and adjusted in accordance with tax principles, which generally coincide with accounting principles.
- 51. The accrual method is generally applicable. In general, business expenses are deductible if properly recorded. Depreciation qualifies as a deductible expense (art. 11.1) and in certain cases accelerated depreciation is allowed (art. 11.2). Additionally, there are a number of non-deductible expenses (art. 14). As a general rule, losses may be carried forward to offset taxable income in the following fifteen years (art. 25.1).
- 52. The general tax rate in 2008 is 30% (art. 28 and 8th additional disposition). Special rates are applicable to certain entities, such as those with a net turnover less than EUR 8 million (art. 108): 25% on the first EUR 120,202.41 of taxable income, thereafter, 30% (art. 114).
- 53. After applying the tax rate, several tax credits may be applied (art. 35–43), such as partial or total double taxation relief for foreign dividends and capital gains, investments made in certain assets of cultural interest, in certain facilities for handicapped people, in Spanish motion picture or audiovisual productions, expenses related to international trade fairs, investments made in the publication of books, expenses derived from hiring handicapped workers, etc. Among these deductions are the tax credit for investments on environment protection (art. 39) and the tax credit for expenses incurred on scientific R&D and technological innovation (art. 35). These two tax credits are the focus of this case study, and will be explained in more detail below.
- Most of the tax credits started to be reduced in 2007, and will be phased out by 2011, 2012 or 2014, depending on the case. This is in line with the Spanish *National Reform Programme* (Ministerio de la Presidencia, 2005) following the renewed Lisbon Strategy, which aimed at simplifying the Corporate Income Tax. The 2006 report on the evolution of the *National Reform Programme* argued for progressive suppression of the tax deductions in the Corporate Income Tax as a way to reduce "fiscal dirigisme"

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<sup>12.</sup> For a detailed description of the regulation of the Spanish Corporate Income Tax, see Ministerio de Industria, Comercio y Turismo (2006).

<sup>13.</sup> Hereafter, this will be referred to as R&D&I tax deduction.

(Unidad Permanente de Lisboa, 2006). The *Memoria Justificativa* (compulsory report included in any draft Law sent to the Spanish Parliament) of the Law 35/2006 stated that "the reform of the Corporate Income Tax (following the neutrality principle) reduces gradually, until complete elimination, those deductions that have turned out to be inefficient and that distort economic decisions by taxpayers. <sup>14</sup> Doing so it will achieve greater equity in the application of the Tax, greater efficiency in the allocation of economic resources, greater neutrality in the financing sources for investments and greater fiscal coordination at the international level".

- 55. In general, the above-mentioned tax credits are limited to 35% of the gross tax payable, net of the tax credits regulated in articles 30–34 of the Law. Any excess above this limit can be carried forward for use in the following ten years. In both cases, there are some exceptions that affect the R&D&I tax credit, which are commented in Section 2.1. In some cases, the carry-forward period can be counted from the first year in which a company reports taxable income (art. 44.1). Thus, companies making use of these tax credits have to declare the generated deduction during the corresponding fiscal year, the amount applied and the amount pending for application in subsequent years (which is the difference between the two previous concepts).
- 56. Assets which have benefited from the tax credits listed above (such as installations to prevent pollution or new research equipment) must function for at least five years (three in the case of movable assets), or during their useful life (if this was shorter) (art. 44.3).
- 57. The regulation of the Spanish Corporate Income Tax was further developed by the Royal Decree 1777/2004, of 30 July. Although this Royal Decree has been amended on several occasions, the provisions regarding the two tax credit schemes analysed in this case study have not changed.

### 2. Environmental consequences of R&D and technological innovation incentives

This Chapter analyses whether the R&D&I incentives contained in the Spanish Corporate Income Tax have any environmental consequences. The tax credit scheme is first described in some detail (Section 2.1). An analysis of the evolution of the total amount of this deduction and its importance within the Corporate Income Tax then follows (Section 2.2). From different points of view, and drawing on different sources and methodologies, R&D expenses and tax credits are analysed to assess their incidence on the environment (Section 2.3). The Chapter concludes with a qualitative discussion of the policy implications (Section 2.4).

#### 2.1 R&D and technological innovation deduction within the Spanish Corporate Income Tax

- 59. The Corporate Income Tax includes a tax credit on expenses both current and capital incurred on R&D and technological innovation. This section starts with a brief summary of the evolution of the tax credit regulation. Then it provides comprehensive details of its regulation as of 2008, <sup>15</sup> and illustrates its application with a hypothetical example (Box 1).
- 60. Regulation in Spain in relation to fiscal incentives to R&D was basically set up in 1979. Law 43/1995, of 27 December, implied a major reform and is considered as the origin of the present system. It established a deduction based on the R&D expenses, plus an additional deduction for R&D

<sup>14.</sup> The alleged distorting character of these tax credits is also used as an argument for suppression in the explanatory preamble of the Law.

For more details, see Royal Legislative Decree 4/2004, of 5 March, and its subsequent amendments. Rivas (2006a) also provides a detailed review of the legislation, plus comments on doctrine and jurisprudence.

expenses exceeding the average R&D expenses of the two previous fiscal years. Law 55/1999, of 29 December, increased the deduction from 20% and 40% of the R&D expenses to 30% and 50%, respectively. It also introduced an additional 10% deduction of expenses on R&D staff, and on R&D projects entrusted to universities and public research bodies. Further, it created a deduction on expenses on technological innovation and changed the global limit for deductions aimed at fostering different activities (among which is the R&D and technological innovation deduction) when the deduction on R&D&I together with that on Information and Communication Technologies exceed 10% of the gross tax payable. Law 24/2001, of 27 December, extended the deduction to R&D capital expenses, excluding buildings. It also extended to 15 years the period in which the generated deductions can be carried forward. Law 7/2003, of 1 April, introduced the concept of *reasoned reports*. Law 62/2003, of 30 December, increased the additional deduction on expenses on R&D staff and on R&D projects entrusted to universities and public research bodies from 10% to 20%. Other minor reforms have also taken place. 16

- 61. The Corporate Income Tax Law (art. 35.1.a) defines *research* as "original and planned investigation whose aim is to discover new knowledge and a superior understanding in the scientific and technological fields". It also defines *development* as "the application of results from research or from any other kind of scientific knowledge to the manufacturing of new materials or products or to the design of new processes and production systems, as well as to a substantial technological improvement of already existing materials, products, processes or systems" (art. 35.2.a). *Technological innovation* is further defined as "the activity that results in a technological advance in the obtaining of new products or production processes or substantial improvements of the already existing ones. Products or processes shall be considered as new if their characteristics or applications differ substantially from a technological perspective from the already existing ones." (art. 35.1.a). The Law (art. 35.3) also includes a negative definition, indicating different activities that cannot be considered as "technological innovation".
- As regards the configuration of the tax credit, there is a deduction of 30% of the expenses on R&D incurred during a given year. In case these expenses exceed the average of the previous two years, a 50% deduction is applied to the excess, which makes this tax credit both volume-based and incremental (OECD, 2007e). In addition, an extra 20% tax credit applies for expenses on qualified researchers assigned exclusively to R&D activities, and for expenses related to projects entrusted to Universities, public research bodies or innovation and technological centres, as legally defined (art. 35.1.c.1). There is also a tax credit for 10% of the investments on fixed or intangible assets; insofar as these are used exclusively for R&D activities (art. 35.1.c.2). These investments are considered to be made when the assets are put into operation (art. 35.1.b), and they have to remain in possession of the taxpayer until they have accomplished the purpose for which they were acquired. This deduction cannot be combined with some of the other tax credits included in the Spanish Corporate Income Tax (art. 35.1.c.2). The base for this deduction excludes expenditures on buildings or land, but includes depreciation of goods attached to R&D activities (art. 35.1.b).
- 63. The Corporate Income Tax also includes a 10% tax credit for expenses on technological innovation incurred a given year (art. 35.2.a). The base for this deduction includes expenditures such as those on industrial design, engineering related to production processes, acquisition of advanced technology in the form of patents or licenses, obtaining the ISO 9000 and analogous certificates, etc. (art. 35.2.b). The

<sup>16.</sup> For more details on the evolution of the Spanish regulation on fiscal incentives to R&D and technological innovation, see Rivas (2006a).

<sup>17.</sup> Although the Law repeatedly refers to "products", *binding consultation* V0086-00 stated clearly that "services" have to be considered within this definition.

<sup>18.</sup> Rivas (2006b) analysed the interpretation of these definitions.

tax credit is 15% in the case of expenses related to projects entrusted to universities and other agencies, public research bodies, or innovation and technological centres.

- 64. R&D and technological innovation expenses incurred abroad may qualify for this tax credit, provided that the main R&D activity takes place in Spain and the expenses incurred abroad do not exceed 25% of the total (art. 35.1.b, 35.2.b).<sup>19</sup>
- 65. In order for expenses to be considered eligible for the tax credit, they have to be "specifically individualised by projects" (art. 35.1.b, 35.2.b). Also, the base for the tax credit has to be reduced by 65% of any subsidies received to encourage such expenses or investments (art. 35.1.b, 35.2.b).
- As explained in Section 1.5, tax credits regulated in articles 35–43 of the Corporate Income Tax Law are globally limited to 35% of the gross tax payable, net of the tax credits regulated in articles 30–34. However, this limit is increased to 50% when tax credits regulated by articles 35 (R&D and technological innovation) and 36 exceed 10% of the gross tax payable, again net of the tax credits regulated in articles 30–34. Also for tax credits regulated by articles 35 and 36, any excess above the relevant limits can be carried forward for use in the following 15 years (instead of the normal 10 years for the rest of tax credits).
- 67. With the aim to increase legal security for firms, and to encourage them to make use of the R&D&I tax credit, the Law (art. 35.4) allows firms to on a voluntary basis ask the Ministry of Industry, Tourism and Trade for *reasoned reports* (informes motivados), or to formulate *binding consultations* (consultas vinculantes) and to apply for *preliminary valuation agreements* (acuerdos previos de valoración) to the Tax Administration. Reports issued by the Administration in response to these requests are legally binding for the Tax Administration.
- 68. Binding consultations can be addressed in a written form to the Directorate General for Taxation (Ministry of the Economy and Finance).<sup>20</sup> They are regulated by the General Taxation Law (Law 58/2003, of 17 December, art. 88–89), and can be placed by taxpayers, professional associations and others on the application or interpretation of the tax system. As their name indicates, responses to these questions are binding for the Tax Administration in relation to the one posing the question and to any other in the same situation. A number of relevant clarifications on the scope, definitions and practical application of the R&D and technological innovation tax credit have now been made.<sup>21</sup>
- 69. As regulated by the General Taxation Law (art. 91), *Preliminary valuation agreements* are coordinated and approved by the Tax Agency, specifically by the Department of Financial and Tax Inspection. Their aim is to assess expenses and investments linked to R&D and technological innovation projects, *before* they are made. The procedure finishes by approving the applicant's proposal, by approving an alternative suggested by the applicant during the proceedings, or by dismissing it. The regulation of *preliminary valuation agreements* was further developed by Royal Decree 1777/2004, of 30 July (art. 30).

<sup>19.</sup> This provision was declared illegal by Judgment of the Court of Justice of the European Communities (Third Chamber) of 13 March 2008 in Case C-248/06, because it is less favourable for expenditures taking place outside Spain, than for those taking place within the country. This fails to comply with articles 43 and 49 of the EC Treaty on freedom of establishment and freedom to provide services, and the corresponding articles in the Agreement on the European Economic Area.

This provision is still in force at the moment of finishing this report.

<sup>20.</sup> They can be accessed at: <a href="http://petete.meh.es/Tributos/consuvin">http://petete.meh.es/Tributos/consuvin</a>.

<sup>21.</sup> COTEC (2004) includes a selection of *binding consultations* related to the application of the R&D&I tax credit.

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- 70. Reasoned reports (art. 35.4.a) were instituted in 2003 by Law 7/2003, of 1 April, and can be applied for to the Ministry of Industry, Tourism and Trade. Their purpose is to state the compliance of the scientific and technological criteria required to qualify for the tax credit on R&D&I.
- 71. Regulation on *reasoned reports* was further developed by Royal Decree 1432/2003, of 21 November, which established four different types of reports, according to different possible final uses. In practice, two of these have been merged. Type A reports are used for either new or ongoing projects (in the case of multiannual projects). They check that the project has been executed, they classify the nature of the activities as R&D or technological innovation, and they verify the expenses that are declared. These are the reports relevant for this case study, since they are the ones used to claim for the tax credit. Type B reports are used for *binding consultations* and *preliminary valuation agreements*, whereas Type D reports verify the requirements to qualify for the the reduction in the employers' social security contributions for hiring R&D staff (Ministerio de Industria, Turismo y Comercio, 2007). One copy of the report is sent to the applicant; a second one is sent to the Tax Administration.

#### Box 1. Example of application of the R&D and technological innovation deduction

A hypothetical company undertook in 2008 an R&D and technological innovation project. This implied the following R&D expenditures:

- A. Salary of a researcher dedicated full time to the project: EUR 35,000.
- B. Other salaries from technical personnel attributable to the project: EUR 30,000.
- C. Cost of consumables used by the company in its tests: EUR 5,000.
- D. Cost of services outsourced to an engineering firm: EUR 15,000.
- E. Cost of technical development outsourced to a public research centre: EUR 45,000. This received a 10% public subsidy. The base for the tax credit has to be reduced by 65% of subsidies received.
- F. Investment in testing and measuring equipment used exclusively in the project: EUR 35,000.

There was also the cost of making a prototype (EUR 8,500), which was considered a technological innovation cost (G). This was outsourced to a public research centre.

As regards the R&D deduction, the base for the deduction is concepts A to E, which add up to EUR 127,075 [35,000 + 30,000 + 5,000 + 15,000 + 45,000 - 4,500 \* 65%]. Considering that the company had spent an average of EUR 30,000 on R&D activities during the previous two years, the excess base – which entitles for a 20% higher deduction – is EUR 97,075 [127,075 - 30,000]. Law 35/2006, of 28 November, reduced the amount of the tax credits by 15% from 2008. Therefore, the deduction would be EUR 48,907 [(30% \* 30,000 + 50% \* 97,075)\*(1 - 15%)].

An additional 20% deduction would apply in the case of concepts A and E, being EUR 13,103 [20% \* (35,000 + 42,075) \* (1 - 15%)].

The deduction for the investments made (F) would be EUR 2,975 [35,000 \* 10% \* (1-15%)].

Thus, the R&D deduction would be the sum of the three concepts: EUR 64,985 [48,907 + 13,103 + 2,975].

The technological innovation deduction would be EUR 1,084 [8,500 \* 15% \* (1 - 15%)]. So, the total R&D and technological innovation deduction would be EUR 66,069 [64,985 + 1,084].

Tax credits regulated in articles 35-43 of Royal Legislative Decree 4/2004 are globally limited to 35% of the gross tax payable, net of the tax credits regulated in articles 30-34 (assumed to be zero here). This limit is increased to 50% when tax credits regulated by articles 35 (R&D&I) and 36 (also assumed to be zero here) exceed 10% of the gross tax payable, again net of the tax credits regulated in articles 30-34.

If the company's tax base was EUR 190,000 and no special tax rate was applicable, its gross tax payable would be EUR 57,000 [190,000  $^{*}$  30%]. The 10% limit is exceeded [66,069 > 10%  $^{*}$  57,000], and consequently the applicable limit would be 50% and the maximum applicable deduction during 2008 would be EUR 28,500 [57,000  $^{*}$  50%].

Thus, in the case no other tax deductions apply, the net tax payable would be EUR 28,500 obtained by subtracting the applied deduction to the gross tax payable [57,000-28,500]. The rest of the generated deduction would be EUR 37,569 [66,069-28,500], and it would be available for application during the following fifteen years.

Source: Own elaboration, based on CIDEM (2005).

- 72. Applications for *reasoned reports* have to be submitted for individual projects, detailing all included activities and any expense or investment attached to them (art. 2, Royal Decree 1432/2003), with a distinction between those related to R&D and those related to technological innovation (art. 5.2). Applications should follow a standard form. The application must also include a technical qualification report of the activities, with determination of the expenses and investments in R&D and technological innovation, issued by an organisation accredited by the National Accreditation Agency (ENAC) (art. 5.3).
- According to OECD (2007b), "since 2000, Spain has had the most generous tax relief system in the OECD in respect of technology and R&D spending". It ranks first as regards incentives for large firms and second in incentives for small ones (OCDE, 2003). However, despite this generosity, only a limited number of firms use this tax deduction. Subsequent sections detail some of the reasons underlying this limited use.
- 74. Law 35/2006, of 28 November, introduced several changes to the Corporate Income Tax, one of them being the phasing out of this tax credit. It will disappear as of 1 January 2012, although it will still be possible to apply deductions pending from previous years. This Law also reduced the amount of the tax credits 8% by 2007, and 15% from 2008.
- 75. The intensity by which the tax relief system fosters R&D and technological innovation in Spain will clearly diminish with the reduction and subsequent phasing out of the current tax credit, although this will be compensated to some degree by the above-mentioned reduction in employers' social security contributions for full-time R&D staff. In this sense, Law 35/2006 (23<sup>rd</sup> additional disposition) stipulates that by 2011, the Government will evaluate the effectiveness of the different R&D and technological innovation incentives and support measures in place between 2007 and 2011 and, if necessary, amend them to better adapt to the needs of the Spanish economy.

## 2.2 Use and scope of the tax credit on R&D and technological innovation

- 76. Before focusing on the environmental consequences of the tax credit on R&D&I expenses, a discussion of its scope and effectiveness is needed.
- 77. For recent years, Table 2 details the number of Corporate Income Tax declarations that made use of this deduction, the initial previsions in the State budget regarding its total amount, and the quantity that was actually deducted. Table 2 also shows the relatively low importance of this tax credit in terms of percentage of declarations that made use of it and in terms of the percentage of the total revenue raised by the Corporate Income Tax.

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<sup>22.</sup> For a description of the innovation incentives in Spain as compared to the international situation, see Rivas (2007).

Table 2. Main figures for the tax credit on R&D and technological innovation 2000 - 2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of declarations	3,112	3,836	3,608	3,754	3,750	3,677	-	-	-
Provision in the State budget (million Euros)		248.47	176.99	170.98	159.96	215.55	261.44	375.98	382.74
Total amount deducted (million Euros)	184.25	219.97	204.83	250.91	299.78	348.09	-	-	-
Average deduction (thousand Euros)	59.21	57.34	56.77	66.84	79.94	94.67			
Percentage of declarations	0.36	0.41	0.36	0.35	0.33	0.31	-	-	-
Percentage of overall net tax payable raised by the tax	0.94	0.97	0.87	0.90	0.92	0.91	-	-	-

Source: Spanish State Budget, 2001 - 2008; Ministerio de Economía y Hacienda (2003, 2004b, 2005b, 2006b, 2007b).

78. As seen in Figure 6, both the corresponding expense item in the State budget and the amounts actually deducted have been generally increasing for the last years, the former usually being exceeded by the latter. However, the total amount deducted in relation to the overall revenue raised by the tax has remained fairly constant (Table 2).

Figure 6.Tax credit on R&D and technological innovation according to the State budget and to actual amount finally deducted

2000 - 2008 450 400 National budget 350 Actual deduction Million Euros 300 250 200 150 100 50 0 2000 2001 2002 2003 2004 2005 2006 2007

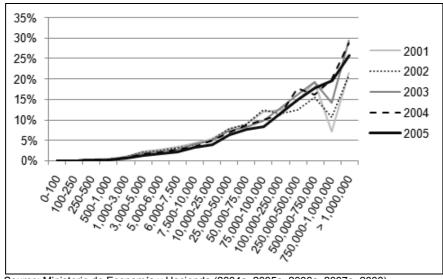
Source: Spanish State Budget, 2001 - 2008; Ministerio de Economía y Hacienda (2003, 2004b, 2005b, 2006b, 2007b).

79. The percentage of companies making use of the tax credit broadly grows as their size increases (Figure 7.a), along with the average size of the deductions (Figure 7.b). These two factors combine to make it possible for larger companies to capture a high share of this tax credit (*e.g.* in 2005, 93.3% of all the deducted amount benefited companies with a net turnover higher than EUR 10 million, whereas they represented only 1.9% of all declarations and 72.9% of the total net tax payable raised by the Corporate Income Tax). This confirms that the R&D&I tax credit mainly benefits large companies, as some previous researchers had already pointed out (Marra, 2004; Rivas, 2006b).

Figure 7. Use of the tax credit on R&D and technological innovation in relation to the firms' net turnover

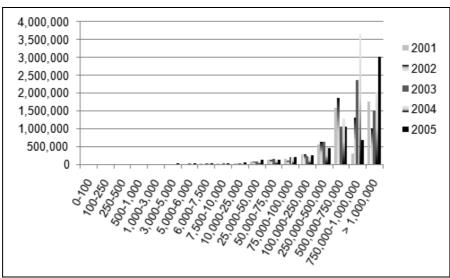
2001 - 2005, net turnover in thousand Euros

#### a) Percentage of companies of each size making use of the tax credit



Source: Ministerio de Economía y Hacienda (2004a, 2005a, 2006a, 2007a, 2008).

#### b) Average deductions by company size (EUR)



Source: Ministerio de Economía y Hacienda (2004a, 2005a, 2006a, 2007a, 2008).

80. It is also interesting to analyse the regional distribution of the application of the tax credit on R&D and technological innovation.

Table 3. Regional distribution of the tax credits on R&D and technological innovation  $2005\,$ 

Autonomous	Net turnover of industrial companies (billion Euros)	Declarations	Deduction applied (thousand Euros)		
Community	(A)	(B)	<b>(C)</b>	(B)/(A)	(C)/(A)
Andalucía	54.08	227	6,739	4.20	124.61
Aragón	24.13	174	5,850	7.21	242.41
Principado de Asturias	13.19	66	6,318	5.00	479.02
Canarias	7.75	4	176	0.52	22.71
Cantabria	7.41	51	1,285	6.88	173.36
Castilla - La Mancha	22.78	88	2,088	3.86	91.64
Castilla y León	32.34	182	9,719	5.63	300.49
Catalunya	132.42	1,260	78,277	9.52	591.12
Extremadura	5.71	20	588	3.51	103.05
Galicia	32.47	163	5,676	5.02	174.80
Illes Balears	4.18	31	93	7.41	22.24
Comunidad de Madrid	61.57	728	157,557	11.82	2,559.04
Región de Murcia	13.47	83	4,151	6.16	308.19
Navarra	17.01	8	15,696	0.47	922.75
País Vasco	50.93	62	38,303	1.22	752.02
La Rioja	5.01	56	1,082	11.17	215.77
Comunitat Valenciana	55.97	474	14,489	8.47	258.87
Total	540.44	3,677	348,085		

Source: Agencia Tributaria (2007); INE (2007b).

- 81. If the number of declarations making use of the R&D&I tax credit is divided by the net turnover of industrial companies [(B)/(A) in Table 3], an estimate of the relative importance of the deduction among regions is obtained. Also interesting is to compare the amount deducted and the net turnover [(C)/(A) in Table 3]. From these variables, it is possible to calculate an indicator of relative dispersion such as the relative standard deviation (RSD), being 56.7% for the first case, and 135.6% for the second. This shows greater dispersion between Autonomous Communities regarding amounts deducted than regarding number of declarations. In Section 3.2, these results are compared to those obtained for the environmental investments deduction in order to check if the participation of Autonomous Communities in some aspects of the administration of the tax deduction has any significant incidence on its regional dispersion.
- 82. As mentioned above, since fiscal year 2003, companies can ask the Ministry of Industry, Tourism and Trade for *reasoned reports* regarding this tax credit. The number of applications has increased steadily ever since; so has the number of reports issued (Table 4):

Table 4. Number of *reasoned reports* applied for and issued 2004 - 2007

	2004 (Fiscal year 2003)	2005 (Fiscal year 2004)	2006 (Fiscal year 2005)	2007 (Fiscal year 2006)
Number of applications	298	561	905	1,215
Number of reports issued	252	496	696	=

Source: Ministerio de Industria, Turismo y Comercio (2007); Gutiérrez (2008).

83. More than 90% of these are type A reports (the ones linked to the R&D&I tax deduction, see Section 2.1). Table 5 shows the distribution of these reports according to the type of expenditures included.

Table 5. Number and nature of Type A issued  $reasoned\ reports$  2004 - 2006

	2004 (Fiscal year 2003)	2005 (Fiscal year 2004)	2006 (Fiscal year 2005)
R&D	136	309	423
Technological innovation	90	134	214
Both	8	19	35
Total	234	462	672

Source: Ministerio de Industria, Turismo y Comercio (2007).

84. Total and average expenditures included in Type A reports are shown in Table 6.

Table 6. Total and average expenditures included in Type A issued reasoned reports 2004 - 2006

	Total exp	penditure (milli	on EUR)	Average (EUR)			
	2004 (FY 2003)	2005 (FY 2004)	2006 (FY 2005)	2004 (FY 2003)	2005 (FY 2004)	2006 (FY 2005)	
R&D	202.6	233.5	338.9	1,457,770	722,812	606,113	
Technological innovation	52.7	124.1	221.0	566,237	827,586	856,446	
Total	255.3	357.6	559.9	1,090,983	774,040	833,185	

Note: FY = Fiscal year.

Source: Ministerio de Industria, Turismo y Comercio (2007); Gutiérrez (2008).

- 85. Table 6 illustrates that expenditures on technological innovation have been gaining importance both in absolute and relative terms, in relation to expenditures on R&D. The average size of the projects has been declining for R&D, while increasing for those classified as Technological innovation. The average size of the projects is also relatively high. For fiscal year 2005, only 17% of the projects were below EUR 100,000, whereas 15% were above EUR 1 million (Ministerio de Industria, Turismo y Comercio, 2007).
- 86. Annual estimations by the Ministry of Industry, Tourism and Trade on the deductions derived from projects supported by *reasoned reports* are shown in Table 7. The percentage of the total amount deducted (Table 2) supported by them is increasing from 34.4% in fiscal year 2003 to 44.6% in fiscal year 2005. The average amount deducted per project with a Type A report is also much higher than the mean deduction, which means that larger projects tend to apply for *reasoned reports* more than smaller ones. This is not surprising, considering that there is more at stake and considering the costs for firms to prepare such reports.

Table 7. Estimated deductions by projects with Type A reasoned reports 2004 - 2006, million Euros

	2004	2005	2006
	(Fiscal year 2003)	(Fiscal year 2004)	(Fiscal year 2005)
R&D	81.1	93.4	135.6
Technological innovation	5.3	12.4	22.1
Total	86.3	105.8	157.7

Source: Ministerio de Industria, Turismo y Comercio (2007); Gutiérrez (2008).

87. The percentage of SME<sup>23</sup> among the companies applying for *reasoned reports* has been declining slightly, from 48.8% in fiscal year 2004 to 44.9% in fiscal year 2006 (Gutiérrez, 2008). For 2005, Table 8 shows the distribution of the number of applications and reports issued, according to company size. Projects presented by SME (in fiscal year 2005) accounted for only 12% of total R&D expenditures validated by *reasoned reports*, and 5% of expenditures on technological innovation (Ministerio de Industria, Turismo y Comercio, 2007).

Table 8. Number of applications and *reasoned reports* issued, according to company size

Fiscal year 2005

	Number of applications	%	Number of reports issued	%
SME	635	70.1	489	70.2
Non SME	270	29.9	207	29.7
Total	905	100.0	696	100.0

Note: This table includes all reports, not only Type A. Source: Ministerio de Industria, Turismo y Comercio (2007).

- 88. The number of reports issued distributed by Autonomous Communities correlates well with the number of declarations asking for this tax credit coming from each.<sup>24</sup> It also correlates positively with the amount deducted in each Autonomous Community and with the net turnover by industrial companies. Thus, in relative terms, the use of *reasoned reports* by companies is quite even among the different Spanish regions.
- 89. Recently, a survey conducted among 331 companies that applied for *reasoned reports* in 2006, pointed out that, for most companies (81%), the main reason to apply was legal security (Gutiérrez, 2008).
- 90. As mentioned, although the tax credit on R&D&I is generous compared to what is found in other countries, it is used by a limited number of companies. Only between 40% and 50% of Spanish innovative firms doing R&D (OECD, 2007e) and only 20% of R&D and technological innovation projects (COTEC, 2005) are estimated to have benefited from this tax credit in recent years. In 2005, the amount of the tax credit was only 6.3% of total internal expenditure on R&D activities by private companies (INE, 2008a).
- According to the *Survey on Corporate Strategies*, conducted in 2006 among 1,696 manufacturing industries, 82.4% of companies with more than 200 workers were aware of the existence of this tax credit, whereas the percentage fell to 49.5% for those between 10 and 200 workers.<sup>25</sup> The percentage of companies declaring that they use it was 40.9% and 8.9%, respectively (Fundación SEPI, 2007). Based on the analysis of this survey for previous years, Corchuelo and Martínez (2005) concluded that having previous R&D experience and being innovative increase the probability of knowing of the existence of the tax credit.<sup>26</sup> Corchuelo (2007) showed how these percentages increase considerably, if only companies with positive expenditures on R&D are considered.

<sup>23.</sup> Fewer than 250 employees, and turnover not exceeding EUR 50 million or balance sheet total not exceeding EUR 43 million.

<sup>24.</sup> Linear regression analysis indicates a linear correlation (R<sup>2</sup>) of 0.62 for these two variables for 2005.

<sup>25.</sup> The Survey on Corporate Strategies includes all firms with more than 200 employees, a sample of those between 10 and 200, and excludes companies with less than 10 employees (Fundación SEPI, 2007).

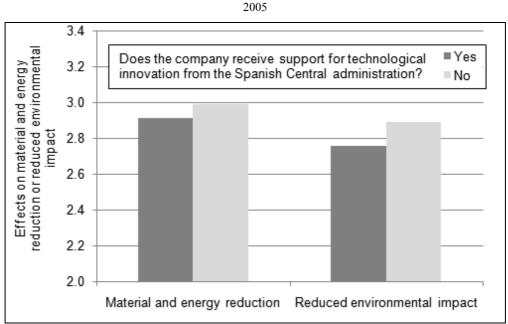
<sup>26.</sup> This is in line with Blanes and Busom (2004), who found that "previous experience in R&D is always positively associated with participation".

- 92. Several econometric analyses have studied the effectiveness of the tax deduction on R&D&I, following different methodologies and finding some contradictory evidence. Corchuelo (2007) concluded that this fiscal incentive is effective in stimulating private investment and expenditure on R&D. Marra (2004) also showed that Spanish R&D fiscal incentives have a positive effect on stimulating demand of private R&D capital. However, she also concluded that they are more effective at encouraging demand of private R&D capital by big companies than by small and medium ones. On the contrary, Romero and Sanz (2007) specified a different econometric model and concluded that fiscal incentives have limited capacity to stimulate R&D investment. They also argue for revision or even suppression of these incentives.
- 93. According to Corchuelo y Martínez (2005), it is the presence of difficulties (such as complexity or legal insecurity) more than the actual evaluation of the benefits derived from the application of the tax credit, which explains the limited use of the tax deduction.

#### 2.3 Environmental implications of the tax credit on R&D and technological innovation

94. Some evaluation of the possible environmental consequences of the tax credit on R&D&I may be derived from the *Technological Innovation in Companies Survey*, conducted annually by the National Institute of Statistics, and from the *Panel on Technological Innovation* (PITEC) (SISE, 2008b), which is based on this Survey. As shown in Figure 8, in 2005, on average, companies that received support for technological innovation activities from the Spanish central administration tended to declare higher positive environmental effects of the innovation activities they undertook.<sup>27</sup> However, this refers to any kind of support (including subsidies, soft credits, etc.), not only to the tax deduction on R&D&I. Therefore, both the nature and the possible cause-effect relation of this link are unclear. Similar results are also reached if all public support from the public administration (*i.e.* from the local to the EU level) is aggregated.

Figure 8. Support to technological innovation from the Spanish central administration and environmental consequences



Note: For each of the two possible answers to the question, the value of the effect has been averaged. Possible answers for each one of the effects are: 1=High, 2=Medium, 3=Low, 4=Not relevant. Source: Own elaboration, based on microdata from the Panel on Technological Innovation (SISE, 2008b).

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<sup>27.</sup> The same analysis was performed for 2004, obtaining very similar results.

95. The Ministry of Industry, Tourism and Trade provided the title and the 6-digit Unesco code for projects supported with *reasoned reports*, for fiscal years 2005 and 2006. From this, projects with an environmental purpose were individually identified and analysed (Table 9).<sup>28</sup>

Table 9. Number of environmentally motivated projects supported by reasoned reports 2005 - 2006

Year	Total number of reasoned reports issued	Number of environmentally motivated projects	%
2005	696	49	7.04
2006	-	69	-

Source: Own elaboration, based on information provided by the Ministry of Industry, Tourism and Trade.

96. In fiscal year 2005, 7% of projects supported with *reasoned reports* were specifically oriented to environmental protection. Table 10 shows that these projects accounted for 4.6% of all validated expenses in 2005.

Table 10. Budget of the environmentally motivated projects supported by reasoned reports 2005-2006, million Euros

	R&D		Technological innovation				
	Total	Environmental	Total Environmental		Total	Environment	
Year	amount	projects	amount	projects	amount	al projects	%
2005	334.8	18.5	215.8	6.9	550.6	25.4	4.6
2006	-	25.6	-	2.0	-	27.5	-

Source: Own elaboration, based on information provided by the Ministry of Industry, Tourism and Trade.

- These figures should be compared to the relative importance of the environmental sector in the Spanish economy. No such single indicator exists, but the proportion of environmental investments by industrial companies compared to their total investments could be used as a proxy. As mentioned in Section 1.3, in 2005, Spanish private industrial companies invested EUR 1,033 million on environmental protection. This was 4.9% of their total investment in machinery and equipment, (EUR 20,887 million).<sup>29</sup> Whereas the proportion of investments in environmentally motivated projects supported by *reasoned reports* is about the same (Table 10), the number of environmentally motivated projects is significantly larger in relative terms (Table 9). This suggests possible positive environmental consequences of the R&D&I deduction, especially in terms of the number of environmental R&D and technological innovation projects that were induced.
- 98. It is unclear to what extent the weight of environmentally motivated projects within projects supported by *reasoned reports* is similar to their weight within the total number of projects making use of the R&D&I deduction. The more uncertain it is for a project to qualify for the tax deduction, the more likely a firm will apply for a *reasoned report*. According to a representative of the Ministry of Industry, Tourism and Trade, qualification of environmentally motivated R&D&I projects is often doubtful. The distribution of these projects among those supported by *reasoned reports* might therefore be quite representative.

<sup>28.</sup> The Ministry provided detailed information for a pre-selection of 4-digit codes, only. Thus, it could be possible that some environmentally motivated R&D and technological innovation projects were not considered, if not included in this pre-selection.

<sup>29.</sup> Industrial Companies Survey (INE, 2007b).

- 99. Environmentally related R&D&I projects (Table 9) can be compared to those found in a survey conducted among 2,823 researchers working in private companies (SISE, 2008a). These researchers were asked for the thematic areas in which the companies had submitted their applications for public support, within the framework of programmes and Strategic Actions of the National R&D&I Plan 2004-2007, during the period 2004-2006. It was found that 8.2% were in the *Environmental technologies* area and 0.4% in the *Biodiversity* area. Other environmentally related projects could be included in other areas, 30 but these were not possible to identify. The definition of areas is not exactly the same as the one used in Table 9 (6-digit Unesco codes, plus individual classification, when doubtful), and therefore some caution is required regarding possible conclusions. However, it seems that the relative presence of environmentally related R&D&I projects is similar in the R&D&I tax deduction scheme compared to the other measures to support R&D&I at the national level. In both cases, these percentages are higher than the percentage of internal R&D expenditures dedicated to environmental control and protection by private companies (Figure 2), which suggests a positive environmental bias in the innovation activities that receive public financial support.
- 100. The average size of the environmental projects supported by *reasoned reports* was EUR 518,645 in fiscal year 2005 and EUR 399,250 in fiscal year 2006, which is significantly lower than the average size of projects validated by *reasoned reports* (Table 6). On the other hand, in 2005, 34.7% of environmental projects supported by *reasoned reports* were presented by SME, and this percentage fell to 24.6% in 2006. These percentages are much lower than the average participation by SME in *reasoned reports* (Table 8). These two seemingly contradictory results (smaller size of environmental projects and lower presence of SME within companies undertaking them) may be partially explained by the existence of several very large non-environmentally related projects that account for a high share of the total expenses validated by *reasoned reports* and increase their average size.
- 101. Another way to look for possible environmental implications of the R&D&I deduction would be to analyse the environmental investments undertaken during the years following the application of this deduction. Such information is not available, but the environmental investments by companies are positively correlated with the amount deducted by the environmental investments deduction.<sup>31</sup> Therefore, the aim is to check if making use<sup>32</sup> of the R&D&I deduction has any incidence on the subsequent application by companies of the environmental investments deduction.<sup>33</sup> Two approaches have been followed.
- 102. First, temporal asymmetries have been looked for when analysing companies that benefit from one type of deduction after the other. For example, 4,408 companies made use of the R&D&I deduction in 2000. Of these, 333 applied the environmental investments deduction the following year (7.6%). Table 11 presents these same calculations for both deductions and for the period 2001-2005. The underlying idea is that if the R&D&I deduction activates subsequent environmental investments, the relative number of companies making use of the environmental investments deduction after having applied the R&D&I deduction will be higher than the other way round.

<sup>30.</sup> For example, the *Energy* area accounts for 6.6% of the projects.

<sup>31.</sup> For the period 2000-2005, the linear regression between environmental investments undertaken by industrial companies in Spain and the total amount of the environmental investments deduction is characterised by a  $R^2 = 0.55$ .

<sup>32.</sup> To *use* refers here to applying or generating the deduction.

<sup>33.</sup> See Section 3.1 for details on the application of the environmental investments deduction.

Table 11.	Deductions of different type used during consecutive years
	2001 - 2005

	2001	2002	2003	2004	2005
Percentage of companies applying or generating the					
environmental investments deduction the year after applying or					
generating the R&D&I deduction	7.6	7.3	8.5	7.8	8.0
Percentage of companies applying or generating the R&D&I					
deduction the year after applying or generating the environmental					
investments deduction	7.2	6.8	7.8	7.8	7.3

Source: Own elaboration, based on information provided by Agencia Tributaria (Ministry of Finance).

- 103. Table 11 confirms that, for the period 2001-2005, the percentage of companies making use of the environmental investments deduction the year after using the R&D&I deduction is always greater (on a year to year comparison) than the percentage of companies making use of the R&D&I deduction the year after using the environmental investments deduction.
- 104. A second approach tests if companies behave in a different way the years after having made use of the R&D&I deduction, as compared to when no such deduction had been used. Having a data series for 6 years (from 2000 to 2005), it is possible to analyse two consecutive 3-year periods (2000-2002 and 2003-2005). Thus, in Table 12, the 34,071 companies that generated or applied any of the two tax deductions during 2001-2005 are classified according to whether they made use or not of the R&D&I tax deduction in the initial year of the two sub-periods (2000 and 2003).

Table 12. Number of companies that benefited from any of the two tax deductions, according to whether they made use or not of the R&D&I tax deduction in years 2000 and 2003 2000 - 2005

Use of the R&D&		
2000	2003	Number of companies
Yes	Yes	2,015
Yes	No	2,393
No	Yes	3,941
No	No	25,722
Total	34,071	

<sup>\*</sup> Either application or generation of the tax deduction is considered.

Source: Own elaboration, based on information provided by Agencia Tributaria (Ministry of Finance).

105. From the four groups above, Table 13 focuses only on the two that can be used to compare the net effect of the use of the R&D&I tax deduction on subsequent application of the environmental deduction [i.e. (i) the group of companies that made use of the R&D&I tax deduction in 2000 and did not apply it in 2003; and (ii) the group that did not make use of the R&D&I tax deduction in 2000 but did so in 2003]. This change allows interpreting the behaviour of the companies in terms of the environmental investments deduction in the two subsequent two-year periods (i.e. 2001-2002 and 2004-2005). For each of the two groups of companies and for each of the two periods, Table 13 presents information on the number of companies making use of the environmental investments deduction any of the two years, as well as on the amount of this deduction that was generated and applied.

Table 13. Use of the environmental investments deduction after application or generation of the R&D&I tax credit

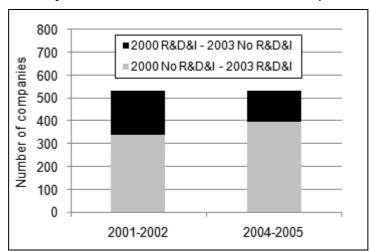
2000 - 2005

Number of companies	Use of the R&D&I deduction*		Companies making use the environmental investments deduction**		Generated environmental investments deduction (million Euros)			Applied environmental investments deduction (million Euros)			
	2000	2003	2001 - 2002	2004 - 2005	Δ 04-05 / 01-02	2001 - 2002	2004 - 2005	Δ 04-05 / 01-02	2001 - 2002	2004 - 2005	Δ 04-05 / 01-02
2,393	Yes	No	192	136	-29.2%	17.9	14.5	-19.1%	4.8	3.8	-20.3%
3,941	No	Yes	338	395	16.9%	57.4	83.8	46.1%	18.6	26.7	43.7%

<sup>\*</sup> Either application or generation of the tax deduction is considered. \*\* Any of the two years. Source: Own elaboration, based on information provided by Agencia Tributaria (Ministry of Finance).

106. As can be seen in Figure 9, the number of companies making use of the environmental investments deduction in any of the two years after having applied or generated the R&D&I deduction (black rectangle for 2001-2002 and grey rectangle for 2004-2005) is higher than the number of companies making use of it when no R&D&I tax deduction had been previously used (black rectangle for 2004-2005 and grey rectangle for 2001-2002, respectively). When this analysis was performed the other way round (i.e. analysing the effect of the environmental investments deductions on the application of R&D&I deductions during the two subsequent years), no similar patterns were observed.

Figure 9. Number of companies making use of the environmental investments deduction, according to whether they used or not the R&D&I tax deduction in previous years



Source: Own elaboration, based on information provided by Agencia Tributaria (Ministry of Finance).

107. Similar results are obtained when the amounts of the generated deductions are analysed (Table 13). Results are plotted in Figure 10. The environmental investments deduction generated during the two years after having used the R&D&I deduction (black rectangle for 2001-2002 and grey rectangle for 2004-2005) is higher than the generated deduction when no R&D&I tax deduction had been previously

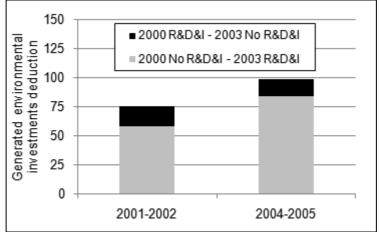
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These results could be a bit attenuated if it was taken into consideration that some companies making use of the R&D&I deduction in 2000 may no longer exist in the 2004-2005 period (and therefore could not make use of the environmental investments deduction) and that some companies making use of the R&D&I deduction in 2003 may not already exist in the 2001-2002 period. The information needed to isolate such effects was not available for this report, but in principle, they are considered of minor importance, since these deductions are to a great extent used by large companies, which tend to continue to exist.

used (black rectangle for 2004-2005 and grey rectangle for 2001-2002, respectively). The higher overall values for 2004-2005 are explained by the total increase in the environmental investments deduction for this period as compared to 2001-2002 (Table 16). Similar results are obtained when analysing the applied (as opposed to generated) environmental investments deduction.

Figure 10. Generated environmental investments deduction, according to whether companies applied or not the R&D&I tax deduction in previous years

Million Euros



Source: Own elaboration, based on information provided by Agencia Tributaria (Ministry of Finance).

108. The results from these two independent approaches confirm that R&D and technological innovation projects that benefit from the corresponding deduction lead in subsequent years to a small, but significant, amount of additional environmental investments that can be observed by an increase in the Corporate Income Tax environmental investments deduction.

109. This links with the perception of some practitioners that some environmental investments that benefit from the corresponding tax deduction have their origin in previous R&D and technological innovation projects that benefited from R&D&I deductions. This can be illustrated using a similar methodology. Again, two 3-year consecutive sub-periods are analysed within the 2001-2005 period. In this case, companies were classified according to whether they made use or not of the environmental investments deduction in the last year of the two sub-periods (2002 and 2005) (Table 14) in order to analyse what happened during the previous two years regarding application of the R&D&I tax credit.

Table 14. Number of companies that benefited from any of the two tax deductions, according to whether they made use or not of the environmental investments tax deduction in years 2002 and 2005

2000 - 2005

Use of the environments	Number of			
2002	2005	companies		
Yes	Yes	1,853		
Yes	No	3,951		
No	Yes	4,989		
No	No	23,278		
Total		34,071		

<sup>\*</sup> Either application or generation of the tax deduction is considered. Source: Own elaboration, based on information provided by Agencia Tributaria (Ministry of Finance).

110. From the four groups above, results in Table 15 refer only to those two that can be used to compare the net effect of the previous application of the R&D&I deduction on the use of the environmental investments deduction [*i.e.* (i) the group of companies that made use of the environmental investments deduction in 2002 and did not apply it in 2005; and (ii) the group that did not make use of it in 2002 but did so in 2005]:

Table 15. Application of the R&D&I tax credit before the application of the environmental investments deduction

2000 - 2005

Number of companies			Companies making use the R&D&I deduction**			Generated R&D&I deduction (million Euros)			Applied R&D&I deduction (million Euros)		
•	2002	2005	2000 - 2001	2003 - 2004	Δ 03-04 / 00-01	2000 - 2001	2003 - 2004	Δ 03-04 / 00-01	2000 - 2001	2003 - 2004	Δ 03-04 / 00-01
3,951	Yes	No	283	305	7.8%	90.7	107.8	18.8%	48.1	22.3	-53.6%
4,989	No	Yes	245	362	47.8%	95.1	155.0	62.9%	21.4	60.2	181.2%

<sup>\*</sup> Either application or generation of the tax deduction is considered. \*\* Any of the two years. Source: Own elaboration, based on information provided by Agencia Tributaria (Ministry of Finance).

- 111. Table 15 shows that the use of the R&D&I deduction is relatively higher before the use of the environmental investments deduction than when this deduction is not used.<sup>35</sup>
- 112. Agencia Tributaria (Tax Agency, Ministry of Finance) was also asked for the classification by sector of the declarations applying the R&D and technological innovation deduction. However, although the tax form asks companies to provide information on the activity code (Código Nacional de Actividades Económicas CNAE), Agencia Tributaria has informed that internal studies show that this information is not reliable enough for statistical analysis, and therefore it has not been made available.
- 113. In summary, the above analysis suggests that R&D and technological innovation projects that benefit from the corresponding deduction lead in subsequent years to additional deductions on environmental investments, which derive from additional environmental investments. This has been proved for the 2000-2005 period. To reinforce this conclusion, for the same period it has also been proved that the use of environmental investments deduction tends to be preceded by a higher application of R&D&I deductions.

# 2.4 Qualitative discussion of the environmental implications of the tax credit on R&D and technological innovation expenses

- 114. According to COTEC (2003), one of the factors that will most affect the evolution of the Spanish environmental sector in the coming years will be the amount of investments on R&D for the development of clean technologies and waste minimisation and recovery. Other factors would be the application of stricter environmental legislation, the use of market instruments and economic incentives, and the amount of public expenditure dedicated to pollution reduction, control and surveillance.
- 115. The importance of innovation for the growth of the environmental sector and for the improved implementation of environmental policies suggests a positive environmental impact of this tax credit.

<sup>35.</sup> This can be seen in columns "\$\Delta\$ 03-04 / 00-01". This case is not as clear as the previous one (Table 13), where row 1 had negative values and row 2 had positive values. Table 15 shows a greater use of the R&D&I deduction in the second sub-period (2003-2004), mostly due to the general trend towards a greater use of this deduction (Table 2). That is why row 1 also has also positive values. However, in all cases, values in row 2 are clearly higher.

However, possible negative environmental effects of some of the R&D and technological innovation projects that benefit from the tax deduction should also be considered. These effects should in any case be modest if projects are to receive public support. At least in relation to direct impacts, these projects ought to undergo an *ex ante* environmental evaluation - but research projects can of course have unforeseen impacts as well.

- 116. Apart from direct effects, possible indirect negative effects should be considered. The rebound effect might counteract possible beneficial environmental effects of innovation. Innovation may lead to more efficient production in terms of energy (or materials) use per unit of product, which may reduce the cost of production and the final price of the products. This may lead to increased consumption, counteracting totally or partially the environmental improvements achieved per unit of production.<sup>36</sup>
- 117. Somewhat related to this process, as a factor that prompts economic growth, innovation contributes to increase the scale of the economy, which is generally linked to various important environmental pressures (for example, the emission of several greenhouse gases or the use of different raw materials).
- There is contradictory evidence as regards the effectiveness of fiscal incentives on R&D. Less is known about the impact of tax credits than of the impact of public grants or other public policies to support innovation. In part this is because tax credits are harder to monitor (Jaumotte, Pain, 2005). In the case of the Spanish R&D&I tax deduction, Corchuelo and Martínez (2005) suggested that the deduction acts only as an incentive for companies that are already undertaking research. Other limitations in the design and use of the tax deduction may also undermine its possible beneficial environmental effects. Some of these are:
  - Regulations governing the tax credit have been modified repeatedly. Although these changes aimed to improve the existing framework, they came at a cost in terms of stability and predictability, which are conditions needed for companies to undertake actions that often require long planning periods.
  - *Insufficient awareness*. Knowledge by companies about the existence of this tax deduction and its characteristics is limited.
  - Lack of clarity and practicality of the legal definitions for research, development and technological innovation. This does not confer on taxpayers enough certainty regarding possible tax audits (COTEC, 2004). The fact that definitions are too generic was explicitly recognised in the Memoria Justificativa of Law 35/2006. According to Rivas (2006b): "There are no guidelines that allow a company to have certainty on whether an innovative action will be considered R&D or Technological Innovation (...) by the Tax Administration (...). Consequently, this hampers planning by companies and increases their administrative costs associated with this tax deduction, or companies just avoid claiming it". The possibility to ask for a reasoned report, introduced in 2003, overcomes this uncertainty, but at a cost for companies.
  - Uncertainty regarding application after 2011. This uncertainty derives from the legal provision by Law 35/2006 to suppress this tax deduction as of 1 January 2012. The Law also obliges the Government to evaluate by 2011 the effectiveness of the different R&D and technological innovation incentives and support measures in place between 2007 and 2011. The outcome of this evaluation might lead to some amendments of the existing instruments.

<sup>36.</sup> For a review of the literature on the rebound effect, see Greening *et al.* (2000).

# 3. R&D and technological innovation driven by environmental incentives

119. This Chapter discusses the possible effects on R&D and technological innovation of the environmental incentives regulated within the Spanish Corporate Income Tax. It starts by describing the tax deduction on environmental investments (Section 3.1), including a hypothetical example of its application (Box 2). It follows an analysis of the evolution of the total amount deducted, and their relative importance within the Corporate Income Tax (Section 3.2). From different sources, the outcome of the incentive is analysed, to interpret its incidence in activating innovation (Section 3.3). Finally, some qualitative discussion is included (Section 3.4).

# 3.1 Environmental incentives in the Spanish Corporate Income Tax

- 120. The Spanish Corporate Income Tax includes a tax credit for environmental investments (i.e. a deduction on capital expenses). This tax credit was originally created by Law 13/1996, of 30 December, and it focused only on investments consisting of installations used to avoid air pollution from industrial facilities, prevent the pollution of surface, underground and sea water, and reduce, recover or adequately treat industrial waste. Initially, it was intended to be in force only one year (1997), but Law 66/1997, of 20 December, extended it indefinitely. Law 55/1999, of 29 December, then extended the scope of the deduction to purchases of new land-based means of transportation for commercial or industrial use. Subsequently, Law 24/2001, of 27 December, included in the deduction the investments related to the use of renewable energy sources, but only for small companies (as defined in the Corporate Income Tax). More recently, Law 36/2003, of 11 November, extended this aspect of the deduction to companies of any size, and also limited eligible installations (regarding air and water pollution, and industrial wastes) to those "that go beyond what is legally required" (although this provision has basically not been applied in practice). These Laws were generally followed by Royal Decrees that detailed the practical aspects of their application.<sup>37</sup> The application of this tax credit has some particularities in the case of the Basque Country, Navarra and the Canary Islands (Cobos, 2004). The following explanation refers to the general case as of 2008.38
- 121. The tax credit is 10% of the total investment, in the case of investments in tangible assets devoted to environmental protection, consisting of installations used to (art. 39.1, Royal Legislative Decree 4/2004):
  - avoid air pollution from industrial facilities;
  - prevent pollution of surface, underground and sea water; and
  - reduce, recover or adequately treat industrial waste.
- 122. In order for these investments to qualify for the tax credit, they have to go beyond what is legally<sup>39</sup> required, and must be included in programmes or agreements with the corresponding environmental authorities, who subsequently have to issue a certificate validating the investment (art. 39.1).

<sup>37.</sup> For more details on the evolution of the tax deduction on environmental investments, see Cobos (2004).

<sup>38.</sup> See Royal Legislative Decree 4/2004, of 5 March, for complete detail. See also Cobos (2004) for *binding consultations* to the Tax Authority, doctrine and jurisprudence in relation to this deduction.

<sup>39.</sup> The original text in Spanish literally translates as "investments (...) for the improvement of existing environmental regulation". According to García (2004), this text is confusing and leads to subsequent implementation difficulties.

- 123. The tax credit is 12% in the case of purchases of new land-based means of transportation for commercial or industrial use. Only the part of the investment that effectively contributes to the reduction of air pollution (art. 39.2), as determined by a subsequent regulation, is taken into account.
- 124. The tax credit is also 10% for investments in new tangible assets for the use of renewable energy sources, consisting of installations or machinery with any of the following objectives (art. 39.3):
  - use of solar energy for transformation into heat or electricity;
  - use as fuel of municipal solid waste, biomass from agricultural and forestry waste or biomass from energy plantations;
  - treatment of biodegradable waste from livestock activities, water treatment plants, industrial effluents or municipal solid waste for biogas transformation; and
  - treatment of agricultural or forestry products, or used oils for their transformation into biofuels (bioethanol or biodiesel).
- 125. The part of any of the above-mentioned investments financed with subsidies does not qualify for the tax credit (art. 39.4).
- 126. The regulation of this tax credit was further developed by Royal Decree 1777/2004, of 30 July (art. 33-38). The certificate required for the investments to qualify for the tax credit has to state that the investments have been undertaken within the framework of plans, programmes or agreements with the environmental authority; that they aim to fulfil environmental legislation or go beyond such legal obligations; <sup>40</sup> that they are adequate for the environmental protection purpose they envisage; and that they will achieve the levels of environmental protection stipulated in the aforesaid plans, programmes or agreements (art. 38).
- 127. In practice, most of these certificates are issued by the Autonomous Communities. Some of these have developed their own legislation detailing some of the procedures for validating environmental investments. They all use similar, but not identical, forms and procedures, and the application of the tax credit varies significantly between regions (Table 17). The issued certificates are sent only to the applicant, not to the Tax Administration. At the moment, the information on these certificates is therefore not centralised by any institution.
- 128. In relation to the tax credit on the purchase of new land-based means of transportation, Royal Decree 1777/2004 (art. 34.1 and 37) defines more precisely its scope and base (*i.e.* how to apply art. 39.2 of Royal Legislative Decree 4/2004). Only vehicles with a diesel engine or running with natural gas or liquefied petroleum gas (LPG) are eligible, as long as they fulfil emission requirements established in Directive 88/77/EEC, of 3 December 1987.
- 129. Law 35/2006, of 28 November, established a progressive phasing out of this tax credit. Thus, the deduction has to be multiplied by 0.8 during 2007, 0.6 during 2008, 0.4 during 2009 and 0.2 during 2010. The tax credit will disappear as of 1 January 2011, although it will still be possible to apply deductions pending from previous years.

39

<sup>40.</sup> This seems contradictory with art. 39.1 of Royal Legislative Decree 4/2004, of 5 March, which states that environmental investments eligible for deduction have to go *beyond* what is legally required - simple fulfillment of environmental legislation seems there not sufficient.

### Box 2. Example of application of the environmental investments deduction

A hypothetical company installed in 2008 a EUR 300,000 scrubber to reduce air pollution from an industrial plant. This investment was included in an agreement with the corresponding regional environmental authority, who issued a certificate validating the investment.

Law 35/2006, of 28 November, established a progressive phasing out of this tax credit. During 2008 the deduction is 6% of the eligible cost of the investment. Therefore, for this investment the company generated a EUR 18,000 deduction [300,000 \* 6%].

It also installed photovoltaic solar panels, worth EUR 100,000, which received a 40% subsidy. The subsidised part of the investment would not qualify for the tax credit. This would generate a EUR 3,600 deduction [100,000 \* (1 - 40%) \* 6%]. Therefore, the overall generated deduction would be EUR 21,600 [18,000 + 3,600].

These investments were undertaken by a SME, whose tax base was EUR 200,000. The corporate tax rate in the case of SME is 25% on the first EUR 120,202 of taxable income, and 30% thereafter. The gross tax payable is obtained by applying the tax rate to this base. In this case it would be EUR 53,990 [120,202 \* 25% + (200,000 - 120,202) \* 30%].

This tax credit, together with several others (assumed to be zero in this example), are limited to 35% of the gross tax payable, net of the tax credits regulated in articles 30 - 34 of the Royal Legislative Decree 4/2004 (also assumed to be zero here). In this example, the limit would be therefore EUR 18,896 [53,990 \* 35%].

Since the generated deduction exceeds this limit, only this amount could be applied during 2008. Therefore, in the case no other tax deductions apply, the net tax payable would be EUR 35,093, obtained by subtracting the environmental investments applied deduction to the gross tax payable [53,990 - 18,896]. The rest of the generated deduction would be EUR 2,704 [21,600 - 18,896], and it would be pending for application during the following ten years.

Source: Own elaboration. See Cobos (2004) for more examples.

130. The suppression of this deduction runs parallel to that of other tax credits within the Corporate Income Tax. However, the *Memoria Justificativa* of the Law 35/2006 specifically states that these investments "in many occasions are no longer optional for companies, but compulsory (...). Today, it would be a paradox for a State to provide tax incentives for some investments, which are compulsory according to environmental legislation (...)". In recent years, the Spanish Parliament has discussed several legal initiatives that aimed to keep this tax credit in place, although none of them were adopted.

# 3.2 Use and scope of the tax credit on environmental investments

131. This Section provides a brief description of the scope and main effects of the tax credit on environmental investments, before entering the discussion of its possible incidence on R&D and technological innovation activities. Table 16 summarises the main numbers regarding the use of this deduction:

Table 16. Main figures for the tax credit on environmental investments 2000 - 2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Number of declarations	3,367	4,723	4,275	4,468	4,567	4,922	-	_	-
Provision in the State budget (million Euros)		6.43	20.63	38.60	46.93	53.87	55.01	88.14	88.91
Total amount deducted (million Euros)	57.94	60.69	56.36	55.59	89.59	89.39	-	-	-
Average deduction (thousand Euros)	17.21	12.85	13.18	12.44	19.62	18.16			
Percentage of declarations	0.38	0.51	0.42	0.41	0.41	0.41	-	_	-
Percentage of overall net tax payable raised by the tax	0.30	0.27	0.24	0.20	0.27	0.23	-	-	-

Source: Spanish State Budget, 2001 - 2008; Ministerio de Economía y Hacienda (2003, 2004b, 2005b, 2006b, 2007b).

132. As can be seen in Figure 11, both the corresponding expense item in the State budget and the amount actually deducted have been generally increasing for the last years, the former always being exceeded by the latter. This indicates greater use of the tax credit than what was actually envisaged by the Ministry of the Economy and Finance. However, the total amount deducted has been decreasing as a percentage of the overall revenue raised by the tax.

Figure 11. Tax credit on environmental investments according to the State budget and to actual amount deducted

2000 - 2008

■ National budget Actual deduction Million Euros 

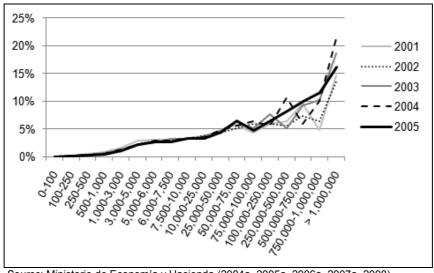
Source: Spanish State Budget, 2001 - 2008; Ministerio de Economía y Hacienda (2003, 2004b, 2005b, 2006b, 2007b).

133. The percentage of companies of a given size making use of the tax credit grows as their size increases (Figure 12.a), along with the average size of the deductions (Figure 12.b). These two factors make it possible for larger companies to capture a high share of this tax credit (*e.g.* in 2005, 79.0% of this tax credit went to companies with a net turnover higher than EUR 10 million), although this concentration is not as high as for the R&D&I deduction (Section 2.2). As compared to the R&D&I tax credit (Table 2), the average deduction for environmental investments is also much lower, whereas the number of applicants is slightly higher.

Figure 12. Use of the tax credit on environmental investments in relation to the firms' net turnover

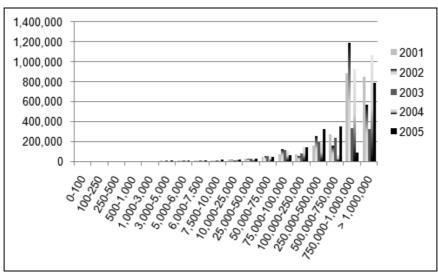
2001 - 2005, net turnover in thousand Euros

### a) Percentage of companies of each size making use of the tax credit



Source: Ministerio de Economía y Hacienda (2004a, 2005a, 2006a, 2007a, 2008).

# b) Average deductions by company size (EUR)



Source: Ministerio de Economía y Hacienda (2004a, 2005a, 2006a, 2007a, 2008).

134. This tax credit is used by a limited number of companies (0.4% of all declarations, in 2005). However, its scope is significant. According to the estimates of environmental investments by private companies conducted annually by the National Institute of Statistics (INE, 2008d), in 2005, private companies invested EUR 1,033 million on environmental protection. Therefore, the tax credit represented 8.7% of total investment on environmental protection declared by private companies. Considering that the

deduction is approximately 10% of the quantity invested, this means that most of the investment on environmental protection undertaken in Spain was supported by this tax credit.<sup>41</sup>

- 135. The legal condition that "investments have to go beyond what is legally required" implies that investments regulated in art. 39.1 of the Corporate Income Tax Law are (in principle) undertaken on a voluntary basis. In this sense, the tax credit on environmental investments effectively reduces the price and payback period of investments, and increases its internal rate of return. This seems a sufficient condition to increase overall investments. However, unlike the R&D&I deduction, there are no econometric studies analysing the effectiveness of this tax credit, and therefore the "additionality" of part of these investments cannot be confirmed. Moreover, as already mentioned, at present this tax deduction also benefits in practice investments aimed to comply with the existing legislation (and that would be undertaken anyway).
- 136. Since the application of this tax credit depends upon the certificates issued by Autonomous Communities, it is worth analysing the application of this deduction at the regional level. Table 17 shows the number of declarations applying the deduction and the total amount deducted at every Autonomous Community. It also includes the net turnover of industrial companies in each region, as a way to measure the importance of the industrial sector in each.

Table 17. Regional distribution of the tax credit on environmental investments 2005

Autonomous	Net turnover of industrial companies (billion Euros)	Declarations	Deduction applied (thousand Euros)		
Community	(A)	<b>(B)</b>	(C)	(B)/(A)	(C)/(A)
Andalucía	54.08	426	11,691	7.88	216.18
Aragón	24.13	381	2,482	15.79	102.85
Principado de Asturias	13.19	98	4,620	7.43	350.28
Canarias	7.75	6	18	0.77	2.32
Cantabria	7.41	94	875	12.68	118.05
Castilla - La Mancha	22.78	358	2,156	15.71	94.63
Castilla y León	32.34	385	4,755	11.90	147.02
Catalunya	132.42	1,226	12,397	9.26	93.62
Extremadura	5.71	52	168	9.11	29.44
Galicia	32.47	258	3,132	7.95	96.45
Illes Balears	4.18	85	2,480	20.32	593.00
Comunidad de Madrid	61.57	453	26,773	7.36	434.85
Región de Murcia	13.47	253	2,005	18.78	148.86
Navarra	17.01	8	3,150	0.47	185.18
País Vasco	50.93	16	4,863	0.31	95.48
La Rioja	5.01	89	522	17.75	104.10
Comunitat Valenciana	55.97	733	7,304	13.10	130.50
Total	540.44	4,922	89,391		

Source: Agencia Tributaria (2007); INE (2007b).

137. If the number of declarations is divided by the net turnover [(B)/(A) in Table 17], an estimate of the relative importance of the tax credit among regions is obtained. The same if the amount deducted is divided by the net turnover [(C)/(A) in Table 17]. From these variables, it is possible to calculate the

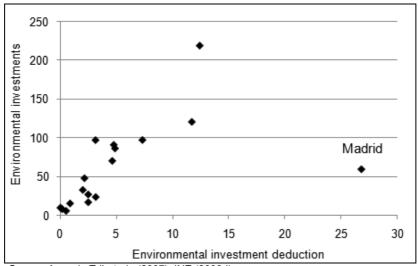
<sup>41.</sup> This conclusion, however, requires some caution because the definition of "environmental investments" asked for in the *Survey on Company Expenditure on Environmental Protection* is not exactly the same than the one used in the Corporate Income Tax Law.

relative standard deviation (RSD), being 58.2% for the first case, and 85.0% for the second. This shows greater dispersion between Autonomous Communities regarding amounts deducted than regarding the number of declarations. It also shows that, despite the participation of the Regional Authorities in the validation of environmental investments, regional dispersion of this tax credit is virtually the same regarding the number of declarations presented and much lower when analysing the amount deducted, compared to the tax credit on R&D&I (Section 2.2), for which Regional Authorities play no role.<sup>42</sup>

138. This is basically coherent with the strong correlation found between the environmental investments undertaken by industrial companies at regional level (INE, 2008d) and the amounts deducted in each region (Figure 13), with the only exception being Madrid.<sup>43</sup>

Figure 13. Relation between environmental investments undertaken by industrial companies at regional level and environmental investments deduction applied in each region

2005, million Euros



Source: Agencia Tributaria (2007); INE (2008d).

139. As mentioned in Section 3.1, Autonomous Communities have the role of validating some of the environmental investments eligible for this tax deduction. Information on the validated investments is not centralised by any Administration, and no studies have addressed this question so far. Fourteen Autonomous Communities<sup>44</sup> were requested for information on the validated investments, and were asked to classify them according to the three categories included in the Corporate Income Tax Law (art. 39.1): investments to avoid air pollution from industrial facilities; investments to prevent pollution of surface, underground and sea water; and investments to reduce, recover or adequately treat industrial waste. Ten responses were received (Table 18). The information from the Autonomous Communities as regards to validated investments had not been gathered before.

<sup>42.</sup> Although, as mentioned above, the regulation of these tax credits has some particularities in the Autonomous Communities of País Vasco, Navarra and the Canary Islands, this conclusion remains the same if these regions are excluded from the analysis.

<sup>43.</sup> R<sup>2</sup> found between these two variables is 0.24 when Madrid is considered and 0.83 when it is not. The case of Madrid may be partially explained because deductions are assigned to the region where headquarters are located, whereas some environmental investments may be assigned to regions where industrial plants are located.

<sup>44.</sup> The Basque Country, Navarra and The Canary Islands were not requested for information due to the particularities of the tax deduction on environmental investments in these Autonomous Communities.

Table 18. Thematic classification of the environmental investments validated by Autonomous Communities

2005, Euros

Autonomous Community	Air	Water	Waste	Total	Derived deduction
Cantabria	4,842,980	1,908,989	973,638	7,725,607	772,561
Castilla - La Mancha	35,185,018	5,532,418	7,465,603	48,183,039	4,366,435
Catalunya	127,656,127	13,363,293	32,208,416	173,227,836	17,322,784
Extremadura	143,573	71,685	160,522	375,780	37,578
Galicia*	11,675,740	28,320,637	11,353,925	51,350,302	5,135,030
Illes Balears	18,858,568	1,101,256	387,529	20,347,353	2,034,735
Comunidad de Madrid	5,201,662	3,583,802	5,411,217	14,196,681	1,419,668
Región de Murcia	3,215,420	727,469	991,394	4,934,283	493,428
La Rioja	548,159	1,792,821	206,689	2,547,669	254,767
Comunitat Valenciana	32,392,478	10,915,269	17,519,757	60,827,504	6,082,750
Subtotal	239,719,725	67,317,640	76,678,689	383,716,054	38,371,605

<sup>\*</sup> In the case of Galicia, information received from projects affecting more than one area was not disaggregated, only the areas were indicated. In this case, investments have been divided by the number of areas and assigned to each one of them.

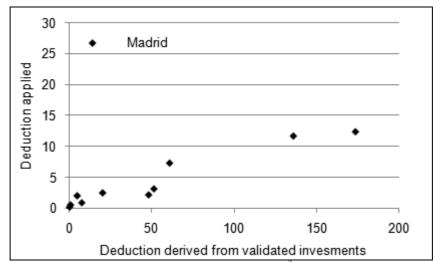
\*Note: The Autonomous Community of Andalusia provided data on the aggregated amount of validated environmental investments (135,673,540 €), but not on its classification.

Source: Own elaboration based on data provided by each Autonomous Community.

- Although there is some dispersion among Autonomous Communities, investments to avoid air pollution predominate among investments validated by the Autonomous Communities, accounting for 62.5% of the total (17.5% for water and 20.0% for waste). This is coherent with the results from the *Survey on Company Expenditure on Environmental Protection*, which shows the predominance of investments in prevention of air pollution (54.7%). As regards investments on water pollution and industrial waste management, the Survey indicates the predominance of the former (28.6%, compared to 16.7% for waste), as opposed to what is found from the information received from the Autonomous Communities regarding validated investments for the application of the tax deduction.
- 141. In principle, virtually all investments validated by Autonomous Communities derive to subsequent applications of the environmental investments deduction. Estimated amounts for such deductions are presented in Table 18. These quantities should in principle be inferior to those presented in Table 17 (column C), since there are other investments that qualify for the deduction but need not be validated by Autonomous Communities (Section 3.1). Moreover, some differences may be explained because the deductions related to some of the validated investments may be carried forward to subsequent years, and *vice versa* (*i.e.* part of the deductions applied in the current year may derive from investments validated in the past).
- 142. However, there is a positive correlation between the deductions derived from the validated investments and the actual deductions applied (Figure 14). The major difference is found in the case of Madrid, where validated investments only account for a small fraction of the deductions applied. Probably, this is again due to a *capital-city effect*, whereby deductions are assigned to the region where headquarters are located, whereas some of the investments may be validated by the regions where they take place.

Figure 14. Relation between the deduction applied in each Autonomous Community and the deduction derived from the investments validated in each of them

2005, million Euros



Note: Linear regression analysis indicates a linear correlation  $(R^2)$  of 0.12 for these two variables when Madrid is considered and of 0.92 when it is not.

Source: Own elaboration based on Agencia Tributaria (2007) and on data provided by each Autonomous Community.

# 3.3 Implications on R&D and technological innovation of the tax credit on environmental investments

143. To study possible relations between the two deductions analysed in this report, the Spanish Ministry of Finance was asked to provide details on companies making use of both deductions simultaneously (Table 19).

Table 19. Details on companies making use of both deductions simultaneously 2000 - 2005, amounts in Euros

	2000	2001	2002	2003	2004	2005
R&D&I deduction		<u> </u>				
Number*	4,408	5,767	5,585	5,956	6,037	6,045
Generated	562,666,120	1,070,207,317	657,094,753	773,828,103	881,520,933	934,942,943
Applied**	185,566,986	220,256,602	204,860,450	251,088,783	299,880,114	348,084,993
Pending	377,099,134	849,950,716	452,234,304	522,739,320	581,640,819	586,857,950
Average deduction generated	127,647	185,574	117,653	129,924	146,020	154,664
Environmental investment	ts deduction (E	I)				
Number*	4,594	6,218	5,804	6,107	6,396	6,842
Generated	207,963,080	187,176,047	160,204,069	171,557,840	186,638,055	219,979,982
Applied**	58,086,821	61,188,366	56,652,641	55,625,625	89,599,204	89,391,208
Pending	149,876,259	125,987,681	103,551,428	115,932,216	97,038,851	130,588,774
Average deduction generated	45,268	30,102	27,602	28,092	29,180	32,151
Both deductions						
Number*	323	468	498	502	488	496
Generated (R&D&I)	85,611,136	117,589,518	118,046,576	185,810,955	166,023,172	198,275,167
Applied (R&D&I)	33,402,507	65,949,366	55,727,463	68,418,295	76,548,040	87,630,444
Pending (R&D&I)	52,208,629	51,640,152	62,319,113	117,392,660	89,475,132	110,644,722
Average deduction generated (R&D&I)	265,050	251,260	237,041	370,141	340,211	399,748
Generated (EI)	31,688,138	39,693,774	31,954,965	38,974,226	57,978,517	76,908,038
Applied (EI)	20,851,741	24,318,229	11,321,804	16,036,477	38,634,037	33,474,812
Pending (EI)	10,836,397	15,375,545	20,633,160	22,937,749	19,344,480	43,433,226
Average deduction generated (EI)	98,106	84,816	64,167	77,638	118,808	155,057
Companies making use of any of the two deductions	8,679	11,517	10,891	11,561	11,945	12,391
% of companies making use of both deductions	3.7	4.1	4.6	4.3	4.1	4.0
R&D&I. % of total applied deduction that benefits companies making use of both deductions	18.0	29.9	27.2	27.2	25.5	25.2
EI. % of total applied deduction that benefits companies making use of both deductions	35.9	39.7	20.0	28.8	43.1	37.4

<sup>\*</sup> Number of companies having generated or applied the tax deduction.

Although the number of companies making use of both deductions simultaneously rose during the 2000-2005 period, their relative presence was quite limited in percentage terms (only around 4% of the companies applying any of the two deductions during that period), and this variable remained quite stable. However, they accounted for a very significant proportion of total amounts deducted, particularly in the case of the environmental investments deduction. As Table 19 illustrates, this indicates that the average deduction (either R&D&I or environmental investments) is higher for companies making use of both deductions simultaneously. This seems to be explained by the weight of big companies in the size-distribution of companies making use of both deductions in the same year. As shown in Figure 15, the proportion of smaller companies is higher when analysing the deductions separately, whereas the presence of big companies is higher among companies making use of the two deductions simultaneously.

<sup>\*\*</sup> Information on applied deductions in this Table is slightly different from that presented in Tables 2 and 16. Source: Data provided by Agencia Tributaria (Ministry of Finance).

Figure 15. Size-distribution of companies applying both tax deductions, separately and simultaneously

2005, net turnover in thousand Euros

Source: Ministerio de Economía y Hacienda (2008); Data provided by Agencia Tributaria (Ministry of Finance).

- 145. This is consistent with the fact that in 2004, among companies asking simultaneously for both deductions, 94.2% of the amount deducted due to environmental investments benefited firms with a net turnover higher than EUR 10 million, whereas this was 79.0% when considering only the deduction on environmental investments. As for R&D and technological innovation, in 2005, 93.3% of the deduction was captured by these firms, but this percentage rose to 98.9% when considering only companies applying both deductions simultaneously.
- 146. Although between 2000 and 2005, the R&D&I and the environmental investments deductions were used (generated or applied) on 33,798 and 35,961 occasions, respectively (Table 19), according to data provided by the Spanish Tax Authority, only 34,071 different companies benefited from any of the two deductions during this period. This means that the use of the deductions is concentrated in some companies. Actually, 14,921 companies made use of these deductions in more than one occasion during this 5-year period. This also implies that having made use of either of the two tax credits increases the probability of making use of them again.
- 147. As mentioned in Section 3.2, fourteen Autonomous Communities were requested for information on the validation of environmental investments for the corresponding tax deduction. In this case, they were asked to classify investments between "end-of-pipe" and "cleaner production" solutions. The same number of responses (10) was received.

Table 20.	Nature of the environmental investments validated by Autonomous Communities
	2005, Euros

Autonomous Community	End-of-pipe	Cleaner production	Total
Cantabria	4,512,852	3,212,755	7,725,607
Castilla - La Mancha*	29,320,073	14,344,274	43,664,347
Catalunya	142,458,404	30,769,432	173,227,836
Extremadura	0	375,780	375,780
Galicia**	15,882,332	35,467,971	51,350,302
Illes Balears	15,805,412	4,541,941	20,347,353
Comunidad de Madrid	4,764,027	9,432,654	14,196,681
Región de Murcia	3,298,291	1,635,992	4,934,283
La Rioja	2,317,019	230,650	2,547,669
Comunitat Valenciana	38,765,044	22,062,460	60,827,504
Subtotal	257,123,455	122,073,908	379,197,363

<sup>\*</sup> In the case of Castilla - La Mancha investments do not add up to the same as in Table 18. The classification there includes investments that were not considered for the classification in this table.

Source: Own elaboration based on data provided by each Autonomous Community.

148. Although there is significant dispersion among Autonomous Communities, end-of-pipe investments clearly dominate among investments validated by them, with 67.8% of the entire invested amount. This has traditionally been the dominant approach to address environmental impacts. However, cleaner production solutions are gaining importance among environmental investment decisions. According to Frondel *et al.* (2007), based on firm-level data from seven OECD countries, 76.8% of facilities reported that they predominantly invest in cleaner production technologies.

149. That is also the case in Spain. The Survey on Company Expenditure on Environmental Protection (INE, 2008d) asked companies to classify their environmental investments between "Independent equipment and facilities" and "Integrated equipment". 45 Considering the definitions included in the questionnaire, the former can be considered a proxy for end-of-pipe solutions, whereas the latter can be considered a proxy for cleaner production solutions. According to this Survey, cleaner production investments have been growing steadily both in absolute and relative terms during the last years. 46 Similar trends are found, both if all investments are considered and if only considering those related to air and water pollution and industrial waste. However, in this second case, the shift from end-of-pipe to cleaner production investments has been faster (Figure 16). This trend is in principle seen as positive, since end-ofpipe technologies "do not address the root of the environmental problem. They treat pollution, but they do not prevent pollution from being generated in the first place. Therefore, where possible it seems preferable to change the production process in order to avoid generating unwanted by-products" (Labonne, Johnstone, 2007). This is in line with Frondel et al. (2007), who argue that "cleaner production technologies are frequently seen as being superior to end-of-pipe technologies for both environmental and economic reasons".

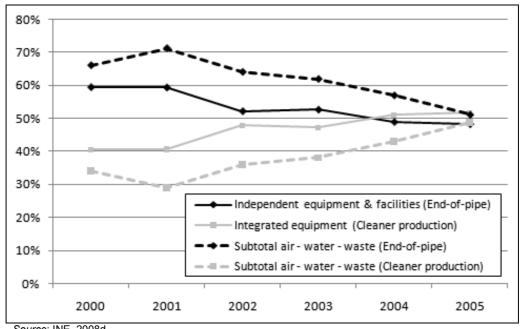
<sup>\*\*</sup> In the case of Galicia, information received from projects including investments of both types was not disaggregated. In this case, investments have been divided by two and assigned to each of them.

<sup>45.</sup> It has to be pointed out that for a respondent is may be more difficult to identify and quantify the cost of the environmental part of integrated equipment, rather than independent equipment.

<sup>46.</sup> Labonne and Johnstone (2007) suggest policy flexibility as one possible reason for this trend.

Figure 16. Proportion of end-of-pipe and cleaner production expenditures among environmental investments

2000 - 2005



Source: INE. 2008d.

- 150. Expenditures on cleaner production among investments validated by the Autonomous Communities (Table 20) are clearly lower that in average environmental investments, according to the Survey on Company Expenditure on Environmental Protection. It seems that rather than accelerating the change illustrated in Figure 16, investments that benefit from the tax deduction keep essentially favouring end-of-pipe technologies. This is, in principle, contradictory with the fact that "more flexible instruments appear to play a role in encouraging investment in (...) cleaner production" (Johnstone et al., 2007).
- 151. As exposed in Section 3.1, in practice the tax deduction on environmental investments still benefits investments that simply aim to comply with the environmental legislation. The motivation of these investments seems more to be the need to fulfil the environmental legislation rather than the tax deduction itself. This may explain why, despite the fact that the environmental investments deduction can be deemed as a flexible policy instrument, its results in terms of promotion of cleaner production investments are lower than could have been expected.
- 152. If only measures going beyond legal obligations were eligible for the environmental tax deduction, investments making use of the deduction would essentially pursue cost savings, as opposed to the present situation. Frondel et al. (2007) found that "cost savings tend to favour clean production and that technology standards and the stringency of environmental policy are positively correlated with end-of-pipe technologies. These results suggest that the application of end-of-pipe measures depends at least partially on regulatory pressure, whereas cleaner production may be motivated - among other factors - by market forces." Therefore, from such an amendment in the tax deduction, one should expect an increase of cleaner production investments, relative to end-of-pipe technologies.
- 153. If end-of-pipe investments are associated more with a reaction to environmental obligations and cleaner production is more associated with an *initiative* aiming at cost savings, it seems reasonable to suppose that the latter may entail more research and technological innovation. In this sense, Frondel et al. (2007) state that "environmental innovations are more often closely identified with cleaner production

measures than with end-of-pipe technologies, which reduce environmental impacts by using add-on measures without changing the production process". Therefore, the present weight of end-of-pipe technologies in the investments applying the environmental investments deduction suggests a limited incidence of this deduction in terms of innovation.

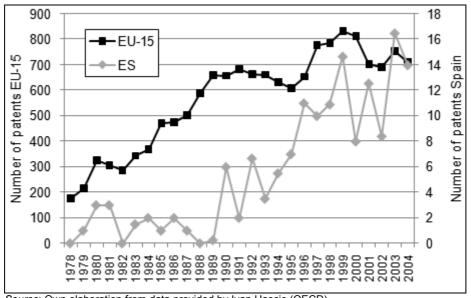
- 154. Given the specific focus of the environmental investments deduction on air pollution, water pollution and industrial wastes, it is interesting to analyse patenting activity in these areas in order to detect possible positive innovation consequences of this tax deduction.<sup>47</sup> In Spain, patents on these three areas for the period 1997-2004<sup>48</sup> account for 75.0% of all environmental patents (which apart from those areas include patents in the areas of noise and monitoring). This percentage is close to the EU-15 average for the same period (72.5%). The difference between Spain and the EU-15 does not seem attributable to the tax deduction since before it was in place (1978-1996 period), the percentage of patents in the areas of air pollution, water and waste was also higher in Spain than in the EU-15 countries (83.7% and 79.4%, respectively).
- When patents in these three areas are compared to the total number of patents registered by the European Patent Office (EPO), similar results are obtained. For the period 1997-2004, in Spain these patents accounted for 0.66% of the total, whereas in the EU-15 they were 0.74%.
- 156. As shown in Figure 17, the absolute number of environmental technology patents in the areas of air, water and waste has been growing for the last decades in Spain. However, the growth rate in the number of these patents was similar before the introduction of the environmental investments tax deduction (1997). The trend followed by the number of patents in these three areas has not been significantly different from that followed by the total number of patents, which indicates that to an important extent the evolution in the number of patents in the three analysed areas is parallel to the general growth of innovation activities in the country. The starting point of Spain, back in the seventies, was very low, both as regards innovation activities and as regards application of environmental policies.

<sup>47.</sup> Results presented here derive from a personal communication with Ivan Hascic (OECD) and refer to the number of European Patent Office (EPO) patent applications during the 1978-2006 period. Some caution is needed, because the definition of the three areas is not exactly the same as in the Spanish Corporate Tax Law.

<sup>48.</sup> The analysis focuses on this period because 1997 is the year that the tax deduction on environmental investments entered into force and 2004 is the last year for which patent information is considered reliable (since it takes time for EPO to process applications).

Figure 17. Annual number of patent applications in Spain and the EU-15 in the areas of air, water and waste

1978 - 2004



Source: Own elaboration from data provided by Ivan Hascic (OECD).

- The relative number of Spanish patents in the areas of air, water and waste are 4.7%, 84.7% and 157. 10.5%, respectively, for the 1997-2004 period. These percentages are very different from the relative importance of these investments in the deduction, according to information on validated environment investments by Autonomous Communities (Table 18), which indicates that investments on air pollution clearly dominate within those applying the environmental investments deduction. This poor correspondence between the composition of environmental investments that benefit from the deduction and innovation in these areas (measured by the number of patents), suggests again a low incidence on innovation of the tax deduction on environmental investments.
- 158. As explained in Section 3.1, some investments in new tangible assets for the use of renewable energy sources also eligible for the environmental investments deduction. Spain achieves one of the highest innovation outputs in renewable energy technologies (Johnstone et al., 2008), in terms of patenting activity. However, this is not a consequence of the tax deduction on environmental investments, since investments for the use of renewable energy sources have only been eligible since 2002, and more generally since 2004. In addition, among the three areas in which Spain performs best as regards patents, only investments in solar energy are eligible, as opposed to investments in wind and ocean energy. In the rest of areas in which investments are eligible, Spain does not show any remarkable patenting activity.<sup>49</sup> The deduction in new tangible assets for the use of renewable energy sources is not, therefore, oriented towards those energy sources that entail more innovation in Spain.
- 159. The Survey on Company Expenditure on Environmental Protection (INE, 2008d) could also lead to some other conclusions on the R&D consequences of the tax credit on environmental investments. Among other aspects, companies are asked in this Survey about expenditures on R&D activities related to

<sup>49.</sup> The number of EPO patent applications by Spanish inventors normalised by overall patenting activity for the different renewable energy sources is 2.62 for wind, 2.29 for solar, 0.24 for geothermal, 1.31 for ocean, 0.00 for biomass and 0.24 for waste, for the 1978 - 2003 period (Johnstone et al., 2008).

the environment, as well as about the amount of tax deductions associated with environmental investments, 50 which essentially refers to the tax credit analysed here.

- 160. In principle, it would also be possible to compare environmentally related R&D expenditures between companies that benefit from the tax credit on environmental investments and those who do not. This would allow checking of whether there is a positive correlation between the amount deducted and the amount of R&D environmentally related expenditures, particularly in relative terms (*e.g.* per employee or per turnover). This analysis could be performed considering companies' size and sectors, or even by regions.
- 161. To cope with the fact that information from deductions in the questionnaire may be from a different year, panel data would be required to perform a fully consistent statistical analysis. However, data (either aggregated or disaggregated) have not been made available by the National Institute of Statistics for this report, due to an insufficient number of respondents, so it was not possible to conduct the suggested analysis.
- 162. Agencia Tributaria (Tax Agency, Ministry of Finance) was asked for the classification by sector of the declarations applying the environmental investments deduction. This would provide information on the sectors that benefit more from the deduction, and would allow comparing it to the information on those applying the R&D&I deduction. However, although the Corporate Income tax form asks companies to provide information on the activity code (CNAE), internal studies by the Spanish Tax Agency show that this information is not reliable enough for statistical analysis, and therefore data was not made available.

# 3.4 Qualitative discussion on the implications on R&D and technological innovation of the tax credit on environmental investments

- 163. The tax deduction on environmental investments affects only some environmental investments in material assets and in industrial and commercial vehicles (Section 3.1), not other environmental expenditures that may be also relevant. In particular, as services gain importance in the economy, this sector accounts for a significant part of the environmental improvements adopted by private companies. Although responses of the Ministry of Finance to several *binding consultations* made clear that services are eligible for the deduction, this deduction is very much oriented towards products, installations and vehicles. Most actions undertaken by the services sector do not benefit in practice from the tax deduction. That is also the case for improvements in logistics or for expenditures on immaterial assets. These sectors account for a significant share of the environmental expenditures and investments that entail innovative approaches.
- 164. Limitations on the configuration and use of the tax deduction on environmental investments may also undermine its possible beneficial effects on R&D and technological innovation. Some of the present limitations are:
  - Lack of harmonisation. There is a lack of harmonisation in relation to the procedures by Regional Environmental Authorities required to validate some of the environmental investments. A given investment in different Autonomous Communities may undergo quite different procedures.
  - *Possible misuse*. Some practitioners mentioned the fact that some Autonomous Communities might be acting more generously than others when validating environmental investments. This a potential risk considering that Administrations validating the investments (Regional Administrations) are not

<sup>50.</sup> Questions 3.2.5 and 3.3.3 in the 2005 questionnaire, respectively. Questionnaire available at: www.ine.es/daco/daco42/ambiente/cuestionario eipa 05.pdf.

the ones bearing the burden of the tax deduction (Central Administration). However, no evidence has been found in this sense, since differences between Autonomous Communities are less important than for the tax deduction on R&D and technological innovation (for which Regional Administrations play no role), and could be explained by a number of reasons. Nevertheless, harmonisation of procedures would also minimise this risk.

- Deductions for compulsory investments. An unknown (but important) share of the environmental investments that benefit from the deduction would have to be undertaken anyway, since they aim to fulfil existing regulation. Since environmental standards are generally based on levels achievable by available technologies, these investments probably entail far less R&D and technological innovation than what would otherwise happen if investments aimed at fulfilling legislation would not be eligible for the deduction.
- *Progressive loss of intensity*. According to Law 35/2006, the intensity of the tax deduction on environmental investments will be reduced 20% annually until complete suppression as of January 2011. This is likely to reduce the number of applications more than proportionally, due to the existence of fixed costs, such as administrative costs. This progressive phasing out may also lead to some environmental investments being advanced.

### 4. Conclusions

- 165. This report has focused on the analysis of two tax credits regulated within the Spanish Corporate Income Tax: the R&D and technological innovation deduction and the environmental investments deduction.
- Only a small percentage of Corporate Income Tax declarations include the deductions analysed (Table 2 and Table 16), particularly in the case of the R&D&I deduction. Among companies making use of these deductions, a high percentage of the amounts deducted benefits a very limited number of large companies, which usually undertake larger and more costly projects (Sections 2.2 and 3.2). It has also been found that having made use of either of the two tax credits in the past increases the probability of using them again.
- 167. The scope of the tax credit is particularly significant in the case of the environmental investments deduction, which has been estimated to benefit a majority of the investments on environmental protection undertaken in Spain. Despite the participation of the Regional Authorities in the application of this deduction, its regional dispersion is less than for the tax credit on R&D&I (Section 3.2). As regards the thematic distribution of the environmental investments validated by Autonomous Communities, it was found that investments to avoid air pollution from industrial facilities account for 62.5% of the total quantity invested, investments to prevent pollution of surface, underground and sea water account for 17.5% and investments to reduce, recover or adequately treat industrial waste account for the remaining 20.0%.
- 168. Since *reasoned reports* were created, their use by companies has been increasing, and so has the percentage of the total amount deducted by the R&D&I tax credit supported by them. The main reason for companies to apply for such reports is legal security. Companies aiming to undertake larger projects tend to apply for *reasoned reports* more than companies aiming to undertake smaller ones. This is not surprising, considering that there is more at stake and considering the costs for firms to prepare such applications.
- 169. As regards the effects of these two tax credits, it is difficult to know what expenditures would have also taken place without the analysed incentives, and it was not the aim of this report to analyse their

effectiveness. Several studies analysed the tax deduction on R&D and technological innovation in the past and generally concluded that is effective in stimulating such expenses. No analyses exist on the effectiveness of the environmental investments deduction. Law 35/2006 stipulates that by 2011, the Government has to evaluate the effectiveness of the different R&D and technological innovation incentives and support measures in place between 2007 and 2011 and, if necessary, amend them to better adapt to the needs of the Spanish economy. Some of the issues raised and conclusions drawn in this case study may be relevant for the evaluation that needs to take place.

- 170. The report focused on the analysis of the environmental effects of the R&D&I deduction and on the effects on innovation of the environmental investments tax deduction.
- 171. Although the two deductions are largely independent, evidence has been found regarding positive environmental consequences of the R&D&I deduction (Section 2.3). For the period analysed (2000-2005), it was found that the percentage of companies making use of the environmental investments deduction in the year after applying the R&D&I deduction was systematically greater than the percentage of companies making use of the R&D&I deduction the year after applying the environmental investments deduction. For the same period, using another methodology, it was also found that the application of the R&D&I deduction increased the application of the environmental investments deduction (*i.e.* additional environmental investments being induced) in subsequent years.
- 172. This conclusion is also supported by the fact that the proportion of environmentally motivated projects among projects supported by *reasoned reports* is higher than the proportion of environmental expenditures among total investment in machinery and equipment expenditures by Spanish industrial companies.
- 173. However, it seems that the relative presence of environmentally related R&D&I projects taking benefit of this deduction is similar to that in the other public measures to support R&D&I at the national level. In both cases, these percentages are higher than the percentage of internal R&D expenditures dedicated to environmental control and protection by private companies (Figure 2), which suggests a positive environmental bias in the innovation activities that receive public financial support.
- 174. It must be pointed out, however, that possible negative direct and indirect environmental effects of not environmentally motivated R&D and technological innovation activities have not been considered. They may not be negligible, and could counteract totally or partially the described beneficial environmental effects of the R&D&I deduction.
- 175. As regards the environmental investments tax deduction, several results suggest that it has no or very low incidence on activating innovation.
- 176. On the one hand, expenditures on cleaner production (as opposed to end-of-pipe expenditures) among investments validated by Autonomous Communities are clearly lower than in average environmental investments (Section 3.3). The present weight of end-of-pipe technologies in the investments taking benefit of the environmental investments deduction suggests a limited incidence of this deduction in terms of innovation, since environmental innovations are more often identified with cleaner production.
- 177. On the other hand, the evolution in the number of EPO patent applications in the areas of air, water and waste did not change significantly with the introduction of the environmental investments tax deduction. Furthermore, the relative number of Spanish patents in the areas of air, water and waste is very different from the relative importance of these investments within the amounts deducted (Section 3.3). This

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poor correspondence again suggests a low incidence on innovation of the tax deduction on environmental investments.

- 178. In any case, and despite the estimated positive environmental consequences of the R&D&I tax deduction, it seems that if environmental R&D and technological innovation is to be fostered, stimulating R&D and technological innovation and environmental investments separately is not the best option. Several programmes specifically addressing environmental R&D and technological innovation could be reinforced (such as the subsidy programme of the Ministry of the Environment for the development of R&D environmental projects) or new ones could be created.
- 179. Some practitioners suggested that these incentives might not only be positive in terms of support for environmental or R&D and technological innovation advances, but also in terms of revenues raised by the Corporate Income Tax in subsequent years (*i.e.* as a consequence of the economic profits triggered by the innovations and environmental investments undertaken thanks to the tax deductions). No information is available to prove or dismiss such a thesis. Any analysis of this aspect should take into consideration the effect of possible alternative investments.
- 180. Some of the limitations of the two tax credits examined in this report are associated with a changing legal framework (this has a cost in terms of stability and predictability), unawareness by companies on their existence (which leads to limited use), complexity and bureaucracy (which leads to higher administrative costs), uncertainty about their future (due to progressive phasing out), and legal uncertainty regarding possible tax audits. Some of these limitations could be overcome and this could lead to a greater use and effectiveness of these two deductions.
- 181. Some other limitations are their lack of flexibility (changing a law is required to modify their intensity, as opposed for example to the flexibility of subsidy programmes) or the fact that a positive tax payable is necessary in order to benefit from the deductions (they can be deferred, but only for a limited number of years). In relation to this, it may happen that two companies that undertake the same activities benefit from the tax credit to a different extent.
- 182. Tax deductions (and other subsidies as well) may be economically justified in some cases, for example when positive externalities appear (*e.g.* environmental innovation projects). However, no subsidies or deductions should be granted to actions that are anyway compulsory to undertake. Although, in principle, the Corporate Income Tax Law prevents this from happening environmental investments deduction, the Royal Decree that details its application continues to consider as eligible investments that simply aim to comply with the existing environmental legislation.
- 183. This is not according to the polluter-pays principle and not only results in inefficient public expenditure, but also hampers a potential side-effect of this tax deduction on innovation. Since environmental standards are often established considering the capabilities of the best available technologies, innovation required to just fulfil the legislation is relatively moderate. If only measures going beyond legal obligations were eligible for the environmental tax deduction, investments making use of the deduction would essentially pursue cost savings, which tend to favour clean production and, therefore, innovation.
- 184. The argument that the environmental investments deduction is being used to finance investments that are anyway compulsory was used in the *Memoria Justificativa* of the Law 35/2006 to justify the progressive phasing out of the tax deduction on environmental investments. While this clearly indicates the need of reformulating the tax deduction, it does not in itself provide full support to justify complete phasing it out.

- 185. On the other hand, there are positive aspects of the tax deduction scheme that could be used to support continuation. For example, tax deductions constitute a form of public support that distorts the market the least, since is not the Public Authority that decides what specific projects to subsidise, but companies that decide whether to make use or not of the tax deduction, and this is automatically granted if the application qualifies. According to Rivas (2006b), tax deductions also entail (at least in principle) less administrative costs than subsidies, both for public administrations and for companies.
- 186. If the environmental investments tax deduction remains, other reforms could be considered, such as the possible inclusion of other areas eligible for the environmental investments (e.g. efficient use of raw materials or others that also would increase the weight of cleaner production expenditures) or a more explicit support to investments in the service sector or to logistics. Also a limitation, or at least a more restrictive application, of the deduction on the purchase of new land-based means of transportation should be considered, particularly since the vehicle registration tax was already recently reformed to foster cleaner vehicles, and since there are governmental programmes aimed at substituting older vehicles (e.g. Plan VIVE) that partially overlap with this deduction. However, if deeper reforms were considered, they should be ideally framed in a broader ecological reform of the Spanish tax system.

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