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R&D policy evaluation: a case study on Law 46/1982 in Italy

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Sommario

Abstract

Even in the context of neo-classical theory, characterized by a strong trust in the virtues of the free market, the need for a policy intervention in the field of research and innovation is theorized, because of the presence of market failures. In the contemporary context of economic and public finance crisis, on one side there is a strong need to boost the industrial productivity through investment in research and technology; on the other side the public budget constraints call for prudency. In this context the need for systematic evaluations of public incentives to firms is particularly strong. In this context, the paper offers an evaluation exercise on the major instruments used to promote R&D and innovation activities of Italian firms.

The analysis concentrates in particular on the incentives offered by Law 46/1982 (and revisions) and their effects on firms expenditures and employment in R&D. The Law represents the main national funding program as well as the longest lasting single instrument for technology and innovation promotion, although revisions of the Law have occurred. In addition to Law 46/1982, Italian firms have the chance to benefit from a larger span of public subsidies, particularly at the regional and local level. This makes the counterfactual question of "what would have happened without the policy" particularly interesting since it is likely, and this is confirmed by the data, that firms that do not access to the incentives of Law 46/82 benefit from other sources of public financing. Therefore it is particularly important to consider the effects of Law 46/82 not just in the hypothetical situation of complete absence of policy intervention, but also when other similar laws are at work.

For this reason besides the difference-in-difference estimation, the paper analyses the effects of Law 46/1982 through a difference-in-difference-in-difference model, which allows to verify whether the interaction between different kinds of incentives has a multiplicative or a substitutive effect.

The paper also addresses another typical aspect of evaluation studies: the average effect of the policy normally retrieved seems to be not sufficiently informative, especially in a country characterized by a marked territorial economic dualism (Centre-North vs. South) and by a strong presence of small-medium firms, with profoundly different characteristics from large firms. In other words the effects of the policy instrument might vary substantially among firms. Therefore the paper takes explicitly into consideration the different effect of the incentives on different sectors (according to Pavitt classification), on different size of firms and in different zones of the country. The database used for the analysis is the Capitalia Survey (former Mediocredito Centrale). Data are obtained from three consecutives surveys for a total of nine years starting from 1995 to 2003.

1. Introduction[1]

Modern economies, even when based on a free-market organization, make use of public intervention for several purposes. Mainstream economic literature traditionally justifies such intervention with the market failure argument. Other strands of literature, describing the *developmental state*, signal the use of industrial development policies for strategic objectives. The recent economic crisis has somehow blurred the borders of such a distinction and policy intervention seems to be greatly welcomed by industrialized economies as well as by emerging markets. However, the international scenarios opened by the crisis are largely uncertain and unknown and this offers an opportunity for governments to rethink their industrial development policies as well as the structures of their economies, which in many cases have contributed to the upsurge of the crisis. In this context, the research on policy evaluation, viewed as both an institutional practice and as a coherent set of techniques, becomes fundamental. Too often policy evaluation is studied and developed within academic circuits, with few linkages with policy makers and scarce effects on voters' choices (Barbieri and Santarelli, 2010; Barbieri, 2010), whereas policy evaluation can offer important solutions to the government failure dilemma.

The word "evaluation" means different things in different contexts and although the literature normally refers to it as a "judgement on the effects*"* of a policy (Shadish *et al.,* 1991) there is no consensus on the comparison term that should be used to measure such effects. They are often investigated with reference to predefined objectives, standards or other countries' experiences. However, it is worth recalling that the diffusion of policy evaluation is in many ways linked to the experience of the U.S. social experiments of the '60s and '70s and to the idea of "counterfactual situation" (see

[1] This paper is the result of a strict collaboration among the authors. Anyway sections 1, 3, 6.1 and 6.2 may be mainly attributed to Elisa Barbieri; sections 2, 4 and 7.1 to Roberto Iorio; sections 5, 6.3 and 7 (except 7.1) to Giuseppe Lubrano Lavadera. Conclusions have been jointly written.

among others Katz, 1998; Haveman, 1987). When talking about ex-post evaluation the question "what would have happened without policy intervention?" is crucial. Social experiments, statistic and econometric techniques of the so-called quasi-experiments and interviews to the beneficiaries of policy interventions are traditionally three ways to address this question. Quasi-experiments have increasingly gained consensus within policy evaluation as a scientific reference method to carry out policy evaluation when social experiments are not feasible. As it can be argued (see among others Smith, 2004) quasi-experiments have limitations: sometimes the counterfactual situation is just impossible to identify, or the combination of available data with conventional statistic and econometric tools implies unrealistic assumptions. Moreover, ex-post policy evaluation and the counterfactual estimation is often carried out as a separate activity from process evaluation (and by different actors); as a result quasi-experimental analyses tend to conclude that policies are effective or ineffective, without being able to explain why. Although these can be arguments against the quasi-experimental approaches, the question of what would happen without policy intervention remains crucial and this paper wishes to stress the need for research to move forward in this direction, looking for ways to take into account the numerous complexities that policy intervention implies.

In this scenario and with this aim, the research presented in this paper investigates the effects of the Italian law n.46/1982 (with its subsequent transformations), which regulates the major incentive programs that are used to support the Research and Development (R&D) and innovation of Italian firms (Ministero dello Sviluppo Economico, 2009). In particular, we study the effects of these incentives on firms' R&D expenditures and on the number of workers in R&D. To this aim we refer to a consolidated and diffuse methodology: the difference in difference technique (DD). We also utilize a less diffuse form of such an approach (difference in difference in difference, DDD) in order to take into account that firms might receive from the national and the regional governments

other incentives for their R&D activities, in addition to those of law 46/1982. Moreover we investigate the effects of Law 46/1982 for homogeneous sub-groups of firms with the aim to deepen our knowledge on the specific kind of firms that benefit the most from this policy intervention. Our results seem to point at an inefficient overlapping of instruments aiming at similar goals. A positive effect of the law seems to emerge for large firms, although a deeper look at the specific manufacturing sectors suggests that the specific industrial production needs to be taken into account. We also take explicitly into consideration the different effect of the incentives in different zones of the country.

The paper is structured as follows: section 2 recalls the main theoretical considerations on R&D and innovation policies; section 3 summarizes the debate on the effects of subsidies to R&D; in the fourth section the main features of Law 46/1982 are described with reference to the Italian scenario; section 5 describes the data used in the estimates, whereas section 6 explains the econometric strategy applied. The seventh section discusses the results and the eighth concludes.

2. Theoretical considerations on R&D and innovation incentives

The theoretical reasons why public intervention is needed when speaking of innovation have been long since established. The traditional conceptual framework belongs to the neoclassical approach; then an articulated evolutionary approach to the problem has been also developed.

The seminal contribution belongs to Arrow (1962), who underlines the non-perfect appropriability of knowledge and the need for government intervention to avoid an underinvestment in R&D by private actors. Patents, as known, are the fundamental policy instruments to obtain this result, assuring a full, even though temporary, appropriability of the results of inventions and innovations. Nevertheless, the large part of innovation that is not patented implies that the existence of a patenting system cannot

completely overcome the problem of underinvestment in research. Therefore other instruments of public intervention are frequently adopted, particularly monetary subsidies (in the form of tax relief or lower interest rates). From a theoretical point of view the effectiveness of such tools is not assured: the additionality is not guaranteed. Additionality, that is a key point in evaluating a public intervention, means that a firm which benefits from a public subsidy in a general sense *does* more and better than it would have done without the intervention. We use such a generic definition because different kinds of additionality may be identified: following Georghiou (2002) we may identify an input additionality, an output additionality and a behavioural additionality. There is input additionality if the firm, receiving the incentive, spends an amount of money in input of innovation (typically R&D) greater then it what would have spent in absence of such incentive. Properly, there is no input additionality if the increase is smaller than the subsidy. Input additionality is not verified also when the firm accepts the subsidy for an activity that it would have carried out anyway and the internal resources that would have been destined to such project are invested in another project. The Nordhaus' model (1969) identifies this problem, predicting that a profit maximising firm invests in R&D up to the level where expected costs are equal to expected returns of the project: a public subsidy may induce the firm to undertake "inframarginal", therefore not efficient, projects (whose expected costs exceeds benefits). It is particularly difficult to investigate this second kind of input additionality, as it is not easy at all to investigate the "intention" of firms, or the real expected costs and return of the possible research projects.

The second kind of additionality is the output additionality, that is verified when firms obtain an innovative output (product or process) that would not have been realised without the public support. Since an innovation is the result of a complex interaction of several factors, that takes place through non-deterministic paths and not exactly determined time profiles, it is extremely difficult to

establish if a specific innovation is the results or not of a particular intervention.
With the third kind of additionality, the behavioural additionality, we move towards the evolutionary approach to innovation. In such a theoretical context an innovation policy may change the behaviour of the firm, specifically in the way a project is carried out: not only some "objective" decisions may change (a change in the scale, scope and timing of the firm activity is possible) but there can be also permanent changes at the strategic level (e.g. the firm moves into new areas of activity), at the level of acquired competences and, more deeply, there may be what Bach and Matt (2002) call cognitive capacity additionality. This kind of changes are particularly significant in the long run, therefore it is more difficult to measure them, especially if a criterion of comparison between resources and results is adopted.
The importance of each of the three kinds of additionality is evident, but we underlined the difficulties associated to the evaluation of output and behavioural additionality. This is the reason why, at this stage, we focus on the input additionality, in the sense that we try to verify if firms which have received the incentives established in Law n.46/1982 have increased their R&D expenditure and personnel, with respect to a hypothetic situation where such public intervention is absent.
Our paper also deals with a less traditional theme: the evaluation of the effects of a specific incentive in the presence of other incentives directed to similar goals. In fact the presence of multiple incentives, that is, as we will see, a characteristic of the Italian policy to sustain innovation, creates theoretical and practical problems when trying to evaluate the effect of a specific incentive.
If an incentive A has typically an effect X and an incentive B has typically an effect Y, a firm that receives both incentives may simply have an effect X+Y. But there are many reasons to hypothesize that the effect is less than X+Y and other good reasons to suppose that the effect is more than X+Y.

The first case may for instance happen if there is an overlapping of the two incentives, that is of the fields or kind of projects that they may finance; in such a case part of the projects of the firm may be covered *de facto* by two incentives: we only have partial additionality. The second case may for instance happen if there is a behavioural additionality. With the first incentive the firm tries to do something it would not have done without it; then the firm learns to do that kind of research: the incentive has the "normal" effect X plus "something else" (in terms of experience). This "surplus" allows the firm to obtain more than the "normal" benefit (Y) if it utilises a second incentive (B). Indeed, a third case is actually possible: if a firm receives the incentive A alone, the effect is X, when the firm receives the two incentives together, the effect is minus than X; if this happens it is a sign of a severe distortion in the system of incentives.

3. The debate on the effects of subsidies to R&D and innovation

The literature on the evaluation of the effects of public subsidies on firms' innovation activities is extremely wide. However, there are several thorough reviews that help synthesize the main features of the studies available on the topic (see in particular David et al., 2000 and Klette et al., 2000).

What emerges immediately from a first look to such literature is that most of the available studies measure the effects of public incentives on firms' R&D expenditures. In other words they question the degree of substitutability or complementarity between private and public investment in R&D and they choose to use, as a measure of the outcome, the variable that determines innovation (R&D expenditures) instead of innovation itself (Griliches, 1990). As already mentioned, one of the reasons of such a preference is that the causal relationship between public incentives and expenditures in R&D is easier to track than the one between incentives and the final innovation performance of the firm. In this latter case many variables other than incentives have an influence on the firm's innovation capacity and the causal chain between

incentives and innovation is longer and more difficult to establish. However, investigating the relation between government incentives and firms' spending is also a necessary first step to understand the effectiveness of R&D policies over innovation results.

A number of studies that go beyond the estimation of the input additionality take into account the effect of publicly supported research on: growth in sales (Lerner, 1999), labour productivity (Griliches and Regev, 1998), total factor productivity Klette and Moen (1999), patents (Narin et al., 1997), R&D employment (Wolff and Reinthaler, 2008).

Within the available studies, in particular as regards input additionality, one can distinguish according to the type of data used, the method and the level of analysis. There are studies using cross-section data (among others Wallsten, 2000; Busom, 2000; Antonelli, 1989; Lichtenberg, 1984; Almus and Czarnitzki, 2003), time-series data (particularly in aggregated analysis, see Levy and Terleckyj, 1983; Lichtenberg, 1987) and panel data (Lichtenberg, 1987, 1988; Toinovanen and Niininen, 1998; Lach, 2000). The methods used are typical of the quasi-experiment approach and range from multiple regressions with different estimation methods to matching methods and the use of instrumental variables, according to the type of data available and to the type of bias that needs to be taken into account. Finally, according to the unit of analysis, there are firm level studies (Wallsten, 2000; Busom, 2000; Antonelli, 1989; Lichtenberg, 1984; Almus and Czarnitzki, 2003; Lichtenberg, 1987, 1988; Toinovanen and Niininen, 1998; Lach, 2000), industry-level studies (Lichtenberg, 1984; Levin and Reiss, 1984; Goldberg, 1979 to name some) and macro analyses at the country level (among others Diamond, 1998; Von Tunzelmann and Martin, 1998; Levy, 1990).

These researches, as noted also by Almus and Czarnitzki (2003), seem to point at a general positive effect of the public investment on private R&D expenditures, thus suggesting a complementarity between the two, at least at the country and industry level. However, when going into the details of firm-level studies the

results are not homogeneous. We have no priors concerning the effects of public incentives to R&D since the empirical evidence suggests that it is the single instrument, the way it is designed and implemented and the specific context where it is adopted that determine a positive or a negative (or null) effect.

As regards the fewer studies available on other outcome variables, Lerner (1999) finds a limited positive impact on the growth of sales and employment in the U.S.; Griliches and Regev (1998) find a positive impact on labour productivity in Israel, while Klette and Moen (1999) in a study on Norway conclude for a negative impact on total factor productivity, probably, they explain, due to a government selection, at that particular time, of large firms that were experiencing problems after the restructuring of the IT sector at the end of the 80s. Narin *et al.* (1997) discover a strong relation between publicly funded research programmes and industrial patents in the U.S., and Wolff and Reinthaler (2008) find a limited effect of public subsidies on R&D employment, but a stronger effect on R&D expenditures in several OECD countries which, they point out, might suggest an increase in the wages of scientists.

Coming to the effect of the specific law 46 that we are investigating, a first study on the effect of FAR (Fund for Applied Research, which is regulated by art. 1-13 of the law) was produced by Merito et al. (2007) with matching procedures on a different database (Ministry of University and Research, Amadeus-Bureau van Dijk and Delphion-Thomson). The results do not show any positive effect of the law on sales, employment or labour productivity, while they suggest a short term effect on patent applications. A second contribution by Potì and Cerulli (2010) (with data from Ministry of University and Research and Italian National Institute of Statistics) finds that FAR has stimulated additional investment in R&D and better innovation performances (measured by patents). These results refer in particular to large firms. The second part of the law (art. 14-19 which regulate the FIT – Fund for Technological Innovation) has also been object of a few studies: De Blasio et al. (2009) re-create a natural experiment

thanks to an unexpected shortage of funds and conclude that there are no effects on firms' tangible and intangible asset investment. The Ministry of Economic Development, on the other hand, following a qualitative approach with direct interviews to the beneficiaries concludes that the FIT produces additional investment, with 65% of the firms declaring that without the incentives they wither would not have invested or they would have invested less than observed (Ministero dello Sviluppo Economico, 2008).

4. Law 46/1982 in the Italian scenario

The Italian economy is characterised by a low level of private investment in R&D (40% of the total) if compared to that (70%) of other European countries (Sweden, Germany, Finland, Ireland and Spain). Moreover R&D incentives only represent 13% of government incentives, compared to 15% of Germany, 16% of Spain and 23% of France (Ministero dello Sviluppo Economico, 2009).

Among R&D government incentives to firms, Law 46/1982 is the longest lasting and most important policy measure in Italy (Ministero dello Sviluppo Economico, 2008). It is directed particularly to research intensive geographical and manufacturing areas and sectors. It therefore offers benefits in particular to large firms in Northern Italy, in high-tech sectors and specialised in the development of large research projects (Ministero dello Sviluppo Economico, 2009).

Two different parts can be distinguished within the Law, the first one concerning art.1-13, the second one art.14-19.

The first part of the Law (art.1-13) regulates the special Fund for Applied Research, originally established with Law n.1089/1968. The focus of art. 1-13 is particularly on applied research, on technology transfer to the medium and small enterprises and on research collaborations between the public and the private sector[2].

[2]The financed research must be conducted in external public or private laboratories, authorised by the government.

Up to 50% of the costs of the projects may be covered by such fund. The second part of the Law (art.14-19) creates the Fund for Technological Innovation. According to the Law's words, this fund has the goal to "finance programs concerning activities of planning, experimentation, development and pre-industrialization". Under this fund firms receive financial support at a cut rate, up to a period of fifteen years.

Some measures are exclusively dedicated to small and medium firms, like actions of technology transfer and under several aspects the law assures favourable conditions to this kind of firms (lower interest rates, dedicated funds, etc.).

Several other funding programs were in force at a national level, but the Legislative Decree n.297/1999 (which became effective in 2001) unified several of these programs[3] in a unique Fund to Facilitate Research (FAR). It also absorbed the Fund for Applied Research established by the first part of the law 46/1982. Therefore, to be precise, in evaluating the effect of the first part of the law 46/1982, we must consider that the fund established in accordance to such a Law became part of a wider fund.

Notwithstanding this legislative simplification, Italian firms continue to have the chance to benefit from a lot of public subsidies, particularly at the local level; this peculiarity of the Italian system increased in the last decade as a consequence of a significant process of legislative decentralization, particularly in favour of the Regions (MET, 2005).

It is important to spend a few words on the selection procedures of the benefited firms,. As regards the Fund to Facilitate the Research (FAR), the demand must be directed to the competent Ministry (Ministry of University and Research), then three kinds of procedures are possible: evaluative, negotiation and automatic[4].

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[3] Precisely: law 46/1982; law 488/1992 (the part concerning research); law 346/1988; law 196/1997 (art.14); law 449/1997 (art.5).

[4] In illustrating the three procedures we followed a web page of the site of the Ministry of University and Research (http://www.miur.it/0003Ricerc/0139FAR_-_/0159Il_nuo/index_cf3.htm), which makes a comment to the Ministerial Decree

In the first case a specific committee evaluates the projects of the applicant firm; some criteria are expressly required and verified by the committee: innovative character, originality and industrial utility of the project on one side, technical and economic capacity to carry out the project on the other side. It is interesting to notice that the additionality criterion is expressly required only for large firms, in line with the EU regulation[5].

The negotiation procedure regards public competitions for projects of R&D and training: the ministry individuates specific thematic areas of intervention and modalities of provision of the incentive and selects the best projects. This is a typical top-down form of public intervention.

The evaluation phase of the projects is completely overcome with the automatic procedure of intervention: when a firm carries out some specific activities (hiring of qualified research personnel, provision of scholarships for Ph.D. students, assignments of specific research contracts) it may apply for some established forms of funding, that will be automatically granted, according to the chronological order of the demands, up to a pre-defined budget limit.

These selection procedures were similar even before the reform that introduced the FAR (Ministero dello Sviluppo Economico, 2005, p.15) and throughout the reform the majority of financed firms access the government incentives through the evaluative procedure, although before the reform no specific mention was made to the requirement of additionality (Ministero dello Sviluppo Economico, 2002; 2009).

As regards the second part (art.14-21) of the Law, the demand and the project must be directed to the competent Ministry (Ministry of

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n.593/2000; this decree made the Legislative decree n.297/1999 effective, substituting the first part (art.1-13) of the law n.46/1982.

[5] Large firms are all the firms that do not meet at least one of the criteria to be defined as small-medium enterprises (SEMs). SMEs in turn are defined according to these three criteria: number of employees lower than 250 employees; annual revenues not exceeding 40 million Euros; no ownership control by a large firm exceeding 25% of the capital.

Industry), then a procedure of "investigation" begins, in order to establish if the firm can obtain the required financial support.
It must be observed that there is no reference to the theme of additionality. Nevertheless, the financed firms must declare that they are not benefiting from other specific public funds for programs with the same object and goals[6]. Another remarkable aspect is the existence of a verification procedure, with a system of penalties: if a funded firm does not realize the program, the funding may be interrupted and the firms may be forced to return the received funding.
Summing up, we found that the theme of additionality, which is central in the theoretical analysis of the public funding for innovation, is rarely expressly considered in the laws we are analysing. Such laws try to avoid the worst problems (the same project financed by two or more public funds; failure to realize the financed projects), being more pragmatic on the possibility that the firm would have carried out the project even without the public sustain.
With the automatic procedure there is a clear risk of non-additionality, but it is faster and not biased against weaker firms, that have in general fewer chances to get through the evaluation. Some studies done by the Ministry of Economic Development in 2008 (Ministero dello Sviluppo Economico, 2008) confirmed these considerations: an high percentage of firms that utilised the automatic incentives would have anyway done the same actions, even in the absence of the public support; this percentage is much lower when the evaluation procedure is involved; on the other side, the automatic procedure have been greatly appreciated, particularly by small firms, exactly because they are easy to access, while the main complaint against the evaluation procedure is its length.

[6] Precisely: law n.1089/1968; law n.675/1977.

5. Data and summary statistics

The database used for the analysis is composed by the 7th, 8th and 9th waves of data gathering of Capitalia Survey[7] (former Mediocredito Centrale) on manufacturing firms with more than 10 employees. Each wave includes about 4500 observations: these are extracted in a stratified sample for firms with less than 500 workers, whereas they cover all Italian firms with more than 500 employees. Each wave refers to a period of three years, respectively 1995-1997, 1998-2000 and 2001-2003. Questionnaires were kept very similar among the waves to ensure comparability and they are equal in the parts that are relevant to this study. The stratified sampling has been realised to cover macro-regions (North-East, North-West, Centre, South), dimensions (11-20, 21-50, 51-250, 251-500, more than 500 employees) and Pavitt classification (Supplier-Dominated, Scale-Intensive, Specialised Suppliers and Science-Based). Each stratum has been determined following the Neyman's formula, in order to be representative of the whole population.

The database that results from the merger of the three waves is composed by more than 13000 observations. Within this database, a balanced panel of more than 600 firms can be observed across the three waves (see table 1) and two balanced panels, one of 1316 firms and the other of 2127 firms, cane be observed respectively between the 7th and 8th waves and between 8th and 9th waves. There is high attrition (i.e. loss of data across different waves) in the sample, as O'Higgins and Nese (2007) noted, which can potentially result in an attrition bias in the regression estimates. Appropriate tests on the variables as in Verbeek and Nijman (1992) and Wooldridge (2002) have been introduced in the analysis (see section 7) to deal with this aspect.

The Capitalia dataset is composed mainly by small and medium firms, in line with the structure of the Italian productive system. Large firms represent only about 10% of the sample (Table 1).

[7] Centro Studi Capitalia (1998, 2001, 2004).

Enterprises that are part of a group are 20% to 30% of the sample. This is a relevant portion of the sample and it is mainly due to the definition of "group" used: it is in fact a broad definition that covers all firms that have any kind of property link with another company. The Pavitt classification was preferred to others because it distinguishes enterprise specialization without splitting the sample into excessively minute sub-samples. Moreover, it is relevant to analyse the effect of incentives on R&D for firms that employ different levels of technology. Most firms in the sample belong to the Pavitt 1 category (supplier-dominated), whereas the percentage of science-based firms represents only a minor part of the survey, about 5% (Table 1).

Table 1. Number of oservations and percentage of sub-groups of observations

Variable\Period	Wave 7 1995-97	Wave 8 1997-2000	Wave 9 2001-03	Wave 7-8 1995-2000	Wave 8-9 1997-2003	Wave 7-9 1995-2003
Observations	4497	4680	4284	1316	2127	663
Big Firms	10.52	6.77	11.37	8.61	8.97	9,49
Part of a Group	24.88	20.34	32.33	22.57	26,07	25,67
Pavitt1 Supplier-Dominated	44.07	52.78	51.96	52.39	48,51	49,61
Pavitt2 Scale-Intensive	24.86	17.84	16.81	21.10	17,16	19,73
Pavitt3SpecialisedSuppliers	26,46	24,10	26,68	25,26	25,33	25,71
Pavitt4 Science-based	4.60	5.64	4.55	5.13	5,12	4,95

The first line shows the number of firms composing the balanced sample. Other lines are all percentage calculated on rotation sample (rotation sample compositions are the sum of the waves).

The Capitalia database contains information on both firm characteristics and incentives received. On the one hand, it is possible to know if firms are part of a group, their R&D expense, how they finance investments and the number of workers in R&D. On the other, the database distinguishes between different typologies of incentives to foster R&D and between the two parts of Law 46/82. This bulk of information in Capitalia Survey is a

unique instrument for the evaluation of law 46/82 and other R&D incentives.

The percentage of firms that received any R&D incentive (including Law 46/82) in the survey increased from 11% to 20% in the three waves (Table 2, first line). Specifically, the number of firms receiving an incentive under Law 46/82 is not so wide: incentives under the first part of the Law are granted to about 2% of the firms, whereas the second part of the Law benefits more than 3% of the firms. Even if the number of firms receiving incentives under Law 46/82 is scant, most of them obtain at least another R&D incentive, as it is displayed in the last three rows of Table 2. The combination of different incentives stimulating the same firms can mislead the evaluation of law 46/82 (and its parts) and needs to be taken into account.

Table 2. Percentage of granted firms

Variable\Period	Wave 7 1995-97	Wave 8 1997-2000	Wave 9 2001-03	Wave 7-8 1995-2000	Wave 8-9 1997-2003	Wave 7-9 1995-2003
% Received a law for R&D	11.32	14.94	19.79	13.16	17,26	15,27
% Received Law 46/82	4.47	5.47	11.11	4.98	8,17	6,93
% Received Law 46/82 first part	2.22	2.31	1.54	2.27	1,94	2,04
% Received Law 46/82 second part	3.34	4.29	10.20	3.82	7,12	5,85
% Received Law 46/82 and other law for R&D	62.69	66.41	40.55	65.77	49,59	52,41
% Received Law 46/82 first part and other law for R&D	89	88.89	74.24	88.94	83,33	85,40
% Received Law 46/82 second part and other law for R&D	64.67	68.16	41.65	66.67	50	52,79

All lines are percentage calculated on rotation sample (rotation sample compositions are the sum of the waves).

6. Econometric Analysis

6.1. Methodology

The advantage of having repeated observations over time for each of the unit of analysis is that one can observe the behaviour of firms that did not have any incentive and then received it at some point in time, and compare it with that of firms that never received the incentive.

In doing this we recall that the main issues to take into account are (1) the selection bias; (2) endogeneity, stemming possibly from reverse causality or from the presence of omitted latent variables that influence both the private and the public investment decisions. More precisely:

- firms that receive the subsidy, as already said, are not a random selection of potential beneficiaries, on the contrary they might be the result of a self-selection process: firms that are more "active" in R&D and innovation might have more information on the available subsidies (deadlines, procedures alternative incentives etc.) and might have higher technical competencies and expertise to submit the applications. Their innovation performance might be higher than that of firms that did not apply for the subsidy, but this could be the results of the above mentioned factors instead of the public incentive;

- even if self-selection is taken into consideration, it is quite unlikely that the public decision to finance R&D and innovation activities trough subsidies is completely independent from the firm's previous R&D and innovation records. In other words, the decision to offer a subsidy might be influenced by and at the same time might determine how "innovative" a firm is. The choice by government is non random and in most cases it reflects a "picking the winner" strategy. Related to the above-mentioned issues it is the more general idea that there might be observable or unobservable factors that influence simultaneously the private and public investment decisions (David et al., 2000).

In this study we refer to the "difference in difference" approach as an instrument to take into account possible biases due to the non random selection of beneficiaries (Heckman, 1998; David et al., 2000; Klette et al., 2000)[8]. In particular, given the nature of our data, we use the DD estimator in the fixed effect form as in Imbens and Wooldridge (2009)[9]. Difference-in-differences estimators have been used widely in policy evaluation since Ashenfelter and Card (1985). The analysis is carried out over two consecutive time periods (each period covers three years) and the beneficiaries are firms that received the incentive in the second period but not in the first one[10]. We do not take into account therefore firms that received the incentive in the first period, because these potentially incorporate already an effect of the incentive on R&D expenditures. In this approach the selection mechanism for receiving the subsidy is allowed to be dependent on time-invariant unobserved characteristics. The usual example is of subsidised individuals, or firms in our case, that are "more able" or "more motivated" to take part to the program than excluded firms, provided that such an advantage affects their outcome in every period in the same way. In the context of firms incentives to R&D, several analyses have chosen the DD method of estimation to take into account the selection on unobservables above mentioned (see for instance Lichtenberg, 1984 and 1988; Holemans and Sleuwaegen, 1988). The use of the fixed effect form also allows to control for possible heterogeneities of the beneficiaries, meaning

[8] The DD model can be applied if at least two observation (before and after the policy intervention) are available for beneficiaries and non-beneficiaries of the incentive program. In the standard form $Y_{i,t}$ □□□□□□□P_i □□□T_t□□□□P_iT_t□□□□$_{i,t}$□□$Y_{i,t}$ is the outcome variable, P_i is a dummy variable equal to 1 if firms i is part of the beneficiaries and 0 otherwise, T_t is also a dummy variable equal to 1 only in the second period (after the policy program begins) and 0 otherwise. The true "treatment variable" is P_iT_t that is equal to 1 only for firms that received the incentives at the time of policy intervention. The coefficient □ therefore estimates the effect of the policy. For further details see also among others Smith (2004).

[9] For further reference see also Blundell *et al.* (2007) and Wooldridge (2007).

[10] Alternatively we could have run the regression on the three periods, but in this case we would assume a constant effect of the law throughout nine years, which seemed to us unrealistic Bertrand et al (2004).

other individual effects depending on time-invariant firms characteristics (such as geographical location and industrial sector). Moreover, we add other control variables in the model in order to capture effects that cannot be refereed to the single firm and differences in the growth trend of beneficiary firms and non beneficiary ones. The main limit of such an approach, beyond the assumption of fixed effects, is that it is dependent from the functional form that the evaluator chooses to specify[11].
The estimation of the effects of Law 46/82 is carried out on both R&D expenditures and on R&D employment, analysing the Law as a whole as well as its two different components (FAR and FIT). The DD estimations take the following form:

$$(1) R\&Dexpenditures_{it}=\alpha+\beta_1 Wave_t+\beta_2 Law46/82_{it}+Z_{it}\gamma+c_i+ u_{it}$$

$$(2) R\&Demployment_{it}=\alpha+\beta_1 Wave_t+\beta_2 Law46/82_{it} + Z_{it}\gamma+c_i + u_{it}$$

In the above specified equations β_1 captures the time effect; β_2 is the DD estimator that captures the effect of the policy, the variable $Law46/82_{it}$, in fact, is equal to 1 when firm *i* receives the incentive at wave *t*. The variable Z_{it} summarizes all controls; further details on the variables and the way they are calculated can be found in table 6.1.

6.2 Aspects of multiple treatment and heterogeneity

The above specified equations allow to compute an average effect of the policy on the beneficiaries of Law 46/82. However, there still are a number of crucial issues that are missed in the estimations of equations 6.1. and 6.2.

First of all, as mentioned in a previous work by the authors

[11] Non parametric, matching methods for instance, do not suffer from this limit. Although they are only able to deal with a selection mechanism based on observable variables. For further details see Abadie (2002), Dehejia and Wahba (1999)

(2010) there is a need to take into account the possible scenario where firms receive more than one incentive, by different government sources and authorities. As shown in section 5 this is indeed a common scenario. The counterfactual situation for non beneficiaries of Law 46/82 is seldom "a complete absence of incentives", but it is rather likely (and it is the case in Italy) that firms face a choice among many different incentives (at the national and regional level), so that many firms will benefit from other R&D incentives in addition to Law 46/82, while other firms will have only one of this options and still other firms will have none. As it is discussed in the result section 7 when other R&D incentives are included in the analysis the results change substantially.

Secondly, DD conventional estimation returns, as said, an average effect that is equal for all firms. In other words it does not allow to take into account the possibility that effects are heterogeneous among firms or group of firms (ex. large vs. small firms, high tech vs. low tech and so forth). Despite homogeneity being in some cases a very strict assumption, the so called ATET (average treatment effect on the treated) is by far the most used estimator in the analyses on R&D incentives. Analyses that produce as a result an average effect on beneficiaries can be little helpful to policy makers (and to firms and workers) since they tend to either accept the incentives as they are, or (much more often) to suggest that incentives should be fully abandoned. In this way little room is left for improvements and rationalisation.. Heterogeneity and multiple treatments can imply complex models of estimation (Smith, 2004) which often discourage a diffuse debate on these aspects. In this paper we provide a contribution in this direction by including in the analysis other incentives in R&D and by estimating the effect of Law 46/82 for subgroups of firms.

In particular, in order to take into account other R&D incentives we calculate the DDD (difference in difference in differences) estimator (Wooldridge, 2007; Imbens and Wooldridge, 2009). To this aim, a new variable is created (R&D incentives) to identify

firms that received other R&D incentives[12], different from those offered by law 46/82. Equations 3 and 4 provide the details of the DDD estimation:

$$(3) R\&Dexpenditures_{it} = +\beta_1 Wave_t + \beta_2 Law46/82_{it} + \beta_3 OtherR\&Dincentives_{it} + + \beta_4 DDD\ Estimator + Z_i\gamma + c_i + u_{it}$$

$$(4) R\&Demployment_{it} = \alpha + \beta_1 Wave_t + \beta_2 Law46/82_{it} + \beta_3 OtherR\&Dincentives_{it} + + \beta_4 DDDEstimator + Z_i\gamma + c_i + u_{it}$$

The coefficient β_1 captures the time effect, β_2 measures the effect of law 46, β_3 highlights the effect of all other laws that encourage R&D (other than law 46/82) and finally β_4 shows the combined effect of other R&D incentives and law 46/82 (Barbieri et al., 2010). Details of the new variables can also be found in table 6.1.

6.3 Variables description

The relevant dependent variables are, as mentioned, the logarithms of expenditures in R&D (*R&D expenditures*) and the logarithms of number of workers within the R&D sector (*R&D employment*).
Given that the database allows to distinguish the two parts of Law 46, regressions look at the whole effect of Law 46 as well as at the distinct effects of the Fund for Applied Research and the Fund for Technological Innovation. All control variables are provided by the Capitalia database, except for the number of bank branches in the firm's town of residence, which is provided by the Bank of Italy [13]. Control variables were introduced for two specific reasons. On the one hand, they allow to take into account some relevant confounding factors: first of all firms' size (*Workers and*

[12] Among these are law 166/02, law 30/84, law 140/97 and other (non specified) regional and local incentives.
[13] http://www.bancaditalia.it/statistiche

Log_Sales) that affects the ability to manage R&D and that captures the effects of macroeconomic cycles or shocks; secondly, the participation to consortia that represents an alternative channel for small companies to foster R&D (*R&DConsortia*). On the other hand, incentives work as an alternative method of financing. Firms with reduced capacity of interactions with banks can have more difficulties in finding sources to invest in R&D and this justifies controlling for a few financial indicators (*Self-financing in R&D and Bank branches*).

The variable *Law 46/82* has different specifications depending on whether it is analysed as a whole or in its two parts, and on the considered period of observation. The term "*Law46/82"* has de facto six different specifications that are explained in detail in table A.1 of the appendix. To simplify the reading of the results, all these specifications take the same name in the regression tables.
The variable referring to *other R&D incentives* is defined in a similar way and details can also be found in table A.1 (appendix). The last policy variable (*DDD estimator)* is the product of Law 48/82 and other R&D incentives and it represents the cross effect of the different R&D policies.

7. Results

Before commenting on the results, a few remarks on the specification tests carried out in the analysis are mandatory. Data description in section 5 has shown possible biases in the results coming from a possible attrition problem in the data. The Verbeek and Nijman test[14] has been used to control for this possibility and it shows that the loss of observations that we detect is not dependent from any variable in the regressions, but it is rather due to causal factors. We can therefore exclude the presence of attrition bias. The

[14] Verbeek and Nijman (1992) cited in Wooldridge (2002). The dummy variable *nextwave* was created. Its value is equal to 1 if an observation is also present in the following wave. With a simple t-test, we test the hypothesis that P(Y|Nextwave,X) = P(Y|X). If the hypothesis is verified then the loss of observation is not related to variables in the regression but it is probably due to causality.

results of the attrition test are displayed in the regression tables (see appendix). Regressions are also run taking into account heteroskedasticity, which is corrected through robust estimations[15].
The results of the difference in difference estimation (table A.2 of the appendix) show a general positive effect of the Law on both R&D expenditures and R&D employment. However, only a few cases satisfy the conventional significance threshold (90%) that excludes the possibility of a null or even negative effect. In particular, the first part of the Law appears to have positive and significant effects on R&D expenditures, but only in the first period of observation. On the other hand, the second part of the Law displays positive and significant effects on R&D employment, but again only in the first period of observation (waves 7 and 8).
When moving onto the DDD estimations, where other R&D incentives are taken into account, the results change considerably (table A.3 of the appendix). In particular, whereas the other R&D incentives always display positive and significant results, the effects of Law 46/82 loose significance in all the different specifications and periods of observation. Moreover, although never significant, the DDD estimator always appears with a negative sign. These results confirm that multiple treatment is an issue that needs to be carefully investigated: in this case it appears that the first positive effects of the Law detected in the DD estimation were in fact due to other R&D incentives and that there might be an inefficient overlapping of instruments to support R&D investments.
In addition, the DDD estimation returns an average effect that is equal for all kinds of firms. As already mentioned the homogeneity of effects is probably an unrealistic assumption in this case and it is worth looking at subgroups of firms that share similar characteristics. The idea is to have a clearer picture of the type of firm that might benefit the most from FAR and FIT. Tables A.4 and

[15] This correction is made through the cluster method, which takes into account aggregate variables in the individual (single firm) estimations. A simple robust estimator in fact can under-estimate the error as noted by Moulton (1990).

A.5 of the appendix provide a separate estimation of the DDD model for large firms and for medium and small enterprises (SMEs). Again, some slight changes in the results appear. In particular, a positive effect of the first part of the law can be detected for large firms on both R&D expenditures and employment, but only for the period between the waves 7 and 8. On the other hand, a negative effect appears for SMEs on both expenditures and number of workers in R&D, but again limited to the first part of the Law and to the first period. The second part of the Law does not appear to have effects on either SMEs or large firms and both the second and the first part of the Law seem to have no effects whatsoever in the second period of observation (that is after the reform of 2001).

It is worth noting that when considering the sub-sample of large firms, the effects of other R&D incentives also seem to loose some significance (in particular in the second period of observation), whereas they remain always positive and highly significant for SMEs. A further attempt to make the analysis deeper has been done taking into consideration if a firm is part of a group or not[16]. The results are very similar to those already discussed with reference to large firms and SMEs. Firms that are part of a group display very similar results as large firms. This is easily explained since 80% of large firms are part of a group, whereas only 20% of SMEs are part of a group.

We tried to go beyond an analysis of the aggregate effect of the law46/82 also by investigating the effects of the law in each of the four group of firms identified by the Pavitt taxonomy, running four distinct DDD regressions. Then, we crossed this distinction with that by firm size (small-medium firms, on one side; large firms, on the other). Crossing the four Pavitt groups with the two size groups, we obtained other eight sub-groups of firms and other eight DDD regressions. The results of all these twelve regressions are shown in

[16] In the questionnaire submitted to the firms, a group is defined as a set of firms controlled –directly or indirectly- by the same persons, the same company or the same public institutions.

Tables A.6-A.9.
It is difficult to identify a sub-group of firms where the law46/82 results with no doubt effective from all points of view (effect on both employers and expenditures in each of the considered periods); nevertheless, we may identify some interesting "partial" effects. In the large firms belonging to the first Pavitt group (supplier dominated) the second part of the law46/1982 (FIT) has a positive effect on the number of R&D employers in the second considered period. Even in the second Pavitt group (scale intensive), it is possible to find a positive effect of the law on the large firms; in this case the effect is on R&D expenditures by the first part of the law in the first of the considered periods; anyway, in this case it has to be observed the strong negative sign of the DDD coefficient, still underlining the negative effect of the interaction of our law with other incentives to R&D. In the third Pavitt group (specialised suppliers) the first part of the law had a significant effect, in the second considered period, both on expenditures and employers in R&D; differently from the first two categories, in this case the effect is concentrated on small-medium firms. Even in the fourth Pavitt group (science-based), where R&D is particularly important, there is a positive and significant effect of the law in the second period, exactly of both parts of the law on the employers in R&D (in the sub-group of SMEs this effect is confirmed only for the second part of the law).

7.1 A territorial analysis

Another dimension that has to be taken into consideration is the territorial one. This is particularly true in Italy, a country characterized by a persistent dualism between the rich and developed Northern part of the country and the less developed Southern part. In the South of Italy the weakness of several environmental and strictly economic factors may negatively affect the impact of the public subsidies; on the other side, the public intervention is particularly needed in a less developed context: it is exactly where the investment in R&D is poor that the public

subsidy may let to overcome the financial constraints and cause a significant boost in that kind of expenditure. We considered a division of national territory in four areas (North-West; North-East; Centre; South). First of all, it has to be observed that the South is significantly below the other three areas, very similar among them, in terms of expenditure and occupied in R&D; the size of the firms, expressed by the number of occupied, is on average smaller in Centre and South respect to the North East and North West. The DDD analysis shows that the other incentives to R&D but law 46/1982 have an overall positive effect both on the expenditure and the employment in R&D in all the areas; on the contrary, between wave 7 and 8, the law 46/1982 never shows a significant positive effect; moreover, in many specifications it has a significant negative effect in the South of Italy, particularly if we consider the second part of the law; the interaction term is often negative and significant, too, indicating that the contemporary presence of the law46/1982 with other treatments gives particularly negative effect; the negative effect of the law 46/1982, taken alone and in interaction with other incentives, is often true for the Centre of Italy, too. It must be underlined the presence of some public subsidies specific for the South and other less developed part of the country: the interaction among laws with its negative effect may therefore happen, in the South, with such subsidies. It has also to be observed that the presence of some form of public incentives only in some part of the country makes it difficult to compare all the results for the different areas of Italy. Things seems slightly to change in the second considered period, as the law 46/1982, particularly the first part (FAR), if taken alone (without other incentives) has in the South of Italy (and only there) a positive effect on both expenditure and employment in R&D. In the light of the hypotheses formulated above on the possible effects of the public incentives in the less developed parts of the country, this results could be read as the prevalence of the negative effects of the context in the first period and the prevalence of the positive, “boosting” effect in the second period. As giving efficient

incentives to the Southern Italy, increasing its technological level, is an historical policy priority in Italy, if this result will be confirmed by further studies, this may be considered a positive result of the re-organization of the public system of incentives to R&D.[17]

8. Policy Conclusions

In this paper we have recalled the importance of policy evaluation in the definition of industrial policy strategies, we have reviewed the theoretical reasons why government should support private expenses in R&D and reported the results of the main attempts to evaluate this kind of policies. Then we focused our attention on the Italian system of incentives to R&D and innovation, underlining the potential overlapping problems and analysing in particular the effects of a specific law - 46/1982 - with its subsequent transformation. We found that Law 46, and its distinction in two parts, does not seem to have any significant effect on the R&D expenses or employment of firms once other R&D incentives are at work. These results appear particularly discouraging if considered that the other R&D incentives appear, with few exceptions, positive and significant. Moreover, the Italian system of incentives to innovation seems to be plethoric, since the law under consideration seems to even reduce the strength of the other incentives.

Nevertheless, these average results are in part mitigated if we take into consideration some distinctions inside the sample of firms. When large firms are analysed separately from SMEs some positive results emerge for large firms, while negative effects appear for small firms. However, these findings are not systematic and are only limited to the first period of observation. This could cast some doubts on the appropriateness of the re-organisation of FAR and FIT in 2001, since the analysis for the most recent periods (wave 8 and 9 after the reform) never shows any signal of positive effect of the Law. Moreover, these results appear particularly discouraging if

[17] The results concerning the territorial analysis, as well as those concerning the analysis the belonging or not to a group, may be obtained on request.

considered that the other R&D incentives appear, with few exceptions, positive and significant. Some positive signals about the effects of the Law46/82 after its re-organization in 2001 come from the analysis conducted by Pavitt group, as we find, in the second considered period (wave 8 and 9), some effect of FAR in the specialised-suppliers firms and of both FAR and FIT in the science-based firms. Even considering a territorial analysis, the only positive results come from the FAR in the second period in the South of Italy, surprisingly the same part of the country that registers the worst results of the law in the previous period. Two general warnings emerge therefore from our study. First of all, when a specific public intervention is adopted in presence of similar policies, there is a need to take explicitly into consideration the context, in order to be able to isolate the effects of the different policy instruments. This is important to formulate policy suggestions that can help avoid a useless overlapping of incentives. Besides, in the evaluation process there is a need to go beyond the use of mean effects, considering the sub-groups of the treated subject, given that the effects may different substantially across them: identifying the specific groups where the policy is effective may reduce the entity of public expenditure, increasing its effectiveness and rationality.

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Appendix

Table A.1Variables: definitions and calculations.

Dependent Variables	
R&D *expenditures*	ln (1+ total R&D expenditures in the wave)
R&D employment	ln (1+ average number of workers in R&D in the wave)
Time Variable	
Wave	different meaning in different periods: Regressions in the Waves 7-8: =1 if the observation is in the VIII wave; = 0 if the observation is in the VII wave Regressions in the Waves 8-9: =1 if the observation is in the IX wave; = 0 if the observation is in the VIII wave
Policy Variables	
Law46/82	different meaning according to the different regressions: Regression Law 46/8-Wave 7-8: =1 if the firm receives incentives from any part of the law in the VIII wave; =0 otherwise Regression Law 46/ 8-Wave 8-9: = 1 if the firm receives incentives from any part of the law in the IX wave; =0 otherwise Regression Law 46/8-Part I -Wave 7-8: = 1 if the firm receives incentives from the first part of the law in the VIII wave; =0 otherwise Regression Law 46/8-Part I -Wave 8-9: = 1 if the firm receives incentives from the first part of the law in the IX wave; =0 otherwise Regression Law 46/8-Part II -Wave 7-8: = 1 if the firm receives incentives from the second part of the law in the VIII wave; =0 otherwise Regression Law 46/8-Part II -Wave 8-9: = 1 if the firm receives incentives from the second part of the law in the IX wave; =0 otherwise
Other R&D incentives	different meaning according to the different regressions: Regression Law 46/8-Wave 7-8: =1 if the firm receives other incentives but law46/82 in the VIII wave; =0 otherwise Regression Law 46/ 8-Wave 8-9: = 1 if the firm receives other incentives but law46/82 in the IX wave; =0 otherwise Regression Law 46/8-Part I -Wave 7-8: = 1 if the firm receives other incentives but the first part of the law46/82 in the VIII wave; =0 otherwise Regression Law 46/8-Part I -Wave 8-9: = 1 if the firm receives other incentives but the first part of the law46/82 in the IX wave =0 otherwise Regression Law 46/8-Part II -Wave 7-8: = 1 if the firm receives other incentives but the second part of the law46/82 in the VIII wave; =0 otherwise Regression Law 46/8-Part II -Wave 8-9: = 1 if the firm receives other incentives but the second part of the law46/82 in the IX wave; =0 otherwise
DDD Estimator	*Law46/82*Other R&D incentives*
Control Variables	$\mathbf{Z_i}$
Workers	Average number of workers in the wave)
Log_Sales	ln (1 + total sales in the wave)
Self-financing in R&D	Amount of self-financed R&S expenditures in the wave
Bank branches	Number of bank branches in the town of firm's residence
R&D Consortia	(= 1 if the firm is Part of an R&D Consortium; = 0 Otherwise)

Table A.2 Difference -in-Differences. Effects of Law 46 (total, part I and part II). Waves 7-8 and 8-9. Dependent variables R&D expenditures (log) and R&D employment (log). Fixed-effect coefficients (standard errors in parenthesis).

	Law 46/82				Law 46/82 – Part I (FAR)				Law 46/82 – Part II (FIT)			
	Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9	
	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment
Wave	1,19***	0.17***	0,16	0.07**	1,30**	0.19***	0,20	0.07**	1,25***	0.17***	0,17	0.06**
	(0,22)	(0.03)	(0,18)	(0.02)	(0,22)	(0.03)	(0,17)	(0.02)	(0,22)	(0.03)	(0,18)	(0.02)
Law 46/82	**2,10****	**0,30****	0,76	0.11	**2,27***	0.22	1,86	0.28	1,42	**0.25***	0,52	0.14
	(0,69)	(0,10)	(0,56)	(0.09)	(1,06)	(0.12)	(1,39)	(0.21)	(0,76)	(0.11)	(0,55)	(0.09)
Log_Sales	0,50	0.08	0,18	0.07	0,49	0.09	0,10	0.07	0,51	0.10	0,16	0.07
	(0,48)	(0.06)	(0,42)	(0.05)	(0,48)	(0.06)	(0,40)	(0.05)	(0,48)	(0.06)	(0,41)	(0.05)
Workers	-0,00	0.00	-0,00	0.00	0,00	0.00	-0,00	0.00*	-0,00	0.00	-0,00	0.00
	(0,01)	(0.00)	(0,00)	(0.00)	(0,00)	(0.00)	(0,00)	(0.00)	(0,00)	(0.00)	(0,00)	(0.00)
Self-financing in R&D	0,01**	0.00**	0,02***	0.00	0,01**	0.00*	0,02***	0.00	0,01**	0.00**	0,01***	0.00
	(0,00)	(0.00)	(0,00)	(0.00)	(0,00)	(0.00)	(0,00)	(0.00)	(0,00)	(0.00)	(0,00)	(0.00)
Bank branches	-0,01	-0.00	0,01	0.00	-0,01	-0.00	0,01	0.00	-0,01	-0.00	0,01	0.00
	(0,01)	(0.00)	(0,01)	(0.00)	(0,01)	(0.00)	(0,0)	(0.00)	(0,01)	(0.00)	(0,01)	(0.00)
R&D Consortia	0,64	-0.05	0,86	-0.06	0,66	-0.09	1,80	0.06	0,60	-0.05	0,80	-0.05
	(2,42)	(0.20)	(1,12)	(0.23)	(2,49)	(0.19)	(1,17)	(0.17)	(2,43)	(0.20)	(1,00)	(0.21)
_Costant	-4,68	-1,04	0,68	-0,70	-4,79	-1,05	2,14	-0,64	-4,89	-1,23	1,23	-0,78
	(7,98)	(2,65)	(7,02)	(1,78)	(8,00)	(2,66)	(6,77)	(1,72)	(7,90)	(2,69)	(6,98)	(1,78)
Hausman test FE vs RE	24,62***	65,98***	36,24***	60,86***	17,87*	61,64***	27,43***	38,54***	26,03***	59,37***	34,18***	53,89***
NEXTWAVE	0,47	- 0,51	-0,24	-0,31	0,52	-0,26	-0,22	-0,29	0,59	-0,34	-0,23	-0,31
N	7380	7153	7181	6892	7462	7232	7323	7024	7425	7197	7234	6936
Adjusted R-squared	0,054	0,085	0,022	0,029	0,052	0,076	0,019	0,026	0.049	0,081	0,018	0,028
Log likelihood	-14221,5	1535,9	-14610	270,0	-14500	1514,8	-15000,4	95,13	-14356	1479,2	-14760,2	213,3

* Significance: * $\alpha < 5\%$; ** $\alpha < 1\%$; *** $\alpha < 0{,}1\%$
Hausman values of χ^2 and significance.
T-test values for the attrition variable NEXTWAVE and significance.

Table A.3. Difference -in-Difference-in Difference (DDD). Effects of Law 46 (total, part I and part II). Waves 7-8 and 8-9. Dependent variables R&D expenditures (log) and R&D employment (log). Fixed-effect coefficients (standard errors in parenthesis).

	Law 46/82				Law 46/82 – Part I (FAR)				Law 46/82 – Part II (FIT)			
	Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9	
	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment
Wave	0.87***	0.12***	0.10	0.06**	0,87***	0,12***	0,11	0,06**	0,87***	0,12***	0,11	0,06**
	(0.23)	(0.03)	(0.19)	(0.02)	(0,23)	(0,03)	(0,20)	(0,02)	(0,23)	(0,03)	(0,19)	(0,02)
Law 46/82	0.37	0.16	0.41	0.12	0,41	0,27	2,58	-0,17	0,41	0,07	0,00	0,07
	(1.01)	(0.18)	(0.93)	(0.12)	(0,71)	(0,30)	(4,66)	(0,17)	(1,30)	(0,20)	(0,93)	(0,12)
Other R&D incentives	5.44***	0.57***	4.83***	0.36***	4,69***	0,52***	3,24***	0,29***	5,26***	0,54***	4,73***	0,34***
	(0.64)	(0.09)	(0.65)	(0.08)	(0,56)	(0,08)	(0,53)	(0,07)	(0,61)	(0,09)	(0,66)	(0,08)
DDD estimator	-1.32	-0.14	-1.56	-0.09	-1,58	-0,34	-2,58	0,67	-1,64	0,05	-0,89	0,09
	(1.48)	(0.24)	(1.40)	(0.24)	(1,69)	(0,34)	(5,14)	(0,48)	(1,71)	(0,26)	(1,41)	(0,24)
Log_Sales	0.20	0.07	0.36	0.07	0,22	0,07	0,37	0,08	0,24	0,07	0,36	0,07
	(0.50)	(0.06)	(0.41)	(0.05)	(0,50)	(0,06)	(0,41)	(0,05)	(0,49)	(0,06)	(0,41)	(0,05)
Workers	-0.00	0.00	-0.01*	-0.00	-0,00	0,00	-0,01	-0,00	-0,00	0,00	-0,01*	-0,00
	(0.00)	(0.00)	(0.00)	(0.00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Self-financing in R&D	0.02***	0.00***	0.02***	0.00*	0,02***	0,00***	0,02***	0,00*	0,02***	0,00***	0,02***	0,00*
	(0.00)	(0.00)	(0.00)	(0.00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Bank branches	-0.01	-0.00	0.01	0.00	-0,01	-0,00	0,01	0,00	-0,01	-0,00	0,01	0,00
	(0.01)	(0.00)	(0.01)	(0.00)	(0,01)	(0,00)	(0,01)	(0,00)	(0,01)	(0,00)	(0,01)	(0,00)
R&D Consortia	1.54	-0.03	-1.61	-0.11	1,61	-0,03	-1,19*	-0,09	1,52	-0,03	-1,58	-0,10
	(2.34)	(0.15)	(0.89)	(0.37)	(2,39)	(0,15)	(0,60)	(0,36)	(2,35)	(0,16)	(0,87)	(0,37)
_Costant	-0.41	-0.75	-2.93	-0.83	-0,50	-0,75	-2,96	-0,86	-0,84	-0,78	-2,84	-0,83
	(8.23)	(0.95)	(6.86)	(0.78)	(8,22)	(0,95)	(6,98)	(0,77)	(8,21)	(0,95)	(6,86)	(0,78)
Hausman test FE vs RE	33,55***	77,17***	56,34***	115,81***	33,81***	66,44***	47,07***	100,64***	35,20***	68,59***	56,77***	118,46***
NEXTWAVE	0,53	-0,24	-0,32	0,50	0,37	-0,37	-0,33	-0,35	0,44	-0,17	-0,32	-0,34
N	7123	6904	6761	6519	7123	6904	6761	6519	7123	6904	6761	6519
Adjusted R-squared	0.147	0.136	0.085	0.055	0,137	0,131	0,071	0,055	0,144	0,138	0,087	0,057
Log likelihood	-13113.3	1999.5	-13288.0	857.7	-13157.0	1978.1	-13341.8	857.7	-13126.2	2007.0	-13283.1	864.7

* Significance: * $\alpha < 5\%$; ** $\alpha < 1\%$; *** $\alpha < 0{,}1\%$
Hausman values of χ^2 and significance.
T-test values for the attrition variable NEXTWAVE and significance.

Table A.4. Difference -in-Difference-in Difference (DDD). Effects of Law 46 (total, part I and part II) **for PMI firms.** Waves 7-8 and 8-9. Dependent variables R&D expenditures (log) and R&D employment (log). Fixed-effect coefficients (standard errors in parenthesis).

	Law 46/82				Law 46/82 – Part I (FAR)				Law 46/82 – Part II (FIT)			
	Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9	
	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment
Wave	0,78***	0,12**	0,15	0,07***	0,79***	0,12***	0,15	0,07**	0,78***	0,12***	0,15	0,07**
	(-0,23)	(-0,03)	-0,19	-0,02	(0,23)	(0,03)	(0,19)	(0,02)	(0,23)	(0,03)	(0,19)	(0,02)
Law 46/82	0,25	0,10	1,16	0,09	**-0,59***	**-0,11*****	2,46	-0,19	0,39	0,05	0,73	0,05
	(-1,17)	(-0,19)	(1,04)	(0,10)	(0,23)	(0,03)	(4,63)	(0,17)	(1,37)	(0,21)	(1,02)	(0,10)
Other R&D incentives	5,17***	0,49***	4,92***	0,34***	4,70***	0,45***	3,70***	0,26***	4,97***	0,46***	4,80***	0,31***
	(-0,69)	(-0,10)	(0,67)	(0,08)	(0,61)	(0,09)	(0,56)	(0,06)	(0,66)	(0,09)	(0,68)	(0,08)
DDD estimator	-0,33	-0,05	-2,12	-0,12	-1,69	-0,03	-2,23	0,62	-0,23	0,13	-1,16	0,04
	(-1,72)	(-0,26)	(1,60)	(0,21)	(1,71)	(0,17)	(5,25)	(0,58)	(1,90)	(0,29)	(1,61)	(0,23)
Log_Sales	0,33	0,09	-0,06	0,01	0,31	0,09	-0,04	0,01	0,34	0,09	-0,07	0,00
	(-0,48)	(-0,06)	(0,36)	(0,04)	(0,48)	(0,06)	(0,37)	(0,04)	(0,48)	(0,06)	(0,36)	(0,04)
Workers	0,05***	0,00**	0,04**	0,01***	0,05***	0,01**	0,04**	0,01**	0,05***	0,01**	0,04**	0,01***
	(-0,01)	(0,00)	(0,01)	(0,00)	(0,01)	(0,00)	(0,01)	(0,00)	(0,01)	(0,00)	(0,01)	(0,00)
Self-financing in R&D	0,01**	0,00*	0,02***	0,00**	0,01**	0,00*	0,02***	0,00**	0,01**	0,00*	0,02***	0,00**
	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)	(0,00)
Bank branches	0,01	0,00	0,02*	0,00	0,01	-0,00	0,02	0,00	0,01	0,00	0,02*	0,00
	(-0,01)	(0,00)	(0,01)	(0,00)	(0,01)	(0,00)	(0,01)	(0,00)	(0,01)	(0,00)	(0,01)	(0,00)
R&D Consortia	1,44	0,02	-1,71	-0,11	1,40	0,00	-1,39	-0,09	1,45	0,03	-1,68	-0,10
	(-2,85)	(-0,17)	(0,99)	(0,36)	(2,88)	(0,17)	(0,77)	(0,35)	(2,87)	(0,17)	(0,97)	(0,36)
_Costant	-5,58	-1,42	0,15	0,07***	-5,17	-1,40	0,70	-0,04	-5,78	-1,43	1,15	0,01
	(-7,80)	(-1,01)	(0,19)	(0,02)	(7,81)	(1,01)	(6,00)	(0,68)	(7,79)	(1,01)	(5,84)	(0,68)
Hausman test FE vs RE	29,73***	56,63***	38,51***	108,38***	33,20***	55,89***	33,00***	89,92***	28,96***	50,31***	38,30***	110,71***
NEXTWAVE	0,06	0,06	0,33	0,33	0,03	0,03	0,32	0,32	0,05	0,05	0,33	0,33
N	6554	6381	6206	6091	6554	6381	6206	6091	6554	6381	6206	6091
Adjusted R-squared	0,17	0,16	0,094	0,073	0,156	0,156	0,084	0,072	0,163	0,163	0,095	0,074
Log likelihood	-11692.1	2751.7	-12159.7	1544.3	-11728.2	2732.8	-12192.9	1542.1	-11703.4	2758.6	-12155.6	1547.5

* Significance: * $\alpha < 5\%$; ** $\alpha < 1\%$; *** $\alpha < 0{,}1\%$
Hausman values of χ^2 and significance.
T-test values for the attrition variable NEXTWAVE and significance.

Table A.5. Difference -in-Difference-in Difference (DDD). Effects of Law 46 (total, part I and part II) **for Big firms.** Waves 7-8 and 8-9. Dependent variables R&D expenditures (log) and R&D employment (log). Fixed-effect coefficients (standard errors in parenthesis).

	Law 46/82				Law 46/82 – Part I (FAR)				Law 46/82 – Part II (FIT)			
	Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9	
	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment
Wave	0,20	-0,01	-0,85	-0,18	0,20	-0,02	-0,89	-0,15	0,28	-0,01	-0,79	-0,15
	(1,19)	(0,22)	(1,49)	(0,34)	(1,19)	(0,22)	(1,50)	(0,35)	(1,19)	(0,22)	(1,50)	(0,34)
Law 46/82	3,80	0,60	-2,62	-0,01	6,28*	1,17***	0,37	0,24	0,44	0,04	-2,93	-0,34
	(2,06)	(0,45)	(3,06)	(0,94)	(2,63)	(0,22)	(1,82)	(0,63)	(1,15)	(0,22)	(3,27)	(1,13)
Other R&D incentives	7,15***	1,39***	2,21	0,99*	5,60***	1,29***	0,34	0,79	7,15***	1,36***	2,19	0,98*
	(1,87)	(0,37)	(1,41)	(0,49)	(1,63)	(0,33)	(1,96)	(0,54)	(1,69)	(0,34)	(1,41)	(0,49)
DDD estimator	-6,01*	-0,46	4,08	0,67	-4,56	-0,49			-3,67	0,12	3,71	0,83
	(2,90)	(0,62)	(3,07)	(1,19)	(3,94)	(0,36)			(2,13)	(0,45)	(3,21)	(1,27)
Log_Sales	-4,27	-0,11	-1,41	1,27	-3,96	-0,10	-1,53	1,24	-4,29	-0,10	-1,13	1,39
	(2,31)	(0,11)	(3,50)	(0,84)	(2,41)	(0,11)	(3,56)	(0,82)	(2,32)	(0,11)	(3,51)	(0,86)
Workers	-0,00	-0,00	-0,01	-0,00	-0,00	-0,00	-0,01	-0,00	-0,00	-0,00	-0,01	-0,00
	(0,00)	(0,00)	(0,01)	(0,00)	(0,00)	(0,00)	(0,01)	(0,00)	(0,00)	(0,00)	(0,01)	(0,00)
Self-financing in R&D	0,06**	0,01**	0,03	-0,00	0,06**	0,01**	0,04	-0,00	0,06**	0,01**	0,03	-0,00
	(0,02)	(0,00)	(0,03)	(0,01)	(0,02)	(0,00)	(0,02)	(0,01)	(0,02)	(0,00)	(0,03)	(0,01)
Bank branches	-0,04	-0,01	0,02	0,01	-0,04	-0,01	0,01	0,00	-0,04	-0,01	0,01	0,00
	(0,02)	(0,00)	(0,02)	(0,01)	(0,02)	(0,00)	(0,02)	(0,01)	(0,02)	(0,00)	(0,02)	(0,01)
R&D Consortia	2,45	-0,93			2,97	-0,75			2,77	-0,91		
	(3,53)	(0,87)			(2,91)	(0,82)			(3,73)	(0,87)		
_Costant	93,38*	4,06	40,32	-22,40	87,22	3,83	42,71	-21,63	94,57*	3,98	35,96	-24,15
	(43,91)	(2,36)	(65,11)	(15,05)	(45,73)	(2,36)	(66,03)	(14,65)	(44,17)	(2,33)	(65,12)	(15,30)
Hausman test FE vs RE	18,62*	9,68	13,80	6,21	20,15*	8,39	15,02*	5,25	20,99*	9,83	14,37	6,37
NEXTWAVE	0,88	0,88	0,05	0,05	0,75	0,75	0,04	0,04	0,67	0,67	0,05	0,05
N	569	523	555	428	569	523	555	428	569	523	555	428
Adjusted R-squared	0,236	0,228	0,213	0,111	0,229	0,222	0,182	0,084	0,248	0,232	0,213	0,118
Log likelihood	-1170.7	-146.7	-1037.9	-199.5	-1173.5	-148.8	-1049.3	-206.6	-1166.1	-145.3	-1038.1	-198.0

* Significance: * $\alpha < 5\%$; ** $\alpha < 1\%$; *** $\alpha < 0{,}1\%$
Hausman values of χ^2 and significance.
T-test values for the attrition variable NEXTWAVE and significance.

Tables A.6: Difference -in-Difference-in Difference (DDD). Effects of Law 46 (total, part I and part II) **by Pavitt 1 classification and dimension.** Waves 7-8 and 8-9. Dependent variables R&D expenditures (log) and R&D employment (log). Fixed-effect coefficients.
Only policy variables and significant (at 5%) coefficients are shown.

		Law 46/82				Law 46/82 – Part I (FAR)				Law 46/82 – Part II (FIT)			
		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9	
		R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment
Pavitt 1 All firms	Law 46/82												
	Other R&D incentives	6.86***	0.67***	5,25***	0.39***	6.15***	0.62***	3.51***	0.30**	6.49***	0.64***	5.29***	0.37**
	DDD estimator			-3,98*			-0.63*	-8.01*	0.31**			-3.66*	
	N	3540	3435	3582	3460	3540	3435	3582	3460	3540	3435	3582	3460
Pavitt 1 Small and Medium Firms	Law 46/82												
	Other R&D incentives	6.68***	0.64***	5.58***	0.36**	5.91***	0.57***	3.62***	0.26**	6.26***	0.61***	5.61***	0.33**
	DDD estimator			-4,32*		-5.74***	-0.66*	-8.10*	0.35**			-3.96*	
	N	3340	3248	3368	3288	3340	3248	3368	3288	3340	3248	3368	3288
Pavitt 1 Big firms	Law 46/82				1.69***		NO		NO				1.69***
	Other R&D incentives	8.91**				7.68***	0.98*		1.56*	8.67***		5.61***	
	DDD estimator				NO		NO		NO			-3.96*	NO
	N	200	187	214	172	200	187	214	172	200	187	214	172

Significance: *α < 5%; ** α <1%; ***; α<0,1***

Tables A.7: Difference -in-Difference-in Difference (DDD). Effects of Law 46 (total, part I and part II) **by Pavitt 2 classification and dimension.** Waves 7-8 and 8-9. Dependent variables R&D expenditures (log) and R&D employment (log). Fixed-effect coefficients.
Only policy variables and significant (at 5%) coefficients are shown.

		Law 46/82				Law 46/82 – Part I (FAR)				Law 46/82 – Part II (FIT)			
		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9	
		R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment
Pavitt 2 All firms	Law 46/82							-11.50***	-0.68***				
	Other R&D incentives			5.12***	0.27*			3.32***		3.72*		3.83*	
	DDD estimator				1.24**			NO	NO				1.27**
	N	1468	1423	1203	1155	1468	1423	1203	1155	1468	1423	1203	1155
Pavitt 2 Small and Medium Firms	Law 46/82			-6.16*				-11.69**					
	Other R&D incentives		0.64***	4.13**	0.36**		0.57***		0.26**		0.61**		0.33**
	DDD estimator			12.51***	1.35***		-0.66*	NO	0.35**			12.60***	
	N	1302	1268	1077	1060	1302	1268	1077	1060	1302	1268	1077	1060
Pavitt 2 Big firms	Law 46/82	18.51***		8.09***	-1.41*	18.77***	NO	NO				8.09***	-1.41*
	Other R&D incentives		1.85***		4.13***		1.57**	10.07***		7.96*	1.85**		4.13***
	DDD estimator	-19.56***	NO	NO	NO	NO	NO	NO		NO	NO	NO	NO
	N	166	155	126	95	166	155	126	95	166	155	126	95

Significance: *α < 5%; ** α <1%; ***; α<0,1***
NO means that it has not been possible to estimate that coefficient; it has been reported only if, in the same regression, at least one of the other policy variables is significant.

Tables A.8: Difference -in-Difference-in Difference (DDD). Effects of Law 46 (total, part I and part II) **by Pavitt 3 classification and dimension.** Waves 7-8 and 8-9. Dependent variables R&D expenditures (log) and R&D employment (log). Fixed-effect coefficients.
Only policy variables and significant (at 5%) coefficients are shown.

		Law 46/82				Law 46/82 – Part I (FAR)				Law 46/82 – Part II (FIT)			
		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9	
		R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment
Pavitt 3 All firms	Law 46/82							10.21***	0.20*				
	Other R&D incentives	4.54***	0.36*	4.49***	0.34*	4.52***	0.44**	2.93**	0.32*	4.35***	0.33*	4.67***	0.33*
	DDD estimator						NO						
	N	1762	1706	1667	1609	1762	1706	1667	1609	1762	1706	1667	1609
Pavitt 3 Small and Medium Firms	Law 46/82							10.83***	0.16*				
	Other R&D incentives	4.48***	0.37*	4.90***	0.37*	4.84***	0.41**	4.65***	0.29*	4.37***	0.33*	5.08***	0.36*
	DDD estimator					NO	NO	-8.82*					
	N	1603	1563	1501	1483	1603	1563	1501	1483	1603	1563	1501	1483
Pavitt 3 Big firms	Law 46/82			-15.99**				NO				-15.99**	
	Other R&D incentives			-5.72*		4.05*	2.09*	-10.28**		3.72*		-5.72*	
	DDD estimator			21.93**		NO	NO	NO				21.93**	
	N	159	143	166	126	159	143	166	126	159	143	166	126

Significance: *α < 5%; ** α <1%; ***; α<0,1***
NO means that it has not been possible to estimate that coefficient; it has been reported only if, in the same regression, at least one of the other policy variables is significant

Tables A.9: Difference -in-Difference-in Difference (DDD). Effects of Law 46 (total, part I and part II) **by Pavitt 4 classification and dimension.** Waves 7-8 and 8-9. Dependent variables R&D expenditures (log) and R&D employment (log). Fixed-effect coefficients.
Only policy variables and significant (at 5%) coefficients are shown.

		Law 46/82				Law 46/82 – Part I (FAR)				Law 46/82 – Part II (FIT)			
		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9		Wave 7-8		Wave 8-9	
		R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment	R&D expenditures	R&D employment
Pavitt 4 All firms	Law 46/82		1.18***		0.81**				0.57**		-2.21**		0.59**
	Other R&D incentives				0.55**		1.13***				0.61*		0.56**
	DDD estimator		-2.15**		NO	12.48***			NO		NO		
	N	353	340	309	295	353	340	309	295	353	340	309	295
Pavitt 4 Small and Medium Firms	Law 46/82		-2.43**		0.59***				NO		-2.43**		0.59***
	Other R&D incentives				0.55**				0.56**				0.55**
	DDD estimator		NO		NO				NO		NO		NO
	N	309	302	260	260	309	302	260	260	309	302	260	260

Significance: *α < 5%; ** α <1%; ***; α<0,1***
NO means that it has not been possible to estimate that coefficient; it has been reported only if, in the same regression, at least one of the other policy variables is significant
It has not been possible to estimate the regressions for the big firms

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