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**ARE REGIONAL POLICIES EFFECTIVE? AN EMPIRICAL EVALUATION ON
THE DIFFUSION OF THE EFFECTS OF R&D INCENTIVES**

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Abstract

This paper aims to provide evidence on the effectiveness R&D incentives to private firms allocated by Region Umbria for the period 2004-2009. The novelty of our approach consists in a comparison between subsidized firms, localised in the two main local market areas in Umbria (Perugia and Terni), with the unsubsidized ones, controlling for the possible development of technological spillovers due to both geographical and sectoral proximity. To identify the effect of the programme, the study implements a Diff-in-Diff methodology (DID). The results show a positive and statistically significant impact of the subsidies, especially for the innovative outputs and the small firms. The impact is higher with respect to the firms located outside the main local labour systems; this evidence seems to confirm the presence of a strict local linkage and it shows empirically the occurrence of significant local technological spillover, which could be attributed to the conjunct action of the regional policy and the geographical concentration. In conclusion, this paper provide some empirical evidence in favour of the effectiveness of a "place-based" innovation policies which are the "core" of the future smart specialization policies in Europe.

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1 Introduction

In recent years regional and local R&D incentive policies perform an increasingly relevant role of stimulus for innovation activities from national policy-makers viewpoint. Moreover, the EU strategies to foster a "*smart, sustainable and inclusive growth*" in the less developed areas are mainly based on innovation policies oriented to the identification and development of correct areas of specialization able to promote the growth of sectors characterized by comparative advantages and the formation of network externalities (Foray, David et Hall, 2011).

The theoretical justification for the use of regional policies in order to enhance innovation and growth are basically twofold: a stream of literature highlights how "place-based" policies, supported by institutional reforms and well-informed local governments, stimulate the commitment of the stakeholders with beneficial effect for local development and potentially for the entire economic system (Barca 2009; OECD 2010 a, b; Garcilazo et al. 2010). Rodriguez-Pose and Crescenzi (2011) propose a conceptual framework that simultaneously justifies "place-based" policies as a vehicle for local development and instrument of coordination among different type of policies, at national and regional level. The second justification takes into account the wide heterogeneity between the different regional contexts and aims to increase the connectivity between the most developed areas and peripheral regions in order to maximize knowledge spillovers and innovation for the different areas¹ (OECD 2009).

"Place-based" policies tend to emphasize the fundamental function covered by public administrations; their intervention include the provision of the incentives, the discovery of the sectors in which regions have a comparative advantage and the identification of the eventual presence of complementary investments in the backward areas (Foray, 2008).

Our paper tries to shed light to the effect of regional "place-based" policies. It aims to assess the "additional" impact of public policies to encourage R&D for the firms in Umbria. Moreover, we focus on the possible creation of spillovers due to the relative proximity of the firms, both geographical and sectoral. The peculiarity of our approach is that we consider only the effect of regional pol-

¹For further information on the topic: Krugman and Venables 1995; Fujita et al. 1999.

icy, checking for the presence of any national or EU incentives. Our interest is, therefore, to increase the presence of regional empirical works and to analyse the effect of the public policy in the Umbria. The most relevant Italian empirical literature provides contradictory indications about the impact of incentives to R&D activities of the firms. Some of the literature in fact shows the presence of additionality for the incentives, in particular with a greater efficacy verifiable for the SMEs (Merito, Giannangeli e Bonaccorsi 2007; Bronzini, de Blasio, Pellegrini e Scognamiglio 2008); while many are the cases that show no additionality (Accetturo, de Blasio, 2008; de Blasio, Fantino and Pellegrini 2014; Andini, de Blasio 2012) or additionality solely due to a process of inter-temporal substitution that leads companies to anticipate investment in R&D (Bronzini de Blasio 2006).

However, despite the huge amount of empirical analyses on the evaluation of innovation policies at national scale² there are very few papers on regional innovation policies. Gabriele (2007) and Corsino et al.(2012), for the firms of Trentino, underlie an increasing on the stock capital that permit the possibility to access to new market opportunity, without any effect on the factor productivity and profitability. Fantino e Cannone (2013) provides evidence on the effectiveness of the policy to foster short term investment, with particular regard for the smallest firms and the ones with a low credit rating. Bronzini and Iachini (2014), analyzing R&D incentives in Emilia-Romagna, show how the policies have positive effects only on small enterprises investments; similar results are obtained by Bronzini and Piselli (2014) that demonstrate a significant impact for the number of patents limited to small firms sample.

The main novelties of this work concern two particular aspects. Firstly the choice of an appropriate territorial framework allow us to evaluate the regional "smart" policies. This approach has allows us to evaluate the effectiveness of the regional public policies and identify the possible presence of technological spillovers. The identification of spillover effects has required the develop of a "novel" approach that take into account the possibility of differentiated interaction between the firms on the basis of their geographical localization.

The second crucial point introduced in this work concerns the availability of the

²For further information on evaluation at a national scale see: David et al. (2000), Hall and Van Reenen(2000), Cerulli (2010), Alonso-Borrego et al. (2012)

Community Innovation Survey (CIS) micro-data. The CIS are carried out with two years frequency and provide information on the innovativeness of sectors by type of enterprises, on the different types of innovation and on various aspects of the development of an innovation, such as the public funding and R&D expenditures. Despite the relevant amount of information included in the CIS, few are the Italian works that utilized this data to evaluate the effect of public policies (Cefis and Evangelista, 2007; Evangelista, 2007; Cerulli and Potì, 2008; Marzucchi and Montresor, 2013). The innovation introduced in this paper is the matching of the technological variables from the CIS microdata with the economic and financial accounts from the balance sheet data.

The paper is divided into the following parts: in the second section we propose a detailed analysis of the data with a description of the characteristics of the policies and the firms considered; in the third section we methodological framework, with a focus on the distinction between traditional and our novel approach; in the fourth section we show the results of the estimates. In the following one we test the robustness of the results under the different assumptions considered and in the last section we draw some conclusions.

2 Data Analysis

2.1 Local Market Areas

This paper evaluates the effects of smart specialization policies in Umbria, a small region in the middle of the Italy. The evaluation of place-based policies require preliminary the determination of an appropriate functional subdivision of the territory. The agglomerative form that best suits the purposes of this study consist in the Local market areas³(from now LMA). Umbria Region is constituted by 17 LMA, many of which characterized by a reduced size that does not allows to fully

³Labour market areas (LMAs, "local labour systems - SLL" in Italy) are sub-regional geographical areas where the bulk of the labour force lives and works, and where establishments can find the largest amount of the labour force necessary to occupy the offered jobs. They respond to the need for meaningfully comparable sub-regional labour market areas for the reporting and analysis of statistics. LMAs are defined on a functional basis, the key criterion being the proportion of commuters who cross the LMA boundary on their way to work (ISTAT).

grasp the possible presence of some form of externalities. Despite this, Umbria structure exhibit the presence of two main LMA, Perugia and Terni, where population and industrial production tend to be more concentrated.

TABLE 1

The localization in one of the main LMA may have a determinant role in the evaluation of effectiveness of public incentives. Starting from this assumption, we want to analyze how the industrial concentration impact on R&D processes and on the diffusion of technological spillovers. This hypothesis constitutes the focal point of the methodological framework of this work. A graphical representation of the Umbrian LMA can be found in the Appendix.

FIGURE 1

2.2 Public Policies in Umbria

Since the FP6 (2000-2006) Umbria Region has programmed a series of strategic actions in order to develop the creation of business networks and improve their link with research centres. From 2004 the measures implemented by the Region to encourage entrepreneurial and territorial competitiveness are included in the "competitiveness package". In this paper we want to assess the additionality of "place-based" policies on firm performance, taking into account only the incentives administered by the region. We have considered the rankings of three distinct kind of instruments: calls for investment in technological innovation, Law N. 598/1994; calls for integrated packages of benefits (PIA); calls to promote the creation of stable networks of enterprise (Re.Sta.). The regional authority has allocated over €120 million to businesses for an aggregate number of 14 calls. In some calls are present more than one ranking, for a total of 19 classifications.

TABLE 2

The involvement of the firms about the funding opportunities made available by the Region appear limited. Nevertheless individual calls have funded all the projects on the list, the analysis of firm participation rate (number of calls on which each firm has obtained funding) showed that the majority of them have

participated in a single call; while very few are the companies that have received funding on more than 3 calls. Our interest is to isolate the incentives provided to the firms and directed uniquely to research and development processes. This operation allows us to construct a factual sample constitutes by 253 companies.

TABLE 3

The counterfactual sample was built on a list of 148 companies selected through the method of matching pairs. The criteria chosen to select the control units considers: the number of employees, turnover, the economic sector, the business location, profitability ratios. The final dataset is composed by a total of 401 firms.

2.3 Dataset

The aim of this paper is to provide evidence on the additionality of the public policies for both economic and financial accounts and for the main characteristics of the production process, in particular those related to the processes of innovation and investment in R&D. To take into account the economic performance we have used the balance sheet data provided by the Infocamere archives for the years between 2004 and 2011, whereas firm innovative characteristics are extracted from the questionnaires⁴ and the CIS micro data of the Istat annual surveys on R&D. CIS data allows us to identify pairs of companies subsidized and non supported on the basis of their propensity to innovate. In order to summarize the main descriptive statistics of the dataset we have selected some economic indicator for the baseline year (2005).

TABLE 4

The descriptive statistics show some interesting things about the composition of the sample. The control group appear to be firms with an economic structure more solid in comparison with the treated, unveiling bigger value of the turnovers and the mean number of the employees. However, the comparison between the median value of the two sample presents results more homogeneous. It suggests the

⁴The questionnaire is administered by the Umbria Core of Statistics and Evaluation of the investments and provide clear and precise indications on the dynamics of innovation and research processes and an account of Public Administration actions from entrepreneurs viewpoint.

presence of a limited number of big firms in the controls that can cause biased results; group of unit that we have removed by our estimates in order to avoid the presence of systematic differences between the treated and control sample. To prove the correctness of our supposition we have built the descriptive statistics limited only to the sub-sample of the small firms. The estimates highlight a more stable distribution between the treated and control group. These results are confirmed when we control for the geographical localization of the firms. In the next section we will present the methodology of the difference-in-difference (DID), discriminating between the empirical framework that underlie the "standard" and the "novel" approach that we present.

3 Methods

3.1 Standard Difference in Difference

This paper aims to verify the presence of an additional effect of public policies on the firms. We apply the traditional "counterfactual" approach making use of the difference in difference methodology. The effect of a policy can be computed using a "double difference", a difference in time (pre-post treatment) and a difference between subjects (recipients and non-recipients). This methodology requires certain untestable assumptions. The results obtainable through methodologies based on a single difference are characterized by what is defined in the literature as "selection bias"; if what differentiates recipients and non-recipients do not change over time, the method of difference-in-differences eliminates the selection bias and produces correct estimates of the policies effects. In other words, the untestable assumption in DID approach is that the differences between the two groups are constant over time; thus, in absence of treatment, there would not be differences in behaviour between the two groups. To implement the DID approach we estimate equations of the type:

$$y = \beta_0 + \beta_1 T + \beta_2 P + \beta_3 (T * P) + \varepsilon$$

where y denotes the outcome of interest, T and P are dummy variables equal, respectively, to 1 for the treated units and for the post-treatment period. Under the DID assumption we can estimate the Average Treatment Effects on the Treated (ATT):

$$ATT = E[y_i|T_i = 1, P_i = 1] - E[y_i|T_i = 1, P_i = 0] - \\ E[y_i|T_i = 0, P_i = 1] - E[Y_i|T_i = 0, P_i = 0]$$

The analysis focuses on a 5-years period, starting from 2005 to 2010. This choice is optimal since most of the instruments provided by Umbria has been delivered in 2007, allowing to define a pre and post treatment period. Nevertheless, our interest is not limited only to the presence of additionality due to the incentives. In addition we want to identify the presence of spillovers due to the combined action of the policies and the business location. The identification of the spillover effects, however, requires a partially relaxed version of the SUTVA hypothesis.

3.2 Novel Approach

Evaluation strategies based on the SUTVA (Stable Unit Treatment Value Assumption) require that the response of a particular unit be depended only on their assigned treatment, and not on the treatments received by others around him (Rubin, 1974). It is an extremely useful assumption, but there are circumstances in which it is not credible. For instance, it is reasonable to suppose that if two firms located in the same area are direct competitors but only one of them receives public incentives, the subsidized one will have an impact even on the other (i.e. the untreated ones). Recently an increasing number of studies has focused on the cases in which the assumptions at the basis of the SUTVA are violated, in order to find a methodological approach that consider the interaction between the units treated. Manski (2013) provides some bounds on treatment effects in the presence of social interactions. Unfortunately, these bounds are often uninformative, since when SUTVA is violated, random assignment of realized treatment has no identifying power. Sinclair (2012) suggests using multi-level experiments to identify spillover effects empirically. This approach (which relies on multiple rounds of randomization to test if treatment effects are overidentified, as we could expect in the case

of absence of spillovers) is appealing, as the process of diffusion within networks is a concept particularly relevant. However, it does not help to identify treatment effects when spillovers are present. In addition they cannot simply assume that effects estimated under SUTVA represent the upper bounds on the true effects, because it is possible that interference across units could intensify the treatment effects.

In this paper we propose a similar approach to the one proposed by Cerqua and Pellegrini (2014). These authors propose a partially relaxed version of the SUTVA that allows to take into account the possible interaction between the untreated firms; they distinguish non recipient businesses considering their exposition to the subsidized and then they evaluate the spillover effects by means of a comparison between the affected ones and the others. The peculiarity of our approach is to assume internal validity of the SUTVA within the groups of firms considered, both in relation to their state of treatment and geographical localization; nevertheless we allow the presence of interaction between the groups. The interaction has introduced in our empirical framework through the presence of an additional dummy variables (LMA), which represent Perugia and Terni LMA, and the respective interaction term with the treatment and the temporal variable. This framework allows estimating two specific causal effects:

Average Treatment Effect on the Influenced (ATEI):

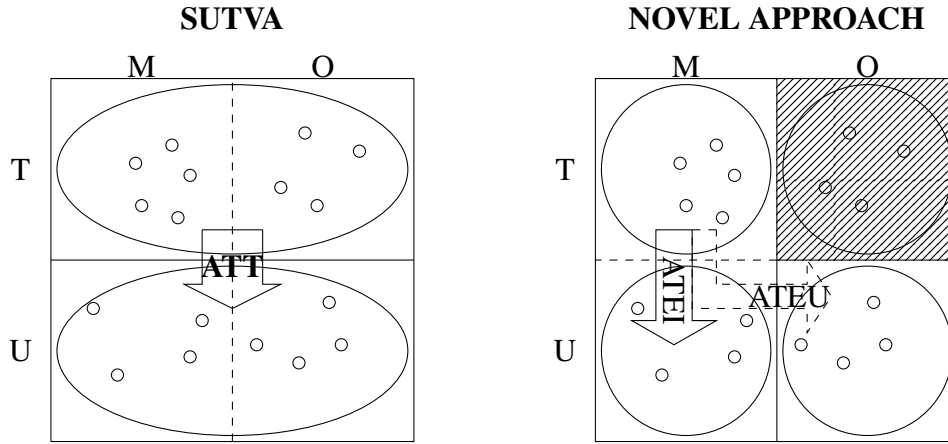
$$ATEI = E[y_i|T_i = 1, P_i = 1, LMA = 1] - E[y_i|T_i = 1, P_i = 0, LMA = 1] - E[y_i|T_i = 0, P_i = 1, LMA = 1] - E[y_i|T_i = 0, P_i = 0, LMA = 1]$$

Average Treatment Effect on the Uninfluenced (ATEU):

$$ATEU = E[y_i|T_i = 1, P_i = 1, LMA = 1] - E[y_i|T_i = 1, P_i = 0, LMA = 1] - E[y_i|T_i = 0, P_i = 1, LMA = 0] - E[y_i|T_i = 0, P_i = 0, LMA = 0]$$

The ATEI and the ATEU consider the possibility of a diversified impact on the untreated firms, on the basis of their inclusion or not in the influence area of the subsidized ones; this area in our case coincides with Perugia and Terni LMA. The comparison between the ATEI and the ATEU permits the identification of

the technological spillover, even if it is still impossible to quantify their magnitude. An immediate comparison between the standard and the "novel" approach is provided by the following figure.



Under the SUTVA assumption we proceed to the estimates of the ATT comparing all the treated (T) with the untreated (U), with our novel approach we have selected only the subsidized units belonging to the main LMA (M). The ATEI requires the comparison with the controls located in M (influenced sample), meanwhile the ATEU select only the unsubsidised of the other (O) LMA (uninfluenced).

4 Results

In this section we present the results of the estimates in order to provide evidence on the effectiveness of public policies on the firms in Umbria. The identification of the spillover effects has required the empirical evaluation of the three distinct treatment effects (ATT, ATEI, ATEU). In addition we have subdivided the outcome variable in three main classes: R&D input, technological output and firms performance. This operation allows us to control and isolate the additional impact of the policies along the entire production process.

TABLE 5

4.1 Innovative Inputs

The estimates show some limited impact on the innovative inputs. In particular we can observe as the treated firms appear to prefer to operate in the international market, instead of a more clear regional tendency of the controls. The international openness of the subsidized can be considered in consideration of an improvement of their relative competitiveness. In addition the treated have additional effects in term of internal and external R&D. This two results make us to think that the incentives have an impact on the activities of the firms, making it more dynamic and global. The comparison between the ATT, ATEI and the ATEU show as firms concentration plays a determinant role in the choice between internal and external research. In fact, the uninfluenced units tend to develop internal research, meanwhile the influenced prefer to commit their innovative activity. The recourse to external research is not limited to the number of firms that commit this activities, but also in the total expenses extramuros. In conclusion, we can gather that the influenced tend to create in a more clear way some kind of research network in order to take advantage of the spillover effects due to the concentration and the proximity with the treated firms.

4.2 Innovative Outputs

The policies have a strong additional impact on the innovative outputs, in particular in terms of products, production processes and number of patents. The results seems to highlight a more intense effects on the influenced firms, in particular for the production process and product innovation. Some limited evidence about the presence of spillover effects can be seen when we consider the uninfluenced estimates of the impact on the logistic systems and the patents. This results, combining with the impact on the input variables, shows two different approach between the controls internal and external of Perugia and Terni LMA. The influenced ones tend to externalize the research activity, with a reduction on the number of employees to R&D and an increment of the extramuros expenses. The lack of internal activity is reflected in a worse propensity to product and process innovation and a major necessity to improve their logistic systems to follow the entire process. The uninfluenced, in consideration also of the less concentrated

market in which they operate, produce internal R&D and develop independently their innovative products, with a number of firms that invest in production processes and technological raw materials higher in comparison with the influenced ones.

4.3 Firms Performance

The economic and financial performances presents only some limited positive and significative impact on the amortization, while there is not effects in terms of profits, turnover and profitability ratios. In addition we have found some evidence of spillover effects on personnel costs and on the Ebitda. The personnel cost presents a significative and negative ATEU in comparison with an insignificant and greater ATEI. The larger expenses on personnel carry out by the uninfluenced is a coherent addition of the hypothesis that this group of firms tend to internalize their innovative process, requiring more qualified, and expensive, human capital. The limited impact on firms performance observed for the ATT, ATEI and ATEU are in line with other regional policy evaluation, such as Bronzini and Piselli (2014) and Corsino et al. (2012).

4.4 Additional results

The results presented in the previous sections have highlighted the presence of some technological spillovers. The peculiarity of Umbria productive structure requires an in-depth analysis. One of the main structural problems of Umbria is the limited presence of large firms, in contrast with a very high number of small enterprises (RUICS,2009). In addition the public policies considered are especially directed to small firms.

Table 6

As we would expect from the empirical literature (see ... *intra alia*), the estimates for small firms highlight a greater additional impact of the public policies, in comparison with the total sample. The incentives presents a major efficiency when we consider the technological process, with some limited effects on the economic structure. In addition the results provide evidence in favour of the development

of spillover effects. The most significant effect can be found considering the expenditure component on the innovation processes. The greater amplitude of the ATEU reflect the fact small firms located outside the main LMA tend to invest less of the influenced controls, but substantially have similar results on the innovation product. The estimates suggest the preference for the uninfluenced to develop internal research, confirmed also by coherent results on the production process and logistic systems in comparison with the ATEI. The results focused only on the manufacturing sector sample show in the clearest way the different research structure between influenced and uninfluenced controls, even if there is no significant effects on the innovation product. Some limited spillover effect are highlighted by the Ebitda. In addition the personnel cost present a negative and significant ATEU, results consistent with the one referred to the employees on R&D.

5 Robustness check

A correct implementation of the DID approach requires that the data satisfy the "common" trend assumption; i.e. the trend in the outcome variable for both treatment and control groups during the pre-treatment period are similar. Thus, in absence of treatment, there would not be differences in behaviour between the two groups. This assumption has a fundamental role in the implementation of the Difference in Difference estimators, but usually is difficult to check its validity. However, if the common trend assumption is satisfied the results of the DID are robust. For this reasons, we assume that the growth rate for treated and controls outcomes follows parallel paths during the pre-treatment period.

Figure 7

The results have confirmed the absence of significative differences in the economic performances for all the outcome variables used in the estimation of the ATT, ATEI and the ATEU. The lack of systematic differences between the treated and controls during the pre-treatment period allows us to point out as the "additional" impact found in the estimates is only due to the incentives. The verification

of the "common trend" assumption supports the correctness of the Difference in Difference estimators and allows us to provide robust results.

6 Conclusion

Modern economic growth theory places a heavy emphasis on the role of innovation and technical change in generating growth. In this paper we have provided evidence on the effectiveness of the FP7 for the firms of Umbria. Starting from a "traditional" approach, we have deepened our analysis introducing the possibility of interaction between firms, on the basis of their localization. Our novel approach allows us to differentiate the effects in consideration of territorial strength, in order to identify the presence of technological spillovers. The evaluation analysis has provided evidences in favour of public policies effectiveness. The subsidized firms have additional and significant effects in the improvement of their technological capabilities, both in term of input and output of the R&D processes; meanwhile there is no impact on firms performances.

However, the impact is heterogeneous across firms. The estimates have highlighted that the geographical concentration matters, not only with beneficial effect on the innovative variables. In fact we have found some empirical evidence in the different structure of the process of innovation. The firm that are non treated but influenced by the policy tend to prefer external research, increasing their link with the other territorial components. Instead, the uninfluenced ones prefer to develop internal research. This fact is evidenced with a major need of specialized employees, with detrimental effects on the personnel costs.

In addition, the novel approach proposed in this paper permits us to identify the development of spillover effects through the comparison between ATEI and ATEU. We have found some evidences of spillover in terms of total expenses extramuros, number of patents, the logistic systems and the Ebitda. The presence of spillovers highlights as the treated firms could share the advantages obtained with R&D incentives, but this effects is influenced by the geographic proximity and the industrial concentration.

The location is not the only relevant factor to improve the effectiveness of public policies. As expected, also firms size is important. The small firms presents a

bigger additional impact, both in terms of policy effectiveness than for the technological spillover . The more evident results are found in terms of the development of spillover effects for R&D expenditures. Indeed, the uninfluenced control tend to spend less for the technological input variables independently from the fact that they are referred to personnel or research costs.

The need of a well-informed public administration can be considered a key issues for the redefinition of the public policies. The analysis of the questionnaires could give us some insight in order to understand the strength and the weakness of the instruments considered.

Table 8

Our analysis shows has the entrepreneurs are particularly satisfied about the action of the public administrations, but require shorter approval times and a major simplicity of the procedure. In conclusion the results seem to confirm empirically a strict local linkage and the presence of significant local technological spillover, which could be attributed to the conjunct action of the regional policy and the geographical concentration. This concept constitutes the "core" of the smart specialization policies in Europe and the novel approach proposed can be considered a powerful tools in order to provide evidence on the presence and development of the spillover effects.

7 Further Research

In this paper we have propose an alternative approach, that partly relax the SUTVA assumption, and allows us to identify the presence of the spillover . The natural further step will be the attempt to quantify their amplitude and intensity making use of the spatial methodologies. The development of new spatial econometrics, mainly concerned with spatial interactions among observations has pushed the conceptual interpretation of spatial spillovers in a specific direction, that of highlighting the role played by the mere physical proximity in the complex processes of local interactions. This will be the empirical expansion of our research.

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APPENDIX

Figure 1. Map of Italian LMAs

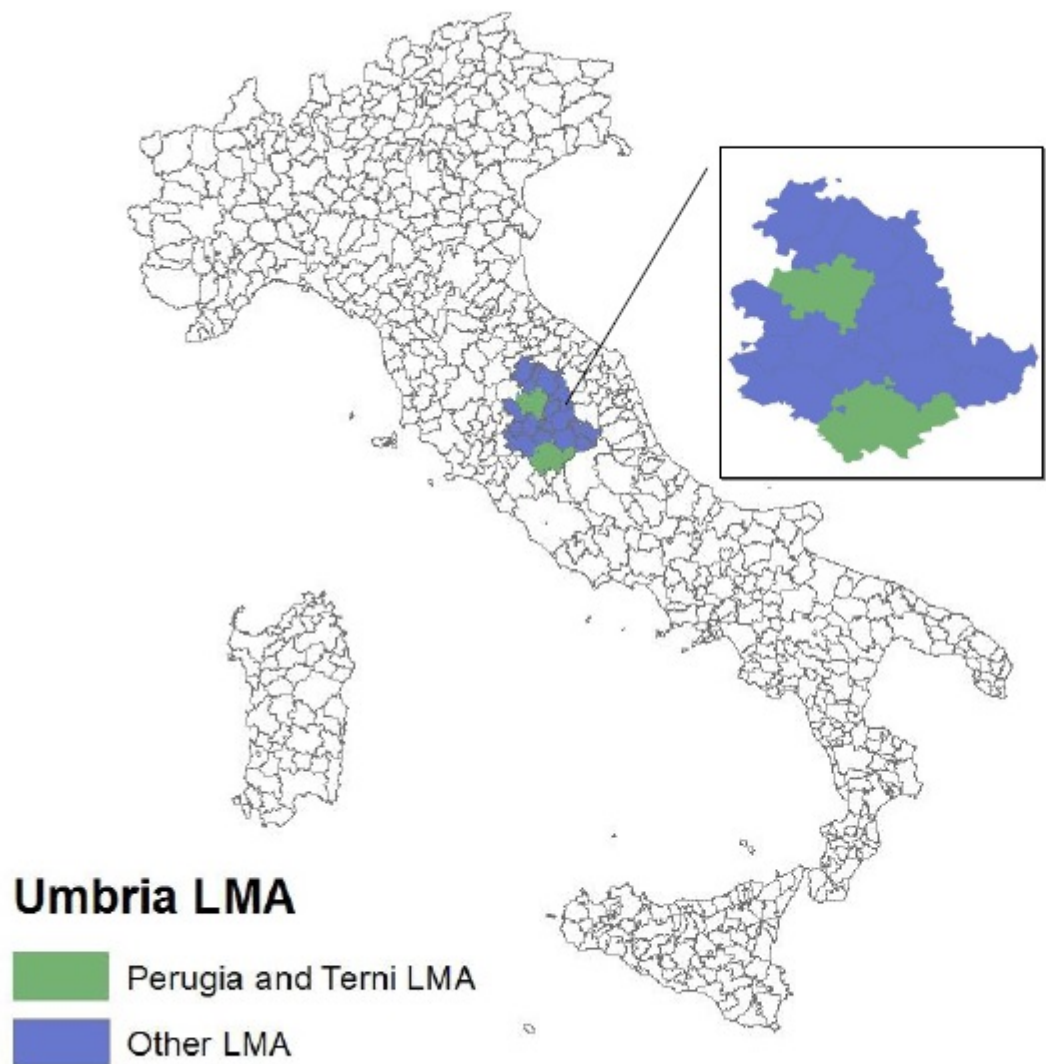


Table 1. Summary Statistics Umbria LMA

Local Market Areas	Dimension	Population	L.U.	L.U. Emp.	Man. L.U. Emp.
Assisi	292,31	51440	5416	21134	7153
Cascia	282,68	4113	398	1094	39
Castiglione del Lago	400,13	24163	2019	7003	1797
Città di Castello	564,4	52639	5147	20524	8625
Foligno	521,74	77636	6931	27424	7114
Gualdo Cattaneo	141,22	9439	795	2677	577
Gualdo Tadino	516,89	31973	2393	10275	4480
Gubbio	589,03	33093	2999	10208	2400
Marsciano	435,65	24920	2032	6821	2452
Norcia	516,77	8034	802	2420	387
Perugia	806,75	195242	21035	84973	16284
Spoleto	540,5	44780	3744	14066	3086
Todi	301,12	20245	1957	6403	1708
Umbertide	391,29	19151	1775	6941	2967
Fabro	214,08	7830	677	1709	314
Orvieto	678,77	41204	3815	11801	1915
Terni	1132,92	177367	14492	59457	14529

Source: Istat

Legend: Dimension is expressed in squared kilometer. L.U is Local Units.
Emp. is Employees. Man. is Manufacturing.

Table 2. Project number per announcements

Announcement	N. funded projects	Overall public funding
RESTA 2007	15	1457578,00
RESTA RICERCA 2007	69	9519585,91
RESTA INNO 2007	64	4055531,75
RESTA INNO 2008	28	2825527,69
RESTA RICERCA 2008	37	3922551,49
RESTA MODA 2009	32	981168,74
RESTA RICERCA 2009	43	5960491,60
PIA 2004	37	5313662,50
PIA 2006	47	6637302,39
PIA 2007	187	27672951,00
PIA RICERCA 2008	56	10156096,31
PIA INNO 2009	45	7036431,71
L. 598/94 2004	32	6701330,00
L. 598/94 2006	41	6407565,00
L. 598/94 2007	74	10021750,00
L. 598/94 2008	49	6660275,00
L. 598/94 2009	59	9088240,00
TOTAL	915	124418039,08

Legend: This table resume the overall financial commitment of the Region to the SMEs in order to improve their competitiveness, pointing out the number of funded projects for each announcement.

Table 3. Comparison between aid for innovation and aid for R & D

	Aid for competitiveness (1)	Aid for R & D activities (2)
N. Public announcement	17	13
N. Financed Firms	575	253
N. Financed Projects	915	480
Total contributions	120362507,34	67297917,50

Legend: Column (1) reports the summary statistics of the table 2. Column (2) selects uniquely the funded projects addressed to R&D activities; the 253 financed firms constitute the factual Sample.

Table 4. Summary Statistics

		Mean			Median		
		Treated	Untreated	Total	Treated	Untreated	Total
Total	Turnover	8868304	12996575	10406595	4003596	4572092	4290482
	Employees	50,8	57,9	53,4	34	28	31
	Capital assets	2871640	4576935	3507073	1054534	931608	1035552
	Intangible assets	291147	753746	463522	45618	31961	40218
	Net assets	2308873	2662620	2440688	618516	462031	538200
	Personnel costs	1300685	1486199	1369812	719450	520884	662955
	ROE	0,81	0,28	0,61	0,14	0,07	0,11
	Ebitda	794748	949779	852516	321238	232085	294954
	ROI	5,00	2,65	4,12	2,67	2,62	2,67
	Turnover / Employees	292298	231696	269630	119999	137672	128759
	Financial charges/ Net assets	0,72	0,67	0,70	0,31	0,22	0,26
	Added Value / Employees	55420	40635	49889	36555	36885	36885
Small Firms	Turnover	4592382	3127457	4038086	3074981	1580328	2583394
	Employees	23	19	21	20	15	17
	Capital assets	1333104	1033537	1219754	595250	470787	513740
	Intangible assets	186406	148549	172082	21122	13793	17749
	Net assets	900932	654687	807758	323765	208417	254548
	Personnel costs	599426	476617	552958	454252	283234	378705
	ROE	0,43	0,22	0,35	0,15	0,04	0,11
	Ebitda	395266	280103	351691	196803	129995	179186
	ROI	4,79	2,59	3,96	2,67	2,13	2,53
	Turnover / Employees	346625	190850	287362	121171	120014	121171
	Financial charges/ Net assets	0,73	0,80	0,76	0,39	0,24	0,34
	Added Value / Employees	61739	38724	52983	34492	35374	34994

Table 5. Results

Input Variables at innovation and R&D				
	ATT		ATEI	ATEU
Graduates (%)	0,57		1,35	-3,19
Mkt Reg (%)	-16,98	***	-12,55	-17,10 *
Mkt Nat (%)	5,88		1,47	6,77
Mkt EU (%)	2,38		3,45	5,69
Mkt Non-EU (%)	9,36	***	8,86 ***	7,09 *
Employes R&D	1,43		3,48	0,05
Graduates R&D (%)	-4,54		-21,36	-7,97
R&D intramuros (%)	36,56	***	46,62 ***	31,29 ***
R&D extramuros (%)	45,68	***	48,65 ***	54,87 ***
Total current expenditure	72,81		124,08	46,41
Expenditure R&D personnel	54,73		102,92	-10,40
Total expenses extramuros	9,12		-18,49	24,87 *
Total research expenditures	-117,70		136,85	-311,81
Output Variables at innovation and R&D				
	ATT		ATEI	ATEU
Product (%)	26,31	***	29,87 ***	24,07 ***
Service (%)	2,59		9,58	-3,70
Production Process (%)	22,47	***	30,68 ***	17,18
Logistic System (%)	16,16	**	14,44	25,42 *
Machine,equipment,software(%)	20,69	***	21,82 **	13,35
Patent (%)	25,66	***	25,85 **	28,36 **
Protection design and model(%)	8,28		9,82	13,26
Brand (%)	5,66		7,30	6,16
Copyright (%)	3,42		5,66	5,66
Performance Variables				
	ATT		ATEI	ATEU
Δ Equity	375580		584633	87697
Δ Net assets	280712		499887	-347362
Δ Net income	20274		-66884	176344
Δ Output Value	-1660703		-3036829	-1033338
Δ Personnel Costs	-119255		-118806	-523622 ***
Δ Financial charges	27407		30119	9083
Δ Extraordinary charges	-21266		1810	-91685
Δ Amortization	215765	***	287742 **	188119
Δ Fiscal charges	-4982		-45173	58276
Δ Capital assets	32158		844060	-954457
Δ Current assets	299079		-109014	1192512
Δ Added Value	117942		88808	-183487
Δ Ebitda	237197		207614	340135 *
Δ Ebit	81873		-3083	155234
Δ ROI	0,34		-0,98	-1,27

Legend: *** 99 % Significativity, ** 95 % Significativity, * 90 % Significativity

Table 6. Additional Results

	Small Enterprises				Manufacturing			
Input Variables at innovation and R&D								
	ATEI		ATEU		ATEI		ATEU	
Graduates (%)	-0,47		-7,43		10,67		4,78	
Mkt Reg (%)	-14,72	*	-22,18	**	-1,25		1,38	
Mkt Nat (%)	3,68		11,77		-2,95		0,55	
Mkt EU (%)	4,70		5,31		-3,31		-3,03	
Mkt Non-EU (%)	8,03	**	6,31	*	9,51	*	6,05	
Employees R&D	6,07		4,32		-0,21		-4,53	
Graduates R&D (%)	-16,48		-5,84		-23,48		0,38	
R&D intramuros (%)	53,38	***	35,33	***	39,00	***	20,82	*
R&D extramuros (%)	54,73	***	59,51	***	34,60	**	52,79	***
Total current expenditure	-46,87		98,47	**	163,34		39,02	
Expenditure R&D personnel	-30,41		59,55	**	124,67		-22,75	
Total expenses extramuros	-20,89		50,11	*	25,42		20,15	
Total research expenditures	-49,97		119,54	**	189,00		-385,54	
Output Variables at innovation and R&D								
	ATEI		ATEU		ATEI		ATEU	
Product (%)	32,37	***	33,48	***	14,37		5,28	
Service (%)	-2,17		-8,42		15,84		11,29	
Production Process (%)	30,00	**	18,89	**	43,64	***	16,36	
Logistic System (%)	20,00		26,94	*	27,88	*	36,97	**
Machine,equipment,software(%)	20,29	*	18,21	*	35,78	***	8,50	
Patent (%)	26,81	**	30,98	**	20,53		29,62	*
Protection design and model(%)	8,45		13,32		7,04		7,04	
Brand (%)	4,44		6,53		-3,03		-12,12	
Copyright (%)	6,67		6,67		6,67		6,67	
Performance Variables								
	ATEI		ATEU		ATEI		ATEU	
Δ Equity	20325		106560		1362941		140474	
Δ Net assets	467031	*	-30603		290191		-395782	
Δ Net income	34873		-82839		-429942		333369	
Δ Output Value	-101256		-366314		1757665		-1193062	
Δ Personnel Costs	-78578		-53972		95516		-703631	**
Δ Financial charges	-16428		31950		109224		-17425	
Δ Extraordinary charges	-37108	*	-24638		118571		-102272	
Δ Amortization	70674	*	88316	**	387028	*	204118	
Δ Fiscal charges	-18648		3462		-119560		91971	
Δ Capital assets	526037		533155		1663113		-1678038	*
Δ Current assets	-1068861		563622		3214236	*	-34167	
Δ Added Value	-45215		-37722		160838		-193869	
Δ Ebitda	33363		16250		65322		509762	*
Δ Ebit	-37431		-132708		-108669		332410	
Δ ROI	-0,93		-1,60		-2,32		-1,24	

Legend: *** 99 % Significativity, ** 95 % Significativity, * 90 % Significativity

Table 7. Robustness check

	ATT	ATEI	ATEU
g Equity	0,22	0,02	-0,01
g Net assets	0,42	0,08	0,04
g Net income	0,39	0,76	0,28
g Output Value	0,11	0,00	0,09
g Personnel Costs	0,25	0,42	0,41
g Financial charges	-1,74	0,05	-3,41
g Extraordinary charges	-0,03	-0,20	-1,24
g Amortization	-0,74	-1,21	-0,39
g Fiscal charges	0,05	0,01	-0,07
g Capital assets	0,82	0,06	0,06
g Current assets	0,16	0,00	0,20
g Added Value	0,27	0,34	0,37
g Ebitda	0,42	0,34	0,19
g Ebit	0,57	0,96	1,13
g ROI	0,19	0,51	0,38

Legend: *** 99 % Significativity, ** 95 % Significativity, * 90 % Significativity

Table 8. Degree of satisfaction of the firms

Satisfaction's degree of enterprises	
Weakness	Strengths
Approval times Dispensing times Certainty obtaining incentive Simplicity of the procedure	Allocation Procedure Mode / entity of the incentive Knowledge of procedure by P.A. Quality relationship with P.A.

Source: *Our elaboration of the questionnaires.*