LOCAL POLICIES FOR INNOVATION: THE CASE OF TECHNOLOGY DISTRICTS IN ITALY

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Abstract

New policy instruments have recently been implemented in Italy to foster innovation activity. In this paper we study technology districts, a policy tool introduced by the Ministry of Education, Universities and Research in the last decade. The aim of the paper is twofold: first, to examine the characteristics of technology districts and those of the firms within them; second, to assess the effect of the policy on district firms' performance by comparing enterprises in the district with similar firms outside the district, before and after the policy was implemented. We find that the firms that did join a district had previously been, on average, larger and more innovative than other firms of the same sector located in the same region. Our results show that after the institution of a district, the performance of the firms that joined it did not differ significantly from that of similar firms that did not.

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1. Introduction[1]

Technology districts (TDs) are among the public policy instruments implemented in Italy during the last decades with a view to fostering innovation. Grounded on the theory of the regional innovation systems and the triple helix model (Cooke et al., 1997; Etzkowitz and Leydesdorff, 2000), the policy sought to enhance firms' innovation capabilities and the competitiveness of local production systems by creating synergies among firms, universities, research centres and local authorities located within limited territorial boundaries. A feature of the policy is the role played by the regions that propose the creation of the districts and, together with other local authorities, coordinate the activities of the actors within them. This paper examines the diffusion and main characteristics of Italy's technology districts, and assesses the performance of district firms, i.e. those that joined a TD.

In our study we address the following main questions. What are the scope and the characteristics of the TD phenomenon? To what extent are firms that joined districts different from those of the same region and sector that did not join a district? After joining a technology district, do firms show a different performance compared with that of firms that did not join a district? We begin by mapping the TDs and identify their main features. Next, we examine the main characteristics of the districts' firms. Finally, we assess the effect of the policy on firms' performance by matching firms that joined a district with similar firms that did not join a district, and using difference-in-differences estimates to compare the performance of the two groups of firms - measured in terms of a number of balance sheet variables and the propensity to patent - before and after the district's birth.

While the literature on technological clusters and regional innovation systems is rather rich (recent papers include, among others: Cooke et al., 1997; Antonelli 2000; Evangelista et al., 2002; Rychen and Zimmermann, 2008), the empirical papers on Italian technology districts and the impact of local policies for innovation are relatively scant. Colombo and Delmastro (2002) compare 45 new technology-based firms located in Italian technology incubators within science and technology parks (a local innovation policy to a large extent similar to TDs) with a control sample of off-incubator firms in the same industry and area. Using a sample survey, the study shows how on-incubator firms invested more in human capital and have a higher probability to adopt technological innovations than similar off-incubator firms. By contrast, the two groups of firms did not differ notably in terms of innovation input or output (intensity of research and development and number of patents). Liberati et al. (2012) analyze a larger sample of firms localized in the Italian science and technology parks, and find that

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The views expressed herein are those of the authors and do not necessarily reflect those of the respective Institutions. The usual disclaimer applies.

firms resident in the parks did not show a substantial different business or innovative performance from those of similar firms outside the parks. Patrucco (2003) studies a technology district in a region of northern Italy (Lombardy). He finds that the number and the diversity of the relationships established by the firms with other enterprises or agents have a positive impact on the innovation capabilities and growth of district firms. Miceli (2010) verifies the consistency of the technology districts' sectors of specialization with the actual specialization of the areas where they are located, in light of the theory of regional innovation systems which underlines that the existence of a cluster of specialized leading firms is a necessary, though not sufficient, condition for the birth of an efficient local system of innovation. She found that in many regions (8 out of 20, principally in the South) there was no consistency between a technology district's sector of specialization and that of its home area.[2] Finally, among the recent papers concerning network effects Ardovino and Pennacchio (2012) try to identify the key drivers of inter-firm R&D collaborations in TDs.

Our paper contributes to this stream of research in several respects. First, unlike most of the previous literature which is based on case studies, we focus on the technology districts nationwide, and examine the universe of the firms that belong to TDs. Second, we use a large set of firm variables together with key measures of firm innovation output. Third, to assess the effect of the policy on firms' performance we employ an identification strategy based on matching techniques combined with difference-in-differences estimates over the period 2003-2011.

The descriptive analysis shows that technology districts in the South are more numerous but include fewer firms than those located in the Centre or in the North. Overall, firms that did join a district had previously been larger and more innovative than other firms of the same sector located in the same region. Finally, our evaluation exercise shows that after joining a district firms did not outperform similar non-district firms.

It is worth reminding that our exercise evaluated the policy's impact on firms' performance only. The programme, which aimed to enhance local innovation systems where the districts were located, involved other actors as well as firms, e.g. universities, public and private research centres, and local government bodies. Therefore, we believe that a more comprehensive evaluation of the effects of technology districts would have to measure the policy's effects on all the actors and the geographical areas involved. This exercise is left for future research.

The rest of the paper is organized as follows. In the next section, we discuss the theoretical framework of the policy. In Section 3 we present the main characteristics of district firms compared to those of non-district firms in the same region. In Section 4 we carry out the evaluation exercise to assess the impact of the policy on the district firms' performance. Section 5 sets out our conclusions.

[2] For the analyses that evaluate some local innovation policies implemented in Germany and Spain see: Dohse (2000) and Viladecans-Marsal and Arauzo-Carod (2012), respectively.

2. Technology Districts: the theoretical background[3]

Traditionally, public intervention for innovation aimed at increasing the level of innovative investment by reducing its costs though fiscal incentives or economic subsidies. These policies are theoretically justified by a typical market failure argument. Since knowledge is a public good, innovative firms are unable to fully appropriate the returns of the innovative investment because of knowledge spillovers, and consequently under-invest with respect to the social optimal level. The rationale for such public interventions is to boost innovative investment towards the level that maximizes the social welfare.

In the last decades new polices for innovation have been implemented. A number of scholars have argued that innovation and technology development are the result of complex relationships among enterprises, universities and public research institutes. These interactions are influenced by national- or regional-specific institutional factors. More specifically, it is stressed that the development of innovation depends not only on the innovative efforts (or on the characteristics) of the enterprises, but is also related to specific economic and institutional characteristics of each national or local system of innovation (Lundvall, 1992; Nelson and Rosenberg, 1993). In this context, a crucial role is played by various forms of agglomeration economies associated to geographical proximity, such as those emerging from R&D collaborations among firms, or face-to-face interactions. The dynamics of innovation processes depend on the sharing of rules, values and elements characteristic of the socio-economic environment that support the exchange of tacit knowledge and learning mechanisms among the actors (Audretsch and Feldman, 2004; Cooke et al. 2004). In conclusion, the concept of innovation system is based on an idea of innovation as an articulate process of collective learning, fostered by the

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[3] The term "Technology District" was adopted for the first time in Italy during the last decade to define an instrument of policy. In order to avoid possible misinterpretations a couple of clarifications are in order. First, it is useful to distinguish between the TD 'phenomenon' and 'instrument". The TD phenomenon represents the entire territorial reality where innovation processes take place, stimulated by the flow of knowledge among enterprises, universities, research institutions and governments. On the contrary, the TD instrument consists of an entity with a legal form made up of the aggregation of enterprises, universities and public administrations of the territory. The analysis proposed doesn't refer to the TD as phenomenon, but only concerns the characteristics and the development of the enterprises that took part in the creation of the TD instrument as a juridical subject (consortium or foundation). Second, it is worth clarifying the difference between this instrument and a model of development typically Italian called "Industrial District" (ID). Within the analysis of the dynamics of innovation processes, regional sciences (Audretsch and Feldman, 2004; Cooke et al. 2004) underline the importance of factors linked to geographic proximity. Within this context the expressions "cluster" and "Technology District" have emerged, referring to spatial agglomeration of highly technological economic activities (Parente, 2008; Cesaroni and Piccaluga, 2003). These conglomerates are characterised by particular agglomeration economies (of scope and scale) derived from co-localisation of activity (Porter, 1998). Agglomeration is actually a common element with Industrial Districts; but there are relevant elements of distinction between the two models. The IDs originate and develop thanks to agglomeration economies such as those defined by Marshall (Marshall, 1920) and represent a model of development characteristic of the Italian industrial structure. They have been generally created spontaneously from the bottom up, gathering small and medium enterprises (and never research institutes). They are not orientated towards a turnover of businesses and exert a defense strategy of the competitive advantage derived from the specific characteristics of a typical product (Becattini, 1979). TDs, unlike IDs, develop from the presence of research institutes in order to guarantee a qualified critical mass of human capital and easy access to research findings. Innovative enterprises and large high tech companies are also present within TDs. Their role is to boost the business of small and medium technologically close firms. Lastly, TDs generally originate from consistent public investments. Openness is also conveyed in the growth strategy for aggregation, aimed at facilitating firms' turnover and promoting the creation of new ones, in particular, research spin offs.

geographical proximity, in which both competition and cooperation play relevant roles (Kline and Rosenberg, 1986; Dosi, 1988; Von Hippel, 1988).

In this framework, the rationale for the policy has moved from market failures to system failures: public policies are justified to overcome imperfection in the innovation systems because some essential elements in the system are missing, or because the linkages within it are not well functioning. According to this theoretical framework, several place-based technology policies were recently implemented in Europe to create or promote clusters of knowledge-based activities. See for example: Albert et al. (2002) for the case of France, Dohse (2000) and Parente (2008) for Germany, and Viladecans-Marsal and Arauzo-Carod (2012) for Spain.

In the late 90s, with the "Triple Helix Model", Etzkowitz and Leydesdorff (1997, 2000) re-elaborated the concept of national and local innovation systems in the light of the pervasive development of information and communication technologies (ICTs) and the intensification of economic globalization. This model refers to the need for strategic integration of the three drivers of development – research, government and industry – that allow the sharing of complementary resources and competencies, and the activation of knowledge flows, stimulating innovation ability of the local system. According to this model, what is relevant for innovation-driven territorial development are not only the characteristics and the strength of the local sub-systems, but above all their capacity to be synchronized and behave as a single unit, and their willingness to work together effectively.

Such conditions do not always spontaneously occur due to the cultural and institutional distances among local actors, or the misalignment of their interests. For example, the academic research cannot be able to fully express its commercial potential; the potential private investors might find excessively risky to participate in new and particularly innovative enterprises; the action of public authorities can be poorly effective or the management methods too bureaucratic; and the large local enterprises might not consider convenient investing in the territory of origin (Parente, 2008; Dasgupta and David, 1994; Sobrero et al., 2007; Mele and Storlazzi, 2006; Torrisi, 2002).

In Italy, the technology district is a region-oriented policy instrument implemented to foster innovation and firms' competitiveness, which is largely grounded on the theoretical framework of the regional innovation systems and the triple helix model. The mission of the technology districts is to act as an instrument of governance, integration of the objectives and coordination of the processes in order to streamline learning mechanisms appropriate for innovation.

Even if it is not in question that the characteristics of the local innovation system play a central role for the technological development of a geographic area, it is worth noting that the success of a public policy implemented to create and promote clusters of localized advanced technology activities cannot

be taken for granted. Our paper attempts to shed some light on the effects of one these policies launched recently in Italy.

3. The characteristics of Italian Technology Districts

The Italian Technology Districts were substantially defined by the National Program of Research 2002-2004 (PNR) of the Ministry of Education, Universities and Research (MIUR), and later better qualified by the PNR 2005-2007, with the aim of fostering firms' innovation capabilities and local competitiveness. They are defined as local aggregations of high-tech activities, made up by public research centers, firms and local governments, geographically concentrated. TDs are legally constituted by an act of MIUR after the proposition of the regional Government. For new TDs the Ministry wrote in the Guidelines for the research 2003/2006 (Linee Guida per la Ricerca) the technological fields.[4] Usually, the legal status of the company responsible for the management of the initiatives in the district is the consortium. Recently the name of technology district changed into "High Technology District" (see Programma Nazionale della Ricerca 2011-2013).[5] To the TDs are granted public funds from European Union and from national or regional sources. According to preliminary information provided by the MIUR, public funds disbursed to the TDs, excluding regional funds, amount to 450 million of euros until the end of 2011.

For district firms the main benefits come from establishing collaborations with other firms, public research centres and universities. Moreover, they may benefit from the public funds, the use of common laboratories, equipments and services available in the district. Universities and public research centers support firms providing services related to the innovation activities, carrying out basic research and coordinating the largest projects; some of them are also involved in promoting spin-off. Finally, the public authorities belonging to the TD (such as Regions, Provinces, Municipalities or Chambers of Commerce) participate to the government bodies of the district, provide public funding and coordinate the activities within the districts. The Region is the link between the TD and the Ministry. The district is created by a legal agreement between the Region and the Ministry (Accordo di programma quadro – APQ).

Our study focuses on the Italian TDs born in the years 2003-2011. The analysis is based on three data sources. First, the dataset built by the Ministry of the Economic Development, where are collected the names of the firms belonging to the TDs existing at the 31st December 2011 (Unità di Valutazione degli Investimenti Pubblici – Dept. for Development and Economic Cohesion, Ministry of Economic

[4] There are three main strategic sectors of intervention: 1) environment, energy and transports; 2) agri-food and wealth; 3) production systems, bio-technology, new materials and nano-technology, ICT, cultural activities.

[5] The legal framework has recently been enriched with a Ministry bill (30.5.2012) that defines the National Technology Clusters (CTN) with the aim of coordinating, at a national level, the activities included in 9 strategic technological fields.

Development). Second, the balance sheet dataset for almost the totality of the Italian companies sourced by Cerved group. Three, the dataset "Patstat", that collects information on patent applications to the *European Patent Office*. Finally, other information are gathered from the institutional websites of the Ministry of Education and Research, some Regions and some technology districts, as well.

3.1 Structure and territorial distribution of technology districts

In Italy by the end of 2011 29 technology districts in 18 regions were recognized by the Ministry, with 2,298 district firms (Tab. 1-2)[6]. Almost half of the TDs was localized in the South of Italy, 5 TD in the North West, 5 in the North East and 5 in the Centre. On average, the north-western TD include 174 firms, among the remaining: 125 were in the north-eastern, 66 in the central and 34 in southern regions. There is a large variability across districts. Number of firms ranges from 4 and 9 firms, respectively, in the TD of Basilicata and the mechatronic TD in Puglia, up to 221 firms in the aerospatial district in Latium and 439 in the ICT-Wireless district in Piedmont.

The genesis of the southern districts is relatively different from that of the other areas and can explain the reason why they are relatively smaller in terms of number of firms. Namely, in the North, but especially in the North West, TDs were established where firms' technological clusters already existed. Therefore, the constitution of the districts appeared similar to a formal act of acknowledgment of productive systems already strongly specialized and oriented to high-tech activities. On the contrary, in the South the birth of the districts was mainly driven by the local government. In such area the TDs were used mainly as an instrument to favour the innovation of a multitude of small local enterprises, by creating stable links between them and intensive research activities carried out by other local players, as the Universities. In these circumstances, national and local authorities pinpointed the strategic activities of the territory which could have been enhanced by the technology district, and led the adhesion of the players to the district. In this area, big national or multinational firms were often involved in the district by the public authorities. Another difference between centre-northern and southern districts is that the latter take more advantage of the national (FAS – underused areas fund) and European cohesion funds (FESR - European regional development fund).

The largest number of districts was activated in 2005 (13, of which 12 in the South). 8 districts started between 2003 and 2004; 7 between 2006 and 2008.

The large majority of the firms belonging to a district are in the industrial or service sector (Tab. 3), 642 and 554 enterprises, respectively. The branches more represented are information and

[6] The dataset doesn't include the number of firms belonging to the districts when they were established, but just by the end of 2011. At the end of the last available period (31-12-2010) in Cerved are stored the balance-sheets of 1.299 firms on 2.298.

communication technology (276 firms), professional activities and electronic products (177 and 168 enterprises, respectively).[7]

3.2 Evidence from firms' balance sheet and patent data

In order to shed light on the main characteristics of the district firms, we have compared balance sheet indicators of on-district enterprises with those of off-district firms belonging to the same sector and localized in the same region.[8]

Over 2,298 district firms in 2011, we were able to find balance sheet data for about 1,300 firms in 2010 (the last year for which data are available), more than a half of the total.[9] Overall district firms differ from non-district firms for the following features (tables 4-5a-5b):

- District firms are larger than those of the same sector and localized in the same region: the median sales and added value are 8 times larger than the latter. There is also a strong heterogeneity across districts. For example, the year before the birth of the TD the median firm of the nanotech-ICT district in Puglia has 369 million of euros of sales, on the opposite side the median value of firm sales in the agro-bio-food and eco-fishing district in Sicily is less than 300 thousands of euros.
- District firms are slightly less profitable than the others: Net profitability (measured by the Returns on Assets – ROA) and operational profitability (Gross operative margin over assets) are smaller for district than non-district firms.
- District firms show a large leverage than off-district firms.

On the opposite, the investment propensity, measured by the median investment over sales, is similar between the two groups of firms.

We have also examined the difference of firm characteristics the year before the enterprises joined a TD, i.e. before they might have taken advantage of the benefits of being in a district. We have considered the year of signature of the agreement between the Region and the Ministry as the year of

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[7] The economic activities carried on within the various districts depend on the peculiarities of the areas. In some districts these features have been relevant, for example: a) the presence of one or more big firms playing the role of leader that encourages the participation of smaller firms (as happened in the Lazio aerospatial district or in the Catania microelectronic district); b) the presence of Universities or Research Centres with a high specialization in some fields (as happened in the Pisa micro-technology and bio-medical district or in the Milan advanced materials and bio-technology districts); c) the peculiar importance given to a specific social or economic aspect of the region (as happened in the Trentino Alto Adige sustainable-building district); d) the mixed effect of some different factors (within the Piedmont ICT district, for example, the simultaneous presence of important aero-spatial and electronic firms, of the technical University and of some other Research Centres and banking foundations allowed the establishment of the bigger district of the country, with more than 400 firms).

[8] We used the balance sheet data stored by the Cebi-Cerved group and we defined the sectors of economic activity of the firms with the ATECO codes at 4 digit.

[9] We decided to exclude Telecom Italia Spa from the district firms, because its size (sales are more than 18 billions euro by the end of 2010) would have altered the results. We considered just once the data of the firms belonging to more than one district. The analysis includes only the firms with positive assets e sales (or, in alternative, the production value).

the birth of the district.[10] In 25 cases a firm belonged to more than one district: in this case we considered it as belonging in all such districts.

Several differences between on-district and off-district firms arise for financial structure and size. More specifically, also before joining the TD, district firms were larger and showed higher debts than non-district firms of the same region and sector. The differences in profitability and investment propensity, on the contrary, were less evident. Results are more heterogeneous across the areas. For example, in the South non-district firms displayed in some cases better performances that district firms (Tab. 5a-5b). Of course, from this examination is impossible to derive any robust conclusion about the effects of the policy, which is the focus of the next section.

We complete the descriptive analysis of the TD by examining the innovative capabilities of the firms. We measure firms' innovative ability through the number of applications submitted by the firms to the European Patent Office (EPO), using the archive Patstat.[11] For each TD we consider the patent applications submitted to the EPO by district and non-district firms of the same region and sector in the five years before the birth of the district (tab. 6).

In all the regions considered, except Basilicata, the share of district firms that have applied for, at least, one patent in the 5 years before the district birth is always higher than that of non-district firms. The highest share comes from firms in the TD called IMAST in the Campania region (polymeric materials), Dhitech (nano-tech and ICT) and MEDIS (mechatronic) in Puglia. Looking at the largest TDs (those with more than 100 firms), the highest propensity to patent is in the TDs of innovative materials and biotech of Lombardy and in aerospace TD of Latium. In absolute value, the TDs with the highest number of patents by firm are those already quoted in Campania and Puglia, together with the TD on nano-systems in Sicily.[12]

4. The performance of the district firms

The TD policy aimed at increasing the innovation capabilities and competitiveness of the firms and the local innovation systems. In this section we assess the effect of the policy on the performance of the district firms. We evaluate whether joining a district has enhanced firms competitiveness by using a

[10] When the data of the establishment of the district was unavailable (as happened for the Tuscany "mechatronic" district), we choose to consider the year following the preliminary agreement. For the Emilia-Romagna biomedical district we don't know the year of establishment because no agreement has ever been signed. The dataset provided by the Ministry didn't include the fiscal code of the firms belonging to the Emilia Romagna "advanced mechanics" district, that we thus excluded from the analysis.

[11] The dataset is referred to the whole Italy for a period lasting from 1978 to 2011 (for 2011 data are not yet definitive) and includes more than 48.000 patents, applied for by more than 8.500 firms. More than 5.000 patents are referred to 259 district firms. We used the dataset provided by Giovanni Marin who we wish to thank. He joined together information coming from the dataset AIDA of the *Bureau Van Dijk* and the dataset Patstat, which contains details about patents, included those of the applicants, provided by the *European Patent Office*. For grater details about the procedure of joining, see Marin (2011).

[12] In these regions are present some outliers, in particular STMicroelectronics (in Campania, Puglia and Sicily) and Centro Ricerche Fiat (in Campania and Puglia).

large set of balance sheet variables and patent indicators at the firm level. More specifically, the outcome variables are chosen to capture the effect of the public programme on the firm size (sales and added value), profitability (gross operative margin over assets and returns on assets), accumulation of tangible or intangible asset (using investment rates) and financial structure (through the leverage). Finally, we evaluate the impact on firms' labor productivity and innovation capabilities measured by the patent applications submitted to the European Patent Office.

The analysis is based on a standard counterfactual method based on the comparison between district firms and similar non-district firms, before and after the birth of the district, using matching methods and difference-in-differences estimates (Imbens and Wooldridge, 2008). First, we match district firms with similar non-district firms, in terms of sector, geographical area and several firm characteristics. Next, by diff-in-diffs method we evaluate if the performance of the district firms changed after having joined the district, by estimating to what extent the differences in the level of the variables between district and non-district firms (belonging to the control group) changed after the policy.

This method is more robust than others used in the literature (e.g. the simple post-policy difference), because it allows us to control for initial differences in the levels of observables, and un-observables, between the two groups of firms. At the same time, the methodology relies upon the hypothesis that in absence of the TD the two groups of firms would have followed the same path (parallel trend assumption). Therefore, we assume that firms of the control group mimic the path that district firms would have followed if the policy had not been implemented. For such reason, it is crucial that the firms of the control group are as similar as possible to firms in the TD in terms of the largest possible set of variables. In our case we take advantage of an ample collection of observables drawn from the balance sheet data set, and several firms' control groups, to make as reliable as possible the results.

More in detail, the procedure is the following. We match each district firm with a non-district firm, localized in the same region and belonging to the same 1-digit sector of the district firm, minimizing the Mahalanobis distance (Rubin, 1980). The variables used for the Mahalanobis function are: sales, added value, the ratio of gross operative margin over total assets, and the ratio of investments over sales. The first two variables are proxy of the firm size, the second is a measure of the operational profitability, the last one is a measure of the capital accumulation of the firms. The matching procedure is based on data referred to the year before the birth of the districts, because in such a case we can exclude that the policy have already affected district firms. The biggest firms, those with more the 1 billion of sales,

were excluded by the analysis because for them it was not possible to find an appropriate control group.[13] The matching procedures allowed us to join 721 non district firms to 860 district ones. [14]

The balancing properties of the samples are reported in Tab. 7. They are examined on: sales, added value, the ratio of gross operative margin over total assets, the ratio of investments over sales (the variables included in the argument of the Mahalanobis function), and the return on assets, investment rate, intangible investments on sales, leverage, the ratio between added value and labour costs, as a proxy of labor productivity. Tab.7 shows that district and non-district firms of the control group are rather similar in term of the observed variables, overall and in each of the four geographical areas considered (North West, North East, Centre, South)[15]. Only rarely the differences in mean between the two groups of firms are statistically significant.

Note that up to now the procedure matches district firms with non-district firms by using a broad definition of sector (Ateco 1-digit). In order to compare firms that carry out more similar activities we used a further method and chose the matching firms within the same 2-digit sector of the district firms. However, since in the same region it was difficult to find a sufficiently large number of non-district firms belonging to the same 2-digit sector, we chose the control group among non-district firms localized in the same geographical area (i.e.: North West, North East, Centre, South), instead of the same region of localization of the district. The control group is chosen minimizing the Mahalanobis function computed using the same variables used before. In this case, the matching procedure allowed us to join 725 non district firms to 831 district ones.

Also with this second control group the balancing properties show a wide similarity between the two groups of firms (Tab. 8). Only for leverage in the North West there is a statistically significant difference between district firms and the control group.

After having chosen the control groups, we compare on-district and off-district firms by diff-in-diffs estimates to assess whether the two groups of firms show a different performance. For each TD we considered a pre-policy period of two years before the birth of the district. The post-policy period includes the year of the constitution and two years after. Therefore, the estimates are carried out over 5

[13] The impossibility of defining an appropriate control group for some district firms led us to exclude the largest ones (sales larger than 1 billlion euro): Telecom Italia Spa, Polimeri Europa Spa, Nuovo Pignone Spa, Rai Spa, Ibm Italia Spa, Alenia Aeronautica Spa, Terna Spa, Avio Spa, Stmicroelectronics Srl, Ericsson Telecomunicazioni Spa, Edipower Spa, Seat Pagine Gialle Spa, Enipower Spa, Egidio Galbani Spa. Some of these firms belong to more than one district. Besides, as the analysis is focused on the regional effects of the policy, we decided to exclude 15 firms which headquarters are in regions that not the regions of establishment of the districts, in order to get the comparison more homogeneous. For one district (Puglia – high tech) this led to the exclusion of all the firms for which balance sheet information were available.

[14] Balancing properties have been tested for samples of firms whose balance-sheet data were available for at least 5 years (the year of the establishment of the TD, 2 years before and 2 years after). We chose the Mahalanobis matching method because the propensity score matching didn't give satisfactory results in term of balancing properties between the two group of firms.

[15] We decided to group the Italian regions in 4 macro-areas: North West (Piedmont, Liguria, Valle d'Aosta, Lombardy); North East (Veneto, Friuli Venezia Giulia, Trentino Alto Adige, Emilia Romagna); Centre (Tuscany, Umbria, Marche, latium); South (Molise, Abruzzo, Campania, Puglia, Basilicata, Calabria, Sicily, Sardinia).

years and the change in the performance is estimated over a period of three years. The sample is balanced, in that it includes firms for which we have the data over all the years examined.

The model used to assess firm performance by diff-in-diffs estimates includes year dummies, 4-digit sector dummies, and the dummy for the localization of the district, in order to control for time, sector and regional common shocks:

$$(1) \quad y_{it} = \alpha + \beta_1(DIST_i) + \beta_2(POST_t) + \beta_3(DIST_i*POST_t) + \sum_r (\gamma_r\ REG_r) + \sum_s (\gamma_s\ SECTOR_s) + \sum_t (\gamma_t\ YEAR_t) + \varepsilon_{it}$$

where $DIST_i$ is a dummy equal to 1 if firm *i* participates to a district and 0 otherwise. POST is a dummy equal to 1 over the post-policy period. REG, SECTOR and YEAR are *dummies* for the region of localization of the district, the 4-digit sector of the firm and the year of the balance sheet; ε_{it} is a stochastic error with the usual properties.

y is the outcome variable by which we evaluate firms' performance. The coefficient β_3 measures to what extent, after having joined a district, firms' performance changed. It is our estimate of the impact of the policy on firm performance. Standard errors reported in the tables are clusterized by firms and corrected by the heteroskedasticity.

As mentioned above we use as outcome variables: sales and added value, in order to measure firm growth; ROA and gross operative margin over assets, in order to evaluate total and operative firm profitability, respectively; several measures of investment, to measure accumulation of tangible and intangible asset; leverage to assess the impact of the policy on the firm financial structure.

In Tab. 9 are reported the coefficients β_3 estimated using the first control group made up by the firms chosen within the same 1-digit sectors and localized in the same region. In such a case the sample includes 1,581 firms. It turns out that for the whole Italy and all the variables there are no differences between district and non-district firms. The coefficients are never statistically significant for any outcome variable. Looking inside each of the four geographical areas the picture does not change remarkably. Only for investment scaled by fixed assets there is a positive and significant effect, but only in the Southern districts, whereas for the leverage in the northern-eastern districts it would emerge a negative coefficient. In all the remaining cases β_3 is not statistically significant.

In Tab. 9 are also reported the results of the estimates using the second control group, based on the matching with non-district firms belonging to the same 2-digit sector, and the same geographical area (one of the four in which Italy can be broken down). In this case the sample is of 1,556 firms.

The results are rather similar. With this second control group we do not find any variable, in any area, which shows a significant change after the birth of TD for district firms (with respect of the control group). The coefficients for investment and leverage are any more statistically significant.

In order to verify the robustness of our results we trimmed the sample excluding the 5th and 95th percentiles of the distribution of each outcome variable, and re-estimated model (1) on the new samples (the percentile are computed over the all period of 5 years). We found that previous results were not driven by some outliers. Also by trimming the dataset we did not find significant differences between the performance of district and non-district firms, for both the control group employed (Tab. 10).

Our results might be due to the length of post-policy period examined. That is, we might not have found any significant change in the district firms simply because the period after the birth of the TD is too short. In order to test for such hypothesis we extended the period from 2 to 4 years after the birth of the district. Therefore, now the coefficient β_3 is estimated over a post-policy period of 5 years (the year of the birth and 4 years after). Note that in this case, since the period is longer and the sample is balanced, the number of firms belonging to the regression is smaller (with the first control group we have a total sample of 1,384 firms; with the second control group the sample includes 1,344 firms).[16] Again, also with this new extended sample the results are qualitatively similar to those obtained up to now: overall there are not signs of statistically significant differences among the firms adhering at the districts and those of the control groups, for any outcome variable estimated.[17] For the sake of synthesis results are not shown but available under request.

Next, we also verified if the impact of the policy had been heterogeneous according to the size of the firms. Given that TDs were created mainly in order to foster synergies among firms, but also between firms and universities or other public research centres, it is possible that the policy benefited more the small firms, that had lower autonomous innovation capabilities, than large ones. For such a reason we have broken down the sample in small and large firms; the former are those with sales below the median value the year before the birth of the district (large firms are the others).

The results are reported in Table 11-12. We find no effect for large firms, whereas some positive effects for smaller southern firms in terms of added value. The coefficient is significant only for the model based on trimmed sample (by excluding outliers of 5th and 95th percentiles), whereas without trimming the sample there is no a significant effect (these results are not shown for the sake of brevity,

[16] It is worth noting that the extension of the post-programme period has pros and cons. On the one hand, it allows us to capture policy's effects that are slower to emerge. On the other hand, the longer is the period, the higher the risk that confounding factors affecting the performance of the firms, unrelated with the policy, bias the assessment.

[17] We also checked if firms belonging to the control groups had already took advantage of other similar instruments of policy, such as science and technology parks that could have influenced their performance (and the results of our analysis). Thanks to the information drawn from Liberati et al. (2012), that we wish to thank for having shared their dataset, we were able to exclude this hypothesis, given that just one firm of or sample belonged also to a science and technology park.

but are available under request). Given that the sample without outliers includes only about 50 southern district firms, such result must be taken with extreme caution.

Finally, we carry out a couple of further exercises to check for heterogeneous effects across TDs according to the features of the district. First, we check whether the change in firms' performance in large and small TDs has been different. The rationale is that districts with more firms might enhance technology transfer and firm performance more than the others, owing to stronger agglomeration economies. Therefore, we distinguish between small districts (those with a number of firms below the median value for Italy) and large districts (the others), and repeat the estimates breaking down the firm sample into the two categories. Again, we do not find any remarkable effect on the outcome variables, neither for large nor for small TDs.

Second, we verify another type of heterogeneity distinguishing the TDs specialized in the same sector of specialization of the region from the others. We take advantage of the taxonomy provided by Miceli (2010) who addressed this issue by a cluster analysis. The motivation is that the creation of the TD could have stronger positive effect if the sector specialization of the TD reflects that of the area where the TD is localized. In this circumstance, the district can take advantage of the localized knowledge and exploits stronger agglomeration externalities. On the empirical ground we carry out separate estimates for regions specialized in the TD sectors, on one side, and regions not specialized in the TD sectors on the other.[18] Again, the results of this exercise do not differ significantly between the two groups of regions, nor from those previously obtained. Results are not shown but available upon request.

4.1 Some extensions: productivity and innovation capabilities

In this section we use two other measures of firm performance: productivity and innovation capabilities.

As regards productivity, in the balance sheet there are information on the number of employees only for a very limited subsample of large firms. For such a reason, as a proxy for firm productivity we use the ratio between added value and labour costs (instead of the more standard added value/employees ratio). Labour cost can differ if the workforce has different skills. Therefore, by using this proxy for productivity we are implicitly assuming that district and non-district firms are similar in terms of the type of workforce employed. It is not possible test for such hypothesis, however we believe that the two groups of firms, being very homogeneous according to a large set of observables considered in the balancing properties, should differ only marginally in this dimension. Moreover, since

[18] Miceli (2010) in order to distinguish the regions uses a specialization index that measures to what extent a sector is important in one region relatively to what extent it is important for the whole Italy, and a concentration index, that measures to what extent a sector is concentrated in one region (i.e. the relevance of the region for a specific sector over the national total). We carry out the exercises using both: specialization and concentration indices.

our analysis is based on diff-in-diffs method, our results are not invalidated if there are differences in the workforce skills "time-invariant" between district and non-district firms, as a result it might suffer only of a second order bias.

The results of the exercises on productivity are reported in Tables 9-12. Again we did not find any significant difference between the performance of district and non district firms after the birth of the TD.

In addition, in this section we assess whether the participation to a TD has enhanced innovation propensity of the firms, measured by the number of patent applications to the European Patent Office, and by the probability of patenting. Information on patent applications come from the merge carried out by Marin (2011) between the Patstat data set and the balance sheet data (see section 3).

Overall, patent propensity of district firms was remarkably higher than that of non-district firms of the control groups: the number of average patent applications, and the share of firms that has applied for at least one patent, over the 5 years before the birth of the TD, were much larger in the former firms' group than in the latter. Yet, these differences depend on a very small number of district firms that have applied for a high number of patents. Therefore, in order to reduce the differences between district and non-district firms in this respect we excluded the district highest patenting firms. Namely, 6 district firms from the sample built using the matching by region and 1-digit sector, and 2 district firms from the second matching based on geographical area and 2-digit sector.

After having excluded these firms, the two groups turned out to be very similar in terms of number of patent applications. In the five years before the birth of the TDs, with the first control group the average number of patent applications by 100 firm is now 15.0 for district firms (it was 31.5 before the cut of the sample) against 13.5 of the non district firms. Mean difference is equal to 1.53 (standard errors=4.63). With the second control group matched by geographic area and 2-digit sector, the figure are 17.6 for district firms against 17.1 for non district firms (mean difference=0.51; standard error=8.46). The two new samples turn out to be balanced also according to the other balance sheet variables.

After having balance the samples, the next step has been to estimate the following model on the new firm samples:

$$(2) \quad y_{it} = \alpha + \beta_1(DIST_i) + \beta_2(POST_t) + \beta_3(DIST_i*POST_t) + \sum_r (\gamma_r REG_r) + \sum_s (\gamma_s SET_s) + \varepsilon_{it}$$

where the outcome variable y_{it} is the sum of the patent applications presented to the European Patent Office by firm *i* over the 5 years before the birth of the policy (pre-policy period) and the 5 years after

(the year of the birth included). With the first control group, district firms that have applied for a patent are 117 and non district firms 54; with the second control group they are, respectively, 113 and 55. Since there are several firms with zero patent applications, we cannot exclude that the error term is not distributed like a normal. Therefore, we estimated the model (2) both by OLS and, assuming that the error terms is distributed like a poisson, by Maximum Likelihood based on a poisson distribution (a standard practice for the empirical studies on patents). As robustness checks, we have used 2- and 4-digit sector dummies, and excluded the regional dummies without appreciable differences in the results (they are not shown but available under request).

The main findings, in line with those previously obtained, are reported in Table 13. We see that the differences in the number of patent applications between on-district and off-district firms do not change after the birth of the TDs. The estimates of the coefficient β_3 are never statistically significant.[19]

Finally, on the same samples we also checked if firms' probability of patenting could have changed after the birth of the district. We estimated the equation (2) by a probit model after having changed the outcome variable y_{it} in the probability of patenting , i.e. y_{it} =1 if firm *i* applied for at least one patent in period t and zero otherwise. In line with previous results we did not find any significant change in the probability of patenting of district firms after they have joined the district (see Table 13, the last two columns).[20]

5. Conclusions

In this paper we have examined Italy's technology districts, a policy instrument implemented in order to stimulate the creation and the development of local innovative clusters. TDs involve a multitude of actors located in limited geographical areas, including firms, public research centres, universities and local government bodies. The focus of our paper is on the characteristics and performance of the firms.

The analysis shows that firms that joined a TD were, before the birth of the district, larger and more innovative, in terms of patenting activity, than firms belonging to the same sectors and geographical areas that did not join the district. District firms were more highly leveraged than non-district firms, but were comparable to them with regard to other characteristics, such as profitability and investment rate.

[19] We obtain qualitatively similar results also when we break down the sample between small and large districts, and separating the regions between those that are specialized in the same sector of the districts and the others, as done in the previous section.

[20] In the Table 13 are shown the results of the model estimated without regional and sector fixed affect because, due to no variability of the dependent variable within some sectors and regions, some observations would have been dropped in the probit model. However, results are similar if we include fixed effects and estimate the probit model over the smaller sample that excludes such observations.

On average, after the birth of the district, district firms' performance did not differ significantly from that of non-district firms located in the same area, belonging to the same sectors and similar to them in terms of a number of characteristics. Firms' performance was measured by various balance sheet indicators such as firm's growth, profitability, productivity, financial structure, investment rate and patenting propensity. We found that joining the district had a weak positive effect on firms' growth for small district firms of the southern regions, but because of the limited southern-firm sample size this result must be taken with extreme caution.

This analysis is a further step to a deeper knowledge of a relevant policy instrument. However, it has some limits that need to be recalled. Since our analysis is based on balanced samples of firms present in the dataset before and after the birth of the TDs, its results cannot be extended to the start-ups born with the TDs. The investigation of start-ups' performance would be highly interesting, especially in our context, but it requires data that, to our knowledge, are not available. Second, to evaluate the effectiveness of the policy, consistently with the theoretical approach on which the TDs were based, it would be important to evaluate the impact of the policy also on the performance of all the actors involved in the programme and on the competitiveness of the geographical areas targeted by the policy. These are highly promising but also very challenging avenues of future research.

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Tab. 1

Main features of the districts

Region	Geographical area	Activities	Year of establishment
Piedmont	North West	ICT-Wireless	2003
Trentino Alto Adige	North East	Sustainable technologies for building	2006
Lombardy	North West	ICT	2004
Lombardy	North West	Biotechnologies	2004
Lombardy	North West	Advanced materials	2004
Liguria	North West	Intelligent integrated systems	2005
Emilia Romagna	North East	Biomedical equipment	-
Emilia Romagna	North East	Advanced mechanics	2004
Tuscany	Centre	Mechatronics	2006
Veneto	North East	Nanotechnologies	2004
Friuli Venezia Giulia	North East	Molecular biotechnologies	2004
Latium	Centre	Aerospace	2004
Latium	Centre	Biosciences	2008
Latium	Centre	Cultural activities	2008
Umbria	Centre	Mechatronics	2006
Abruzzo	South	Agri-bio-food	2005
Molise	South	Agri-bio-food	2006
Basilicata	South	Hydro-geological and seismic risks	2005
Campania	South	Polymeric materials	2005
Puglia	South	Mechatronics	2005
Puglia	South	Nano-tech and ICT	2005
Puglia	South	Energy	2008
Puglia	South	Agri-bio-food	2005
Calabria	South	Logistics and transports	2005
Calabria	South	Cultural activities	2005
Sicily	South	Micro and nano-systems	2005
Sicily	South	ICT and micro-electronics	2005
Sicily	South	Agri-bio-food and eco-fishing	2005
Sardinia	South	Wealth technologies	2005

Source: Ministry of the Economic Development

Tab. 2

Characteristics of the technology districts by region

Region - Geographical area	Number of districts	Number of district firms	Average number of firms by district	Number of district firms with HQ in the region and stored in Cerved	Average number of district firms with headquarter in the region and stored in Cerved	Average sales of district firms stored in Cerved
Piedmont	1	439	439	213	213.0	39,431
Lombardy	3	407	136	314	104.7	37,097
Liguria	1	26	26	21	21.0	3,629
Trentino Alto Adige	1	171	171	108	108.0	9,006
Veneto	1	16	16	8	8.0	35,672
Friuli Venezia Giulia	1	14	14	4	4.0	81,063
Emilia Romagna	2	129	65			
Tuscany	1	175	175	67	67.0	3,532
Umbria	1	59	59	31	31.0	21,437
Latium	3	391	130	222	74.0	52,627
Abruzzo	1	25	25	15	15.0	38,592
Molise	1	23	23	1	1.0	967
Campania	1	15	15	5	5.0	516,847
Puglia	4	151	38	78	19.5	114,939
Basilicata	1	4	4	1	1.0	22
Calabria	2	44	22	16	8.0	21,855
Sicily	3	158	53	54	18.0	77,621
Sardinia	1	51	51	16	16.0	796
North West	5	872	174	548	109.6	36,852
North East	5	330	66	120	24.0	12,781
Centre	5	625	125	320	64.0	36,178
South	14	471	34	186	13.3	61,231
Italy	**29**	**2,298**	**79**	**1,174**	**40.5**	**38,443**

Data are referred to 2010. Firms belonging to more than one district are considered only once. Telecom Italia Spa has been excluded from Piedmont district.

Tab. 3

Number of firms and number of districts by economic activity – Year 2010

Economic activities	Number of districts	Number of district firms	Average number of firms for district
Agriculture, forestry and fishing	2	10	5.0
Food	5	82	16.4
Textile and clothing	4	4	1.0
Wood and furniture	3	9	3.0
Paper and publishing	2	2	1.0
Chemical and pharmaceutics	15	91	6.1
Rubber and plastic goods	9	70	7.8
Metallurgy	9	61	6.8
Electronics goods	22	168	7.6
Machinery	14	68	4.9
Means of transport	8	24	3.0
Other industries	12	63	5.3
Electricity, power, gas, etc.	7	26	3.7
Building	11	67	6.1
Trade	13	64	4.9
Information and communications	14	276	19.7
Professional activities	26	177	6.8
Other services	21	37	1.8
Industry	25	642	25.7
Building	11	67	6.1
Services	27	554	20.5
Other activities	9	36	4.0
Total	**29**	**1,299**	**44.8**

Data are referred to 2010 (last available year). District firms also include those which headquarter is in another region. Telecom Italia Spa has been excluded from Piedmont district.

Tab. 4

Economic and financial indicators for district and non-district firms (in thousands of euros and percentages) – Year 2010

Indicators	Mean		Median		Max		Min	
	District	Non District	District	Non District	District	Non District	District	Non District
Sales	38,443	4,604	3,402	387	5,120,768	17,880,845	0	0
Added value	11,789	960	1,093	110	1,320,552	5,171,348	-4,724	-356,354
Roa	-2.5	-1.8	0.5	0.8	46.8	3,763.3	-1,000.0	-28,800.0
Gross operative margin/asset	6.5	8.9	7,0	8.3	418.2	5,400.0	-940.0	-8,900.0
Investment rate	30.8	119.2	-3,0	-4.9	7,704.2	2,183,600.0	-100.0	-100.0
Tot. inv./sales	-33.7	10.1	-0,3	-0.4	762.2	742,766.7	-30,816.7	-165,983.3
Imm. Inv./sales	-4.6	0.5	0,0	0.0	735.6	80,700.0	-3,266.7	-91,000.0
Leverage	51.5	40.5	51,2	33.9	3,700.0	29,850.0	-538.1	-75,900.0

Data are referred to 2010. Telecom Italia has been excluded from Piedmont district. Firms belonging to more than one district are considered only once. Non district firms have the same combination “Ateco-Region” as the district ones.

Some economic and financial indicators referred to the single districts (D) and non districts (ND) – (in euros and percentages)

District	Region	Year of establishment (1)	Number of district firms	Number of non district firms (2)	Sales				Added value				Roa				Ebit/assets			
					Means		Median		Means		Median		Means		Median		Means		Median	
					D	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D	ND
ICT-Wireless	Piedmont (3)	2003	439	18,341	13,055	8,477	1,873	539	7,464	1,918	805	161	-0.7	-6.0	0.5	0.4	9.8	10.2	10.0	10.7
Sustainable building	Trentino A.A.	2006	171	5,058	10,348	2,661	4,152	575	2,691	516	1,258	120	2.0	-5.4	1.0	0.3	11.2	8.2	7.8	6.9
ICT	Lombardy	2004	89	32,268	6,667	4,313	3,384	415	2,075	1,093	1,234	122	0.5	-3.2	0.4	0.4	9.5	11.5	10.9	11.7
Biotechnologies	Lombardy	2004	154	32,446	37,678	10,564	9,603	1,416	9,223	2,010	2,418	315	1.0	-2.2	0.3	0.4	11.6	8.2	10.9	9.3
Advanced materials	Lombardy	2004	164	35,623	42,102	5,901	6,994	1,080	5,202	1,464	2,032	330	1.1	-4.1	0.3	0.3	10.6	14.7	9.8	10.1
Intelligent integrated systems	Liguria	2005	26	2,284	2,503	1,256	758	205	653	376	239	54	0.7	-1.3	0.1	0.4	11.2	15.2	8.9	12.5
Biomedical equipment	Emilia R.	-	40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Advanced mechanics	Emilia R.	2004	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mechatronics	Tuscany	2006	175	9,977	3,265	2,934	487	254	927	796	165	83	1.3	0.8	0.5	0.8	15.1	37.7	12.8	13.3
Nanotechnologies	Veneto	2004	16	2,375	44,743	12,267	25,056	2,249	11,022	3,423	25,245	567	-0.2	-39.9	0.2	0.6	7.3	11.6	9.3	10.5
Molecular biotechnologies	Friuli V.G.	2004	14	653	71,436	949	21,189	230	26,985	262	6,814	50	0.6	-2.5	0.1	0.4	9.3	13.4	8.9	10.6
Aerospace	Latium	2004	221	43,719	41,575	1,935	2,764	204	15,760	476	966	43	1.1	-8.9	0.4	0.2	11.5	6.5	8.5	9.5
Biosciences	Latium	2008	80	8,932	7,545	2,944	3,898	266	2,582	839	1,146	79	2.2	-1.7	0.6	1.2	12.1	14.1	11.5	12.9
Cultural activities	Latium	2008	90	26,025	18,734	9,221	1,920	193	7,683	2,096	754	53	0.8	-3.2	1.4	0.9	10.4	15.3	8.4	12.1
Mechatronics	Umbria	2006	59	1,627	15,959	2,549	9,109	440	4,305	641	2,110	128	0.7	-0.9	0.4	0.8	8.0	10.1	9.2	10.1
Agri-bio-food	Abruzzo	2005	25	294	41,784	2,769	4,761	330	15,438	469	718	84	-1.7	-0.5	0.0	0.2	2.9	5.9	5.4	6.0
Agri-bio-food	Molise	2006	23	512	732	446	761	158	114	151	50	41	0.8	0.1	0.1	0.2	5.8	10.3	6.2	7.6
Hydro-geological and seismic risks	Basilicata	2005	4	13	5,305	528	5,305	123	124	372	124	46	0.9	-0.7	0.9	1.2	1.6	18.7	1.6	12.5
Polymeric materials	Campania	2005	15	387	395,418	5,890	92,922	697	153,188	1,816	67,834	205	-0.5	-8.4	-0.2	0.5	6.4	4.4	6.6	7.6
Mechatronics	Puglia	2005	9	615	90,712	1,566	10,219	188	31,505	531	5,719	75	-0.5	-3.3	1.0	0.4	7.0	6.5	7.4	10.9
Nano-tech and ICT	Puglia	2005	10	1,350	791,627	1,273	369,216	182	314,530	649	171,080	74	-2.9	-2.8	-0.2	0.6	4.9	7.5	6.6	11.6
Energy	Puglia	2008	31	4,524	124,810	1,170	19,180	360	41,831	318	5,300	119	2.2	-0.4	2.2	0.8	5.9	10.0	5.5	7.8
Agri-bio-food	Puglia	2005	101	7,061	24,122	1,112	2,352	243	3,523	227	490	68	-1.8	-13.5	0.1	0.1	4.4	-3.4	6.4	6.5
Logistics and transports	Calabria	2005	26	1,388	31,146	1,064	3,073	159	13,163	352	449	60	-0.7	-3.3	0.1	0.0	-2.9	-2.7	4.1	7.3
Cultural activities	Calabria	2005	18	603	2,777	504	1,459	134	1,249	229	492	44	3.4	-2.5	0.4	0.2	12.1	8.1	11.6	9.6
Micro and nano-systems	Sicily	2005	12	1,939	659,664	1,241	106,378	146	247,618	562	54,111	57	2.2	-2.1	0.1	1.1	9.1	12.9	8.6	12.2
ICT and micro-electronics	Sicily	2005	136	4,977	2,772	611	862	161	887	163	403	47	0.9	-6.5	1.4	0.4	14.3	7.4	11.9	7.9
Agro-bio-food and eco-fishing	Sicily	2005	10	819	1,665	1,166	246	272	522	210	358	83	-0.9	-1.4	0.1	1.2	3.2	8.6	4.4	8.6
Wealth technologies	Sardinia	2005	51	245	1.496	258	438	43	944	105	303	14	-2.1	-22.3	-0.7	0.0	2.9	-5.6	3.0	3.3

(1) Data are referred to the year before the legal agreement between State and Region or, if not available, the year of the preliminary agreement. (2) Non district firms are those of the same region and the same Ateco code of the district ones (except the district ones). (3) Telecom Italia Spa has been excluded from Piedmont district.

Some economic and financial indicators referred to the single districts (D) and non districts (ND) – (in euros and percentages)

District	Region	Year of establishment (1)	Number of district firms	Number of non district firms (2)	Inv.rate				Tot.inv./sales				Int.inv./sales				Leverage			
					Means		Median		Means		Median		Means		Median		Means		Median	
					D	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D	ND	D	ND
ICT-Wireless	Piedmont (3)	2003	439	18,341	16.0	75.9	-2.2	-3.6	-7.2	7.3	0.4	-0.3	-8.5	1.2	0.1	0.0	39.3	42.2	48.2	38.8
Sustainable building	Trentino A.A.	2006	171	5,058	36.9	61.2	-3.2	-3.1	4.7	-11.9	-0.2	-0.1	0.0	0.3	0.0	0.0	41.2	45.6	37.7	31.5
ICT	Lombardy	2004	89	32,268	15.0	48.8	-5.6	-6.7	-2.4	-6.0	-0.9	-0.5	-0.2	-3.5	-0.1	0.0	45.4	37.8	45.6	27.8
Biotechnologies	Lombardy	2004	154	32,446	7.5	32.5	-2.4	-50.0	0.0	-48.3	-0.3	-0.3	-0.3	-1.1	-0.1	0.0	53.4	34.8	62.2	46.8
Advanced materials	Lombardy	2004	164	35,623	11.1	66.9	-2.9	-4.9	2.2	-56.5	-0.5	-0.6	1.1	-2.3	0.0	0.0	55.5	42.7	63.0	43.8
Intelligent integrated systems	Liguria	2005	26	2,284	47.9	38.2	-11.6	-5.5	1.5	12.5	0.2	-0.4	1.1	2.3	0.0	0.0	47.8	36.2	50.4	12.5
Biomedical equipment	Emilia R.		40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Advanced mechanics	Emilia R.	2004	89	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mechatronics	Tuscany	2006	175	9,977	31.5	45.7	0.0	-4.7	3.8	1.7	0.0	-0.3	4.0	-1.2	0.0	0.0	31.9	31.6	21.2	13.0
Nanotechnologies	Veneto	2004	16	2,375	3.4	7.9	-3.6	-5.0	1.9	-1.9	0.3	-0.6	1.5	1.1	-0.1	0.0	48.7	44.3	47.4	45.9
Molecular biotechnologies	Friuli V.G.	2004	14	653	29.2	127.6	6.7	-5.3	-1.0	5.0	-1.3	-0.2	-3.9	0.7	-1.0	0.0	51.6	-24.0	49.7	26.8
Aerospace	Latium	2004	221	43,719	26.7	71.6	-1.3	-5.8	4.7	-10.5	0.0	-0.3	2.5	-0.2	0.0	0.0	39.9	34.1	39.7	0.0
Biosciences	Latium	2008	80	8,932	89.8	53.7	-0.7	-6.6	1.6	-2.0	0.5	0.3	0.4	-1.8	0.0	0.0	40.4	29.3	47.8	6.5
Cultural activities	Latium	2008	90	26,025	24.5	53.4	0.0	-6.1	1.7	2.9	0.0	-0.3	1.1	2.3	0.0	0.0	44.8	32.7	42.7	2.8
Mechatronics	Umbria	2006	59	1,627	1.6	40.3	-4.0	-2.9	-1.2	-4.6	-0.2	-0.1	0.5	-0.4	-0.1	0.0	47.1	38.6	52.5	30.1
Agri-bio-food	Abruzzo	2005	25	294	1.2	14.1	-1.7	-3.9	-0.9	20.6	-1.0	-0.8	-0.3	1.1	0.0	0.0	46.8	31.3	44.1	43.0
Agri-bio-food	Molise	2006	23	512	-2.4	31.8	-2.4	-1.2	0.6	-0.6	0.7	0.0	0.4	0.4	0.4	0.0	55.4	36.5	61.2	9.1
Hydro-geological and seismic risks	Basilicata	2005	4	13		76.9		-3.7	0.0	6.3	0.0	-0.7	0.0	0.0	0.0	0.0		18.1		0.0
Polymeric materials	Campania	2005	15	387	2.7	53.8	-2.6	0.0	-2.2	27.8	-1.6	0.0	-1.4	4.8	-0.3	0.0	42.5	32.8	36.1	21.8
Mechatronics	Puglia	2005	9	615	4.3	17.8	-0.5	-7.7	4.6	-22.0	2.7	-0.9	3.9	1.6	1.3	0.0	26.8	31.2	25.9	1.8
Nano-tech and ICT	Puglia	2005	10	1,350	3.5	21.0	-2.0	-5.6	6.6	-11.7	-0.9	-0.9	3.7	1.3	0.2	0.0	34.5	34.1	17.5	7.1
Energy	Puglia	2008	31	4,524	31.3	137.2	-0.9	-4.1	-7.5	13.3	-0.2	-0.1	-1.2	0.7	0.2	0.0	46.4	40.8	46.6	40.7
Agri-bio-food	Puglia	2005	101	7,061	136.5	70.9	6.3	-3.7	158.4	20.6	1.6	-0.1	134.3	1.9	0.0	0.0	48.4	39.8	53.2	13.6
Logistics and transports	Calabria	2005	26	1,388	37.4	34.0	2.4	-3.7	2.7	5.5	0.0	-0.4	0.6	1.2	-0.1	0.0	51.7	30.5	47.3	0.0
Cultural activities	Calabria	2005	18	603	223.8	27.9	6.8	-2.5	12.3	15.1	0.0	0.0	3.9	4.2	1.0	0.0	25.8	23.9	13.7	0.0
Micro and nano-systems	Sicily	2005	12	1,939	16.8	91.9	-1.6	-3.8	0.3	146.1	-1.7	-0.3	0.8	99.1	-0.1	0.0	29.8	20.2	62.8	2.0
ICT and micro-electronics	Sicily	2005	136	4,977	62.6	60.7	0.6	-5.8	8.3	44.9	1.4	-0.4	1.3	27.0	0.0	0.0	38.0	30.1	33.0	1.4
Agro-bio-food and eco-fishing	Sicily	2005	10	819	214.9	2,176.5	39.6	-3.6	1,314.1	1.8	20.0	-0.1	39.7	-71.5	1.0	0.0	20.2	24.6	0.0	3.6
Wealth technologies	Sardinia	2005	51	245	13.4	-6.1	20.6	-8.3	668.8	-67.4	43.5	-1.1	612.6	-13.2	0.3	0.0	22.5	34.6	29.1	0.0

(1) Data are referred to the year before the legal agreement between State and Region or, if not available, the year of the preliminary agreement. (2) Non district firms are those of the same region and the same Ateco code of the district ones (except the district ones). (3) Telecom Italia Spa has been excluded from Piedmont district.

Number of applications to the European Patent Office: district and non district firms

District	Region	Number of district firms	Number of non district firms	Districts			Non districts		
				Number of patents (1)	Average number of patents by firm	Percentage of patenting firms	Number of patents (1)	Average number of patents by firm	Percentage of patenting firms
ICT-Wireless	Piedmont (2)	439	18,341	171	14.3	2.7	582	4.5	0.7
Sustainable building	Trentino A.A.	171	5,058	7	1.4	2.9	26	1.7	0.3
ICT	Lombardy	89	32,268	4	1.0	4.5	1,357	11.0	0.4
Biotechnologies	Lombardy	154	32,446	97	4.9	13.0	1,334	5.4	0.8
Advanced materials	Lombardy	164	35,623	157	6.0	15.9	1,757	4.7	1.0
Intelligent integrated systems	Liguria	26	2,284	1	1.0	3.8	12	4.0	0.1
Biomedical equipment	Emilia R.	40							
Advanced mechanics	Emilia R.	89							
Mechatronics	Tuscany	175	9,977	4	1.3	1.7	266	4.5	0.6
Nanotechnologies	Veneto	16	2,375	17	3.4	31.3	103	2.8	1.6
Molecular biotechnologies	Friuli V.G.	14	653	50	16.7	21.4	16	3.2	0.8
Aerospace	Latium	221	43,719	59	4.5	5.9	73	2.2	0.1
Biosciences	Latium	80	8,932	17	2.1	10.0	215	6.7	0.4
Cultural activities	Latium	90	26,025	-	-	0.0	50	2.1	0.1
Mechatronics	Umbria	59	1,627	29	3.6	13.6	25	2.3	0.7
Agri-bio-food	Abruzzo	25	294	7	3.5	8.0	-	-	0.0
Agri-bio-food	Molise	23	512	-	-	0.0	-	-	0.0
Hydro-geological and seismic risks	Basilicata	4	13	-	-	0.0	2	2.0	7.7
Polymeric materials	Campania	15	387	1.146,	114.6	66.7	6	1.5	1.0
Mechatronics	Puglia	9	615	361	120.3	33.3	13	2.6	0.8
Nano-tech and ICT	Puglia	10	1,350	839	209.8	40.0	5	1.7	0.2
Energy	Puglia	31	4,524	22	3.7	19.4	10	1.7	0.1
Agri-bio-food	Puglia	101	7,061	4	1.0	4.0	9	1.8	0.1
Logistics and transports	Calabria	26	1,388	5	5.0	3.8	-	-	0.0
Cultural activities	Calabria	18	603	-	-	0.0	-	-	0.0
Micro and nano-systems	Sicily	12	1,939	827	413.5	16.7	1	1.0	0.1
ICT and micro-electronics	Sicily	136	4,977	5	2.5	1.5	2	2.0	0.0
Agri-bio-food and eco-fishing	Sicily	10	819	-	-	0.0	-	-	0.0
Wealth technologies	Sardinia	5	245	2	1.0	3.9	-	-	0.0

(1) Data are referred to a period of 5 years before the establishment of the districts. 2011, thus not definitive, is included. (2) Telecom Italia Spa has been excluded from the Piedmont district.

Tav. 7

Balancing properties – matching by region and sector of economic activity (ateco 1 digit) with "Mahalanobis" method

Area	Number of matched firms		Sales				Added value				Roa				Ebit/assets			
	D	ND	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.
North West	460	403	14,003	13,623	-380	2,521	3,407	3,390	-17	539	1.22	1.17	-0.05	0.72	11.12	11.89	0.70	0.88
North East	73	54	14,340	15,879	1,539	5,058	3,820	4,027	207	1,342	1.80	2.38	0.58	1.05	10.27	11.83	1.56	2.03
Centre	223	180	18,325	11,025	7,300	5,804	7,223	5,245	-1,978	3,105	1.24	1.25	0.01	0.74	12.20	13.60	1.40	1.54
South	104	84	9,812	7,888	-1,924	2,520	2,880	1,770	-1,109	857	-0.55	1.01	1.56	1.32	7.83	8.04	0.22	2.26
Italy	860	721	14,645	12,475	-2,170	2,082	4,368	3,712	-656	858	1.06	1.26	0.20	0.47	10.97	11.86	0.90	0.70

Area	Investment rate				Tot.inv./sales				Int.inv./sales				Leverage				Lab.cost/ad.val.			
	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.
North West	3.35	2.08	-1.27	2.71	-0.08	1.52	1.60	1.60	-0.07	0.95	1.65	1.81	50.56	42.08	-8.48	3.27 (***)	174	180	-6	27
North East	8.20	2.07	-6.13	7.45	1.95	1.10	-0.85	1.94	-0.21	0.50	0.71	0.56	41.75	45.95	4.20	6.52	587	222	365	295
Centre	9.24	11.94	2.69	4.76	4.43	2.90	-1.53	1.89	3.17	1.07	-2.10	1.55	40.18	36.00	-4.18	4.25	277	177	100	110
South	15.25	12.64	-2.61	7.15	59.32	9.98	-49.34	57.98	2.50	2.54	0.05	2.88	41.98	40.53	-1.46	5.01	179	339	-160	148
Italy	6.72	5.76	-0.96	2.18	8.44	2.82	-5.62	6.96	0.73	1.13	0.40	1.12	46.08	40.67	-5.41	2.24 (**)	230	201	28	42

Firms have been matched with reference to the year before the establishment of the districts, on the base of the following variables: sales, added value, ebit/assets, inv/sales. District firms with sales larger then 1 billion euro have been excluded.
*** p<0.01; ** p<0.05; * p<0.1

Tav. 8

Balancing properties – matching by macroregion and sector of economic activity (ateco 2 digit) with "Mahalanobis" method

Area	Number of matched firms		Sales				Added value				Roa				Ebit/assets			
	D	ND	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.
North West	448	402	14,175	12,670	-1,504	2,405	3,417	3,222	-195	537	1.36	1.50	0.15	0.57	11.29	12.49	1.19	0.83
North East	77	66	13,634	11,176	-2,458	3,521	3,752	3,067	-685	1,011	1.37	2.42	1.05	1.07	9.36	10.56	1.20	1.83
Centre	214	173	17,486	14,724	-2,761	6,524	6,911	6,734	-176	3,414	1.38	1.89	0.51	0.84	12.18	13.44	1.26	1.48
South	92	84	9,389	7,312	-2,077	2,568	2,739	1,572	-1,167	889	-0.72	-0.04	0.68	1.62	7.80	7.78	-0.02	2.24
Italy	831	725	14,447	12,403	-2,044	2,129	4,273	3,855	-418	908	1.14	1.50	0.37	0.43	10.96	12.00	1.04	0.66

Area	Investment rate				Tot.inv./sales				Int.inv./sales				Leverage				Lab.cost/ad.val.			
	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.	Mean D	Mean ND	Diff	Std. Err.
North West	3.19	3.73	0.54	2.58	-0.09	2.46	2.55	1.63	-0.72	1.39	0.28	0.92	50.49	45.85	-4.64	2.39 (**)	168	181	-13	27
North East	9.02	5.25	-3.77	6.25	5.26	2.61	-2.65	4.26	0.08	0.70	0.61	0.81	41.89	52.62	10.73	8.31	184	186	-2	39
Centre	9.87	11.84	1.97	5.08	5.03	4.62	0.40	2.69	3.31	2.46	-0.85	0.98	40.35	38.41	-1.94	4.36	218	178	40	55
South	14.89	18.33	3.45	7.55	64.85	15.25	-49.60	61.81	2.79	6.47	3.68	5.36	41.81	42.77	0.96	5.38	187	366	-178	158
Italy	6.73	7.48	0.75	2.16	8.81	4.57	4.24	7.10	0.78	2.17	1.39	1.27	46.12	44.33	-1.79	1.96	183	200	-17	27

Firms have been matched with reference to the year before the establishment of the districts, on the base of the following variables: sales, added value, ebit/assets, inv/sales. District firms with sales larger then 1 billion euro have been excluded.
*** p<0.01; ** p<0.05; * p<0.1

Tab. 9

Diff-in-diffs regression ("pdist" coefficient and robust std error)

	Observations	Sales	Added value	Roa	Ebit/assets	Inv. Rate	Tot.inv./sales	Int.inv/sales	Leverage	Lab.cost/ad.val.
					Results for matching by region-ateco 1 digit					
North West	4,310	-2,337	-50.30	0.298	-0.00376	22.12	4.917	4.573	1.467	-24.34
		(2,393)	(173.4)	(0.691)	(0.850)	(25.18)	(4.119)	(4.257)	(3.444)	(25.08)
North East	640	-708.7	-197.9	3.203	1.687	-49.92	0.625	2.816	-13.26**	869.6
		(1,835)	(488.1)	(2.266)	(1.818)	(63.38)	(3.764)	(1.926)	(5.304)	(877.0)
Centre	2,012	1,295	305.9	-6.087	-7.512	-331.3	-11.31	-0.403	3.717	197.5
		(1,009)	(544.3)	(7.333)	(6.891)	(242.1)	(10.19)	(1.248)	(3.835)	(196.4)
South	943	2,663	348.5	1.266	3.075	43.08**	-21.39	-2.839	-15.66	-192.6.
		(1,876)	(596.4)	(1.322)	(2.170)	(20.09)	(29.94)	(8.572)	(18.66)	(194.6)
Italy	7,905	-734.9	50.13	-0.979	-1.369	-69.43	-2.162	2.184	-1.131	69.76
		(1,369)	(177.0)	(1.876)	(1.799)	(62.61)	(4.646)	(2.562)	(3.157)	(76.40)
					Results for matching by macroregion-ateco 2 digit					
North West	4,244	196.2	-89.40	1.167*	0.240	7.267	5.534	5.153	-0.822	-14.63
		(720.3)	(213.9)	(0.701)	(0.727)	(26.89)	(4.360)	(4.536)	(1.886)	(14.50)
North East	719	-402.3	145.8	-0.0359	-0.690	5.337	-2.059	0.0474	0.00964	539.0
		(867.4)	(252.1)	(1.244)	(1.609)	(13.30)	(4.197)	(1.788)	(7.165)	(443.2)
Centre	1,934	665.5	124.1	20.06	17.75	0.0476	0.676	1.150	4.128	27.22
		(1,516)	(731.7)	(27.61)	(27.48)	(30.32)	(2.886)	(1.531)	(3.484)	(35.47)
South	883	1,224	-36.78	0.696	1.880	27.82	-12.98	-3.951	-28.73	-176.4
		(1,139)	(340.7)	(2.198)	(2.204)	(23.06)	(27.34)	(10.18)	(24.19)	(182.7)
Italy	7,780	182.5	-103.8	5.578	4.612	8.390	1.063	2.323	-2.575	22.21
		(544.3)	(207.7)	(6.535)	(6.507)	(15.97)	(3.918)	(2.515)	(3.014)	(44.63)

For each district we considered a 5 year period: the year of establishment of the district, two years before and two years after. Robust standard error clustered by firm. *** p<0,01; ** p<0,05; * p<0,1. The following ratios: "investment rate", "total investments/sales", "immaterial investments/sales" have been scaled by the average amount of investments and sales of the two-year period before the establishment of the districts.

Tab. 10

Diff-in-diffs regression ("pdist" coefficient and robust std error) – excluding 5° and 95° percentiles for each variable

	Observations	Sales	Added value	Roa	Ebit/assets	Inv. Rate	Tot.inv./sales	Int.inv/sales	Leverage	Lab.cost/ad.val.
	Results for matching by region-ateco 1 digit									
North West	4,011	-34.95	145.8	0.362*	-0.341	1.096	0.411	-0.0232	-0.594	1.269
		(315.3)	(89.07)	(0.200)	(0.392)	(1.823)	(0.321)	(0.0911)	(1.507)	(2.376)
North East	571	1,671	-67.29	0.0913	0.334	6.416	0.433	0.182	-8.832*	7.325
		(1121)	(253.9)	(0.508)	(0.955)	(4.558)	(0.877)	(0.169)	(4.558)	(6.618)
Centre	1,742	211.3	-115.7	-0.0743	0.297	-0.646	0.389	-0.0234	2.336	-3.173
		(406.5)	(124.7)	(0.317)	(0.665)	(3.170)	(0.477)	(0.170)	(2.598)	(3.967)
South	791	1,095	99.65	0.235	0.472	8.926*	1.051	0.321	3.803	-8.553
		(717.2)	(131.4)	(0.475)	(0.902)	(4.624)	(1.047)	(0.254)	(3.917)	(7.169)
Italy	7,115	308.2	55.14	0.220	-0.0605	1.974	0.429*	0.0367	0.249	-0.567
		(237.4)	(64.15)	(0.153)	(0.299)	(1.431)	(0.249)	(0.0725)	(1.195)	(1.891)
	Results for matching by macroregion-ateco 2 digit									
North West	3,961	327.0	35.75	0.0498	-0.293	0.650	0.344	0.0891	-1.212	-1.605
		(303.0)	(79.25)	(0.204)	(0.412)	(1.905)	(0.331)	(0.0984)	(1.560)	(2.235)
North East	640	-268.5	32.06	0.243	0.612	1.585	0.526	0.104	-4.387	4.847
		(580.1)	(158.9)	(0.492)	(1.001)	(5.173)	(0.854)	(0.193)	(3.787)	(6.932)
Centre	1,653	546.0	78.34	0.313	0.170	-1.261	0.877*	0.0674	2.104	-0.479
		(365.1)	(108.7)	(0.321)	(0.642)	(3.276)	(0.506)	(0.176)	(2.565)	(3.943)
South	748	121.4	44.35	-0.433	0.455	6.849	-0.0572	0.0201	-0.191	-12.77*
		(567.3)	(110.0)	(0.435)	(0.842)	(5.068)	(1.049)	(0.260)	(3.680)	(7.638)
Italy	7,002	265.4	45.67	0.0930	-0.00222	0.985	0.412	0.0792	-0.365	-1.861
		(212.8)	(56.02)	(0.151)	(0.303)	(1.499)	(0.255)	(0.0769)	(1.180)	(1.843)

For each district we considered a 5 year period: the year of establishment of the district, two years before and two years after. Robust standard error clustered by firm. *** p<0.01; ** p<0.05; * p<0.1. The following ratios: "investment rate", "total investments/sales", "immaterial investments/sales" have been scaled by the average amount of investments and sales of the two-year period before the establishment of the districts.

Tab. 11

Diff-in-diffs regression ("pdist" coefficient and robust std error) – excluding 5° and 95° percentiles for each variable – LARGE FIRMS (sales larger than the median)

	Observations	Sales	Added value	Roa	Ebit/assets	Inv. Rate	Tot.inv./sales	Int.inv/sales	Leverage	Lab.cost/ad.val.
	Results for matching by region-ateco 1 digit									
North West	2,373	-487.7	200.1	0.389	-0.0343	2.942	0.507	0.0291	-1.153	-0.542
		(516.0)	(148.8)	(0.248)	(0.481)	(2.197)	(0.417)	(0.102)	(1.778)	(3.112)
North East	332	357.9	-185.3	-0.502	-0.936	6.635	0.850	0.0678	-5.218	6.901
		(1,526)	(387.3)	(0.584)	(1.274)	(5.351)	(1.171)	(0.206)	(6.060)	(9.303)
Centre	606	764.0	-151.9	-0.177	-0.827	-1.278	-0.482	-0.367	-1.191	-2.834
		(1,166)	(335.6)	(0.464)	(0.938)	(4.917)	(0.819)	(0.302)	(4.126)	(6.415)
South	316	3,036	283.4	-0.472	-0.346	3.570	0.391	0.323	-1.943	-3.541
		(1,828)	(282.0)	(0.745)	(0.933)	(6.078)	(1.345)	(0.337)	(5.261)	(7.652)
Italy	3,627	-7,121	75.60	0.128	-0.351	2.705	0.321	0.00839	-1.323	-0.807
		(448.9)	(118.6)	(0.200)	(0.379)	(1.771)	(0.337)	(0.0887)	(1.523)	(2.515)
	Results for matching by macroregion-ateco 2 digit									
North West	2,343	2,168	44.05	-0.00423	-0.571	1.293	0.367	0.0998	1.044	-1.189
		(484.5)	(126.7)	(0.252)	(0.499)	(2.254)	(0.426)	(0.110)	(1.692)	(2.896)
North East	390	-371.2	-66.34	0.185	0.960	-2.150	0.492	-0.0509	0.0436	7.781
		(1,063)	(252.2)	(0.543)	(1.242)	(6.562)	(1.183)	(0.249)	(4.407)	(7.440)
Centre	589	342.2	138.6	-0.0330	-0.265	-0.379	0.145	-0.0912	-1.046	0.799
		(926.5)	(291.5)	(0.431)	(1.012)	(5.018)	(0.740)	(0.276)	(3.746)	(6.292)
South	259	-645.0	-112.0	-1.511**	-0.513	5.188	0.145	-0.221	0.977	-19.34*
		(1,531)	(258.1)	(0.722)	(1.000)	(6.128)	(1.577)	(0.407)	(5.583)	(10.15)
Italy	3,581	54.37	1.824	-0.0491	-0.293	0.565	0.279	0.0543	0.607	-0.563
		(401.7)	(106.4)	(0.197)	(0.394)	(1.843)	(0.340)	(0.0939)	(1.386)	(2.405)

For each district we considered a 5 year period: the year of establishment of the district, two years before and two years after. Robust standard error clustered by firm. *** p<0.01; ** p<0.05; * p<0.1. The following ratios: "investment rate", "total investments/sales", "immaterial investments/sales" have been scaled by the average amount of investments and sales of the two-year period before the establishment of the districts.

Tab. 12

Diff-in-diffs regression ("pdist" coefficient and robust std error) – excluding 5° and 95° percentiles for each variable – SMALL FIRMS (sales smaller than the median)

	Observations	Sales	Added value	Roa	Ebit/assets	Inv. Rate	Tot.inv./sales	Imm.inv/sales	Leverage	Lab.cost/a.v.
	Results for matching by region-ateco 1 digit									
North West	1,638	-88.23	-46.51	0.259	-0.399	-2.407	0.147	-0.129	-1.492	4.208
		(71.74)	(33.39)	(0.362)	(0.712)	(3.364)	(0.503)	(0.183)	(2.984)	(3.873)
North East	239	-25.24	116.5	1.270	2.039	0.166	-0.835	0.295	-25.82***	10.23
		(227.3)	(92.11)	(0.912)	(1.652)	(7.301)	(1.332)	(0.344)	(9.331)	(12.92)
Centre	1,136	36.69	11.79	-0.0862	0.934	-1.124	0.704	0.0968	4.561	-2.215
		(89.24)	(43.10)	(0.426)	(0.932)	(4.265)	(0.590)	(0.209)	(3.503)	(5.318)
South	475	319.5**	140.2**	0.766	0.637	8.431	0.974	0.272	6.636	-9.504
		(148.2)	(59.63)	(0.606)	(1.407)	(6.422)	(1.494)	(0.367)	(5.454)	(10.45)
Italy	3,488	7.356	3.197	0.275	0.345	0.0986	0.443	0.0411	1.100	0.416
		(50.82)	(23.36)	(0.240)	(0.501)	(2.342)	(0.370)	(0.121)	(2.012)	(2.998)
	Results for matching by macroregion-ateco 2 digit									
North West	1,618	-120.6*	-46.58	0.147	0.415	-0.661	0.289	0.0761	-4.773	-0.825
		(71.28)	(33.80)	(0.368)	(0.745)	(3.591)	(0.531)	(0.198)	(3.179)	(3.709)
North East	250	-100.9	-38.88	-1.079	-1.607	2.541	0.229	0.114	-9.116	-4.582
		(200.7)	(130.5)	(0.973)	(1.969)	(9.183)	(1.230)	(0.305)	(7.481)	(17.10)
Centre	1,064	40.69	3.700	0.536	0.541	-2.326	1.141*	0.110	4.491	-1.664
		(88.74)	(42.21)	(0.438)	(0.908)	(4.388)	(0.683)	(0.220)	(3.634)	(5.378)
South	489	205.9	105.6*	0.189	1.238	5.734	-0.898	0.0785	-3.180	-9.123
		(131.3)	(61.94)	(0.543)	(1.204)	(7.133)	(1.416)	(0.360)	(5.011)	(10.64)
Italy	3,421	-19.68	-9.371	0.168	0.374	0.618	0.439	0.0966	-0.954	-2.241
		(50.82)	(25.17)	(0.241)	(0.498)	(2.467)	(0.387)	(0.127)	(2.050)	(3.005)

For each district we considered a 5 year period: the year of establishment of the district, two years before and two years after. Robust standard error clustered by firm. *** p<0.01; ** p<0.05; * p<0.1. The following ratios: "investment rate", "total investments/sales", "immaterial investments/sales" have been scaled by the average amount of investments and sales of the two-year period before the establishment of the districts.

Tab. 13

Diff-in-diffs regression: results for Patents ("pdist" coefficient and robust std error)

	Dependent variable: number of patents			Dependent variable: probability of patenting (1)	
	Observations	Ols	Poisson	Observations	Probit
		First control group: region-ateco 1 digit		First control group: region-ateco 1 digit	
Italy	3,150	0.0666	0.345	3,150	0.0463
		(0.0541)	(0.339)		(0.103)
		Second control group: macroregion-ateco 2 digit		Second control group: macroregion-ateco 2 digit	
Italy	3,108	0.0157	0.0611	3,108	0.139
		(0.0869)	(0.460)		(0.105)

For each firm we considered a ten year period: the year of establishment of the district, five years before and four years after. We decided to exclude the highest patenting firms (six for the first group, two for the second group) in order to get more comparable results. Robust standard error clustered by firms . *** p<0.01; ** p<0.05; * p<0.1.