XXXVI CONFERENZA ITALIANA DI SCIENZE REGIONALI

# SMES DEALING WITH THE CRISIS. EMPIRICAL EVIDENCES FOR REGIONAL INNOVATION POLICY: IMPACT STUDY OF PUBLIC SUPPORTS TO FIRM GROWTH

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## ABSTRACT

Crisis and recession problems strongly require interventions supporting the firms' growth. They should aim at increasing local innovation and development. Some European Countries have already begun to assist their national firms by innovative interventions, but often their results are ambiguous: they aren't always positive, because they are strongly influenced by the firms structure/market performance and by the shape, way and timing of the intervention insertion. This script analyses, through a descriptive evaluation, two Probit models (relative to the short and long time since the interventions) and several regression models (studying different firms' variables) the initiatives realized in 166 SMEs located in the Canavese Technological District (Piedmont, North Italy). It shows their impact is positive in the short time, while, in the longer period, the final effects strongly depend by the firms and interventions' structural characteristics. They have a crucial role and they should be carefully considered during innovation policies implementation. This conclusion could be an additional warning for policy makers.

**Keywords**: Innovation policy; Impact evaluation of public interventions; SMEs technological innovation.

**JEL Classification**: C53, H71, R58.

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## 1. Introduction

The current economic crisis and recession problems strongly require interventions supporting the firms growth and innovation. It is often more efficient if these actions are realized by public bodies and several national or local European governments have already begun to assist their firms by interventions increasing their opportunities. Observing their results it is possible to draw some important deductions about the characteristics which the involved firms and the interventions should have to lead to successful effects. This script would verify, empirically, if some correlations exist: if they are confirmed, the just mentioned characteristics should be interpreted as "winning strengths towards innovation" and they should be carefully considered during the policy implementation. The probability of firms success in the long period depends on them, except in a specific cases, described later. The purpose of this article is to individualize:

- The firm characteristics which should be examined to verify formerly their receptivity to innovative impulses,
- The characteristics of innovative interventions which could affect their probability of success in the firms support.

This inquiry has been realized analysing a panel of 166 Italian SMEs located in a high-tech region of the North–West of Italy: the Canavese Technological District. These firms suffered, since the 1990s' of competitiveness and innovation gaps and they received a series of innovative interventions, delivered by a local public body over the 1999-2006 period.

This paper highlights, through descriptive analyses and two econometric frameworks (Probit and Regression models), a correspondence among the interventions results and the firms/interventions characteristics. It contributes to the economic literature offering a ground to policy makers' strategies for policies design and suggesting some elements increasing the policies usefulness in terms of support to the firms against the crisis.

## 2. Literature Review

Nowadays, several governments of industrial Countries spend copious resources to support firms innovation. Nelson (1959) and Arrow (1962) stated the economic ground of these public programs leans on a systemic approach to innovation (Malerba, 1996; Smith, 2000) and on presumed market failures in providing incentives to the firms (Klette *et al.*, 1999; Gonzalez *et al.*, 2005).

In the last decade, Bergek *et al.* (2008) and many international authorities (OECD, European Commission and UNIDO), highlighted the rising of "new" economic operators: innovative subjects, oriented towards high-tech productions, usually localized in network structures, composed by several SMEs, few large units and public or private research institutes (Rolfo, 2007). These ambits have represented a valid solutions to solve the above mentioned firms innovation problems: they have increased the local SMEs' role as technological driving forces, putting them in a privileged position in public interventions distribution (Antonelli, 1986).

Nowadays, because of the globalization processes, the international crisis and the decrease of the firms' technological competitiveness (Signorini, Omiccioli, 2005), such networked frameworks need a new support. Public innovative interventions have generally represented a valid solution for their improvement (Cappellin *et al.*, 2014) but, despite the extensive literature regarding their positive impact on the firms productivity (Parisi *et al.*, 2006; Cappellin; 2007; Hall *et al.*, 2009; Bienias, Gapski, 2014), some authors (Bergek *et al.*, 2008, Marzenna, 2014) underlined their ambiguous effects.

Several studies (Archibugi, Coco, 2005; Dosi *et al*, 2012) showed the strong positive link, existing at macro level, between public innovation policies and economic performances of local firms, but, unfortunately, this relationship appears weaker at micro level (Franzoni, Vitali, 2005), mostly because many public initiatives are often in competition one with another (Rolfo, Calabrese, 2006).

David *et al.*, (2000) provided empirical evidences which suggest a complementarity between public and private investments in innovation, but other (Dosi, Lovallo 1998; Hujer and Radic, 2005; Santarelli, Vivarelli, 2007) have reached different conclusions: they evaluated the impact of innovative interventions on SMEs' performance and they obtained uncertain results, because of the strong dependence by several factors, such as the measurement adopted (more/less aggregated - Rolfo, Calabrese, 2006), the presence of firm networks (Hujer, Radic, 2005), the sector of activity (public policies implemented during crisis periods, may be useful to set-up new firms in construction/transportation, rather than in manufacturing, commerce and financial sectors, Piergiovanni *et al.*, 2007)

The first purpose of this script is to investigate if some firms' structural elements (sector, size, dynamic structure, absorptive capacity, pre-existing solid balance-sheet data) and some intervention characteristics (level of technicality/innovativeness) can influence the firms' reaction to innovative impulses and then their definitive utility to overcome the crisis.

Extensive research evidences confirm innovation is a critical factor for long-term prosperity in dynamic markets (Schumpeter, 1934; Porter, 1980; Schulz, Jobe, 2001; Garofoli, 1999, 2011; Patterson *et al.*, 2009) and firms' ability to innovate is regarded as a key determinant for success (Shipton *et al.*, 2006; Franco, 2012). Nevertheless, in the last decade, many Italian firms have been characterized by levels of innovation/R&D expenditure, on the PIL value (1,3% in the 2010), below the average European level (2%) and far from the UE 2020 target (3% of PIL) (Franco, 2010). They point out the Italian firms' competitiveness lack (Franco, 2012), which was historically contrasted by mechanisms of labour division (Rothschild, Darr, 2005), by the firms' specialization (Patterson, Kerrin, Gatto-Roisard, 2009) and by the Italian district network structures (Signorini, 2000; Garofoli, 1999, 2011). Nowadays, these resolutive framework suffers because of technological changes (Signorini, Omiccioli, 2005): the ICT allowed the rising of new ways of production, which spread the different phases of a single process in different Countries, characterized by lower production costs (Baldwin, 2006, 2012; Chudnovsky *et al.*, 2006). These new "unbundling impulses" and intersections of technological and globalizing pressures, have gradually weakened the traditional networked structures (Iuzzolino, Micucci, 2011; Di Giacinto *et al.*, 2012) and many European governments have already started to pay attention to some crucial elements affecting the firms innovation (Cappellin *et al.*, 2014; Signorini, 2000), to support them against the crisis.

Although the economic literature shows as growth is largely a stochastic process (Goedhuys, Veugelers, 2012), there is a large need of analyses which point out the factors influencing firms' development. They are "key elements" which should exist in the firms micro-context to allow their positive and rapid reaction to the market challenges. They are firms structural characteristics increasing the interventions effectiveness and affecting the firms' reaction.

They have been partially defined by Rothschild and Darr (2005), Garofoli (2011), Banca D'Italia (2012), Capello, Lenzi, (2013), Karlsson, Tavssoli (2015) and they include:

- The firms' strategic areas and policy characteristics: their influence is often biased by other structural elements as the firms' age/size, location, economic sector, the number and power of customers/suppliers/competitors/employees, by the existence of a network structure and by gaps between theoretical research and management of results. More specifically:
    a. The firm size and its relationship with technological innovation has received a good deal of attention in the economic literature (Karlsson, Tavssoli (2015), but the gained results are expressly mixed and bidirectional (Shefer, Frenkel, 2005). The central idea, traced by Schumpeter (1942) regards the existence of a positive relationship between innovation and firms' size, because of the larger/older firms' possibility of economies of scale in R&D (Acs, Audretsch, 1991; Goedhuys, Veugelers, 2012), their ability to recognize unforeseen discoveries (Kamien, Schwartz, 1982), to enter in new markets (Shefer, Frenkel, 2005), to tolerate occasional unsuccessful R&D project (Damanpour, 1992) and to innovate at a lower cost (Stock, Greis, Fischer, 2002; Shefer, Frenkel, 2005). However, this view is not universally accepted: Gilder (1988) attributed innovative advantages to small/young firms,

because of their dynamism, their ability to avoid "bureaucratic inertia" and to have motivated engineers and scientists. Concluding, recently, Goedhuys, Veugelers (2012) sustained there is no significant interaction between size and age and age and innovation, but this idea should be confirmed.

b. Paying attention to firms' localization, many authors (Garofoli, 2011; Weterings, Boschma, 2005, 2007; Audretsch, 1998) noticed that firms in metropolitan areas result advantaged (the rate of innovation is location-specific).

c. Looking at the firms' activity sectors and absorptive capacity, Cohen, Levinthal, (1989), Franco (2012) and Bergek et al. (2008) underlined they are critical factors in innovation process, because different industrial branches may be positively associated to different R&D levels, firms' abilities to absorb new technologies (Goedhuys, Veugelers, 2012) and to attract skilled employees (World Bank, 2008; Patterson *et al.*, 2009; Ready *et al.*, 2010).

d. The behavior of current or potential firms' competitors: it could influence the firms' answer to innovative impulses, because it weigh on the firms' price dimension. Policy sustaining products differentiations and more flexible structures should be promoted to counter this firms' weakness (Patterson *et al.*, 2009; Bugamelli *et al.*, (2010).

e. The firms' affiliation to a concern: Frenkel et al. (2001) sustained it secures the necessary funding to invest in R&D.

f. The firms' internal organization and the employees' behavior: Patterson *et al.* (2009) highlighted they are at the core of innovation, affecting the long term organizational survival.

g. The firms' abilities to lower the production costs (Patterson *et al.*, 2009) and to generate positive externalities: Bergek et al. (2008) noticed it concurs to create innovation systems.

- Some firms' structural attributes, as their attitudes of research, application of high-tech knowledge, innovation habits, attention to human capital development, concentration on highly-diversified productions and creation of knowledge spillovers.
- Some more specific factors, as the firms' ability to create organizations, to have dynamic capabilities (Teece & Pisano, 1994), to interact frequently with public bodies (Karlsson, Tavssoli, 2015) and to select carefully the collaborations with them (Conti, Salone, 2012).

Concluding, all the empirical literature presented above confirms there are many elements affecting the firms' answer to innovative boosts and it is difficult to define in a secure way whether more targeted innovation policies would bring positive effects (European Commission, 2009; Schneider and Veugelers, 2010). They often depend by some structural characteristics of the involved firms and by the public intervention timing and way of insertion. It would be advisable to evaluate them carefully before the interventions implementation.

## 3. The Analysed Case

The analysed case regards 239 firms/SMEs located in the Canavese Technological District (Piedmont region, Italy) and specialized in innovative, high-tech, computer, telecommunication and high-precision mechanic sectors. They collaborate with the local large firm, the Olivetti S.p.A., but since the 1990s they have been affected by technological innovation and competitiveness gaps, due to the East Economies' entry into the international markets and to the Olivetti crisis (some Canavese zones were identified as "Objective 2 Area"[2]).

To correct this situation, the most important local public body, the Canavese Technological District Consortium (CTDC), delivered, over the 1999–2006 period, a set of free interventions oriented to support the firm technological innovation[3].They included the free use of some CTDC's equipment (laser, printing

[2] Declining industrial areas, with a percentage of jobs and an unemployment rate higher than the European average.

[3] The interventions were realized through 5 Centres of Competence, founded by the CTDC and specialized in different

machines, planning software technologies, micromachining engines, sensor devices, etc..) and the dispensation of consulting services by the Consortium's technicians. They were classified into 17 different types (Tab.1A - Technological interventions supplied by the CTDC) and they were provided in three different tranches, called "Projects" (Tab.2A - Interventions: types and frequencies for project):

- TS Canavese - Technology and Development in Canavese (July 1999-June 2001): it involved 118 local SMEs, which weren't very technologically advanced but which actively participated to the Consortium's initiatives, mostly choosing innovative collaborations, regarding laser applications in mechanical and micromachining activities (C), the use of Centres' analysis (D), feasibility studies (G), sensor functioning (L), cellular sheets analysis (P) and some innovative solutions in pressing activities (I). Unfortunately, these firms achieved satisfactory results only immediately, during the collaborations, but they lost them gradually, in the long run, because of their own low innovation level (Novero, 2011).
- PIA 01-02-03 Project: it was separated in 2 tranches, PIA01 (2003-2005) and PIA 02–03 (2004-2006), both oriented to support 92 local firms (among which 79 SMEs), working both in traditional (manufacturing of metal products/engines and construction of machinery) and in more innovative sectors (computer systems and processors, electric machines, communication equipment, software). These firms got positive results by the projects, because they didn't choose extremely innovative services.
- DIADI (1996-2006)[4] Project, which evolved over three editions. Here, it is analysed the third one, which was implemented over the 2004-2006 period and which involved 58 firms (33 SMEs). They were operating in innovative sectors and they required complex services, as feasibility studies of innovative projects. They produced good results, which strengthened the firms' innovation level.

The supply of all these projects was standardized: it included a first consulting phase, followed by some feasibility studies and by some eventual products modifications (in some cases the projects led to the invention of new patents).

## 4. The Methodology

This section discusses the methodology used to answer the research question and to individualize the firm' elements and interventions characteristics which can affect the success of supporting public actions. The investigation has been made through a descriptive analysis and two econometric frameworks, grounded on some Binary Probit models[5] (to understand the public interventions probability of success) and on some Regression models (which clarify the influence of some firm elements).

### *4.1. The Data*

The panel-data used in this script (Tab.1 - Analysed Variables) concern the balance-sheet figures and the characteristics of 166 Canavese firms/SMEs (they were included among the 239 units which took part to the CTDC interventions: unfortunately the legal forms of 73 SMEs didn't allow the collection of their balance-sheet information[6]) and some peculiarity of the interventions realized. The first group of data collected derive from the AIDA balance-sheets bank; the second from some interviews to the Consortium's technicians. The data-base covers a 10-year range (each firm was observed, on average, for a time span of five years, included

fields:

- laser applications, cellular sheets and pressing activities;
- micro and nano-systems, biotechnologies, nanotechnologies and laser workstations,
- mechanics and micromachining;
- chemical and biotechnology studies, auto components and quality analysis.

4 http://www.diadi.it.

5 Relative to shorter or longer time after the interventions

6 In Italy, the s.a.s., s.r.l. and individual firms aren't obliged to strike a public balance-sheet.

in the period from 1999 to 2008: it depends by the project). The sample size includes around 9,800 observations of the treatment variables. The total number of interventions carried out (513) is greater than the number of evaluated firms (239), because some of them decided to apply for more collaborations (Tab. 2A - Interventions: types and frequencies for project). The firm exports haven't been evaluated, because the involved SMEs didn't deal with foreign markets (too small size).

*Tab.1 : Analysed Variables*

| | |
|---|---|
| Age | Qualitative variable |
| Size | Dummy variable (1 when the observed unit is small, 0 if medium or large)[7] |
| Legal form | Dummy variable (1 when it is a S.p.A. , 0 otherwise) |
| ATECO Sector | Dummy variable (1 when the sector is innovative – activities 72.00.0/74.00.0 Italian ATECO 2002[8] classification - 0 otherwise) |
| Location | Dummy variable (1 if each firm is in an Objective 2 Area1, 0 otherwise) |
| Sales, Profit, Ebitda or Gross Operative Margin, Added Value, Personnel costs | Quantitative variable (€/year) |
| Employees | Quantitative variable (Number per year) |
| ROS, ROE, ROI, RO, ROT indexes | Quantitative variable |
| Proxy of Labor Productivity | Qantitative variable (sales divided labor costs) |
| Firm Technological Status | Qualitative variables (before and after the interventions), obtained by interviews to the firms' technicians and classified into 5 types, from 1 (cutting-edge firm), to 5 (outdated firm). |
| firms R&D level | Canavese SMEs do not usually carry out any R&D (they are family-run, they have a small size and many financial problems): their R&D propensity has been evaluated indirectly, considering their sector of activity (high or low Added Value) and the realization, after the first collaboration, of subsequent steps of interaction with the Consortium |
| Skilled employees | Indirectly evaluated considering the firms' sectors of activity, which can require higher or lower know-how/ competencies |
| Firms absorptive capacity | Evaluated considering the firms size/legal form, profit, labor productivity, the use of ICT and their openness and participation to innovative projects. |

7 In UE:

| Firms: | **Employees, less than:** | **Sales (ml.€), under:** |
|---|---|---|
| *Medium* | 250 | 50 |
| *Small* | 50 | 10 |
| *Micro* | 10 | 2 |

8 Cavallo *et al.*, 2002.

| | |
|---|---|
| Firm products differentiation | Estimated by the firms sales, profit, added value, operative development (Patterson *et al.*, 2009; Franco, 2012) and participation to innovation projects |
| Firms economies of scale | Indirectly verified by the firms' size, profit, labor productivity, projects realized and following new engagements (Porter, 1980; Banca D'Italia, 2012). |
| Firms market power (or quote) | Considered by their size and sales. |
| Firms affiliation to a concern and productive externalities | Evaluated considering the firms size, age, sales, profit, relations with the Consortium and level of new orders. |
| Firms clients and suppliers' power | Evaluated by the firms size, age, legal form, sales, profit, added value and product modifications. |
| Collaborations | Qualitative variable: interventions carried out[9] and their technological level[10] |
| Feasibility Study | Dummy variable: analysis subsequent to the first collaboration |
| Gained Results | Dummy variable |
| Productive Relapses / Utility | Dummy variable: intervention effects on production, |
| Successive projects | Dummy variable: studies after the first collaboration |
| New Orders | Dummy variable: new possible orders |
| Relationship with the Centre | Dummy variable: if the collaborations with the Centre last more years. |

*Source:* internal elaboration form database of CTDC

### *4.2. Descriptive analysis*

The descriptive analysis of the 239 firms data shows the CTDC interventions cause two typologies of effects:

- the former regards the short period after the interventions: it derives from a valuation of the firm balance-sheet data evolution (profit, sales, Ebidta, investments and employment) in the 2-3 years just after a collaboration. It shows 131 firms/SMEs (59%) have had a very good evolution in this years.
- the latter explains the service effects in a longer time (8 years): it derives by the comparison between the general Canavese evolution[11] and the economic performance of each involved firm. In this case, only 92 firms/SMEs (41%) have performed better than the Canavese area.

These results are strongly clarifying the intervention utility: there is an high probability that, during the years of collaboration with the Consortium, the firms gain positive results thanks to its support and to the free use of its equipment. On the contrary, the effects could be worse in the longer period, when the CTDC support stops: it seems only the firms which are able to internalize the knowledge transmitted during the interventions, keep the growing path autonomously.

[9] Discrete variables, corresponding to the cases in Table 1A.

[10] Displayed according to a three-level scale, i.e. high/medium/low.

[11] It has been summarized considering the Canavese growth, investments and employment indexes, identified by the Assindustria Canavese cyclical inquiry of the year 2009 - Tab.3A - Assindustria Canavese conjunctural indexes).

It is also important to notice as among the 239 analysed firms/SMEs, 55 units (23%) showed positive balance sheet results (sales, profit and Ebitda values) in the years preceding the interventions (although they are located in a depressed zone). They all belong to the 92 cases which pursed growing results in the longer period too. This underlines as a more solid previous status of the involved firms/SMEs represents a success element for positive results gained by innovative activities (in these cases, the interventions have had specifically positive results, probably because of the firms larger availability of funds and risk propensity).

Looking to the remaining 37 cases (firms which showed positive evolutions in the 8 years following the interventions, but which weren't characterized by solid data in the previous period), we can ascribe their growing performances to the continuity of the relationship with the Centres.

A general first conclusion can be drawn from these observations: it's highly probable to gain positive results through innovative projects made in collaboration with public bodies, in the short time (2-3 years), but, unfortunately, after this period, the firms, generally, start again to follow their previous recessive path, except in the cases they are solid and technologically advanced (and thus they are able to internalize new know-how), or they keep to collaborate, for a long time, with the Consortium, with feasibility studies or other research activities, which gradually improve their structure. **This gives an answer to the first research question of this script.**

Looking at the single projects, the difference between their effects in the short and long period is particularly high in the PIA02 case (Tab.4A - Intervention effects in short and long time: 29% of firms): most of the involved firms didn't show previous positive balance-sheet values, they weren't technologically advanced and they didn't ask the Consortium a technical support in the longer time. They asked the Consortium some interventions at a very high technological level, but they weren't able to keep on their positive effects autonomously and to absorb the know-how transmitted.

The percentage of units which got worse in the longer time is lower (11%) in the PIA01 project. Generally, its firms were more economically solid, they were more technologically developed and they asked for interventions at an "equilibrate" technological level, which changed gradually their productive process. Further, many PIA01 firms kept on the cooperation with the Consortium through the PIA02 participation and they gained positive results through this continuity.

The TS firms/SMEs belonged to less technologically advanced sectors (mechanical works: forging, drawing and pressing) and they weren't characterized by positive balance sheet values. Firstly, they required some technological services, but their too high level stopped their incentive to cooperate with the Consortium: only few units were able to maintain positive results.

On the contrary, the DIADI firms/SMEs belonged to high technological sectors, they were characterized by solid balance-sheet values and they asked for interventions at a high technological level, which inserted gradually in their productive processes. They all gained positive and growing results.

From this analysis a general rule can be derived: it regards the accordance between the technical level of the innovative interventions required and of the firms themselves and the timing and way of their insertion in the productive processes. If the technical level is homogeneous and the innovative variation are inserted gradually, then the probability the firms are able to internalize their results and to grow through innovative interventions is high.

### *4.3. The Probit Model*

In this framework, two Binary Probit models (González *et al*., 2005) have been applied to answer the first research questions pointed out in the introductive part: they show the most important firms' factors affecting the probability that innovative interventions have success (in term of economic growth of the involved enterprises). These models are usually used when the interest is in a regression-like relationship, because they explain the probability of success as a dependent binary variable ($Y_{i,t}$). They are oriented to specify a

relationship between this variable and a set of covariates, gathered in a vector ($X_{i,t}$) in a binary choice model (Greene, 1993).

The basic notion underlying this model is the existence of a *latent*, unobserved, variable, $Y_{i,t}$*, ranging from -∞ to +∞ and indicating the probability of success of the public innovative interventions. This *latent variable* is related to the set of qualitative and quantitative explanatory variables $X_{i,t}$ by the relationship [1]:

$$Yi,t^* = \alpha + X'i,t\ \beta + \xi \qquad [1]$$

Where:

$\alpha$ : unobserved and stochastic effects, independent from vector $X_{i,t}$ and from $\xi$,

$\beta$ : a set of parameters that reflect the impact on $Y_{i,t}$* of change in $X_{i,t}$ (they are estimated with the maximum likelihood method),

$\xi$ : a random error term, drawn from a standard Normal distribution.

The relation between the latent variable and $Y_{i,t}$ is:

$$Y_{i,t} = 1 \quad \text{if} \quad Y_{i,t}^* > 0 \qquad [2]$$

$$Y_{i,t} = 0 \quad \text{if} \quad Y_{i,t}^* < 0 \qquad [3]$$

Hence, the probability that $Y_{i,t} = 1$ is:

$$P\ (Y_{i,t} = 1 \mid X_{i,t}) = P\ (Y_{i,t}^* > 0 \mid X_{i,t}) = F(X_{i,t}, \beta) = \Phi\,(x'\beta) \qquad [4]$$

Where:

$F(X_{i,t},\beta)$: a continuous probability function, defined over the real line,

$\Phi\,(x'\beta)$: Standard Normal distribution.

The analysed binary, dependent variables ($Y_{i,t}$) are indicating if each public intervention have had success or not, in the longer or shorter period. To obtain these information, we have collected the balance sheets data (profit, sales, Ebidta, investments and employment) of 166 Canavese firms and we have compared each of them with the Canavese area economic evolution. The comparison regarded the relative variation (endogeneity problems are avoided) of the firms' data and of the Canavese indexes. It is expressed by two types of dummy ("Better/Worse" and "Impact Effect"), respectively relative to the longer or shorter period since the interventions and equal to 1 when the firms data performed better than the Canavese indexes, 0 otherwise.

### *4.3.1. Probit Model: longer time*

The first Probit model analyses the influence of different firms variables on the probability the Consortium's interventions have success in a time span of 8-10 years. The model identified is (Vd Tab. 2 - Canavese firms Probit model - longer time):

*Tab. 2: Canavese firms Probit model (longer time)*

| Better / Worse | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Project Dummy | 41.707 | 38.2425 | 1.09 | 0.075 | -33.2464 | 116.661 |
| Legal Form | 5.897 | 22.2427 | 0.27 | 0.791 | -37.6973 | 49.4924 |
| Employees | 0.313 | 0.00426 | 73.32 | 0.000*** | 0.3043 | 0.3211 |
| Sales | -5.91e-07 | 1.86e-08 | -31.76 | 0.000*** | -6.27e-07 | -5.54e-07 |
| Profit | -1.21e-06 | 5.85e-07 | -2.07 | 0.038* | -2.36e-06 | -6.68e-08 |
| Constant | -488.62 | 52.698 | 8.93 | 0.000*** | 385.26 | 502.58 |

Wald test $\chi$ 2 (5) = 35186.98 (p-value = 0.000)
Prob > $\chi$2 = 0.0000 Rho = 0.9999

Significant levels: * 90% ** 95% *** 99%
*Source*: Stata

This model is statistically pertinent to the data, it is perfectly balanced and it results very significant, although, unfortunately, the proportion of the total variance of the individual effects is high (0,99: it means that the pooled and the panel tests are very different) and some coefficients are not statistically significant: it could be affiliate to the dubiousness of some values of Y (which are not easy to certify because of the absence of balance sheet), or to the paucity of data. However they have been considered in this analysis to answer in a more complete way to the research question and to evaluate the signs of the coefficients.

The dummy independent variable "Better/Worse" represents the firm economic performance in the long time. The dependent variables are:

- the projects realized (Project Dummy): they have a large, positive effects on $Y_{i,t}$,
- some firm structural and balance-sheet variables:
  a. the Legal Form: it has a strong positive influence on the firms' performance. It can be explained by the frequent inter-firm contacts and economic solidity usually linked to larger firm.
  b. the Sales and Profit: they have little but negative impacts. It is surprising, but it is probably explainable by the increase of costs due to larger productions and by the low innovation and risk propensity of larger and richer firms.
  c. the Employees (a proxy of the firms size, which can be directly influenced by the Consortium's collaborations): it has a light, but positive impact on the firm performance: it could be explained both by the larger availability of (skilled) human resources and by the higher stability of larger firms.

It's important to point out how the Project Discrete variable, representing the number of interventions made in a firm in a same period, is absent in this model. It seems suggest that the effects following the realization of innovative interventions aren't incremental (the dummy variable underlines that one intervention is enough to start an economic evolution).

Similarly, also the ATECO variable is absent in this evaluation. However, when it is present (Tab.5A - Probit model (longer time),with ATECO Dummy), it explains the greatest part of significance, making the other variables quite not-influential: this underlines the firms sectors of activity have a role in the realization of positive effects by the Consortium's interventions[12].

[12] The decision to eliminate the ATECO variable in the Tab.2 - Canavese firms Probit model (longer time) - is justified by the desire to maintain other variables, which are more important in this analysis.

### *4.3.2. Probit Model: shorter time*

This model regards the probability of immediate positive impacts on the firms' data of the innovative collaborations, in the short time (2-3 years after the interventions - Tab. 3 - Canavese firms Probit model (shorter time):

*Tab. 3: Canavese firms Probit model (shorter time)*

| Impact Effect | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Projects Dummy | 1.717 | 0.350 | 4.90 | 0.000*** | 1.0299 | 2.4032 |
| Labour Productivity | 0.519 | 0.225 | 2.31 | 0.021* | 0.0781 | 0.9605 |
| Employees | 0.002 | 0.001 | 2.51 | 0.012* | 0.0001 | 0.0029 |
| Personnel Costs | -3.22e-08 | 1.56e-08 | -2.06 | 0.039* | -6.28e-08 | -1.59e-09 |
| ATECO Dummy | 1.925 | 0.660 | 2.92 | 0.004** | 0.6311 | 3.2184 |
| Canavese | 2.533 | 0.368 | 6.87 | 0.000*** | 1.8110 | 3.2557 |
| Small size | 1.567 | 0.334 | 4.69 | 0.000*** | 0.9126 | 2.2209 |
| Constant | 0.2343 | 0.001 | 0.0 | 0.000*** | 0.1264 | 0.3092 |

Wald test $\chi^2(7)$ = 139,51 (*p-value* = 0.000)
Prob > $\chi^2$ = 0.0000 Rho = 0.97

Significant levels: * 90% ** 95% *** 99%
*Source*: Stata

It explains well the data: the total variance for individual effects (0,97) shows that the pooled and the panel tests are different and the significance of the attended projects dummy (indicating the participation of the firm to the interventions) is total.

In this second model, the dependent variables are more connected to the firms' structure:

- Labor productivity: it is calculated by the sales/number of employees ratio and it has a low effect on the Impact Effect variable,
- Employees / Personnel costs
- ATECO dummy: it underlines the more advantageous situation of SMEs working in HT sectors;
- Location variable, which surprisingly highlights a positive influence of the Canavese area;
- Size variable, which shows the smaller firms could have, in the short period, better evolutions than the bigger.

The last three variables affect positively the intervention impacts, but they are pre-existent firms' characteristics: they can't be influenced by the Consortium's collaborations. The only figures of this model which could be improved by the Consortium's collaborations are the labor productivity, the employees and the personal costs, which maintain expected signs, indeed.

### *4.4. Regression Models*

Premised the results of the previous descriptive and Probit models, the regression models[10] have been used to detect the direct impact of the innovative interventions on some firms' variables (used from time to time as $Y_{it}$) and the indirect effect of the interventions on the influence each firms' variable has, from time to time, on the $Y_{it}$. All the impacts are evaluated through the coefficients of the variables relative to the different steps of the CDTC collaborations and of the other firms' variables, which could change their influence on $Y_{it}$ because of the allocation of innovative interventions.

The general framework is:

$$Y_{it} = X'_{it}\beta + z'_i\delta + \varepsilon_{it} \quad [5]$$

Where:

$Y_{it}$ : dependent variable, at time t;

$X'_{it}$ : transposed matrix of regressors, at time t;

$\beta$ : vector of coefficients;

$z'_i\delta$ : individual effect term ($z_i$ contains a constant term and a set of individual specific variables, that are taken to be constant over the time t)

$\varepsilon_{it}$ : i.i.d. error term, at time t (Greene, 1993).

If $z_i$ is unobserved and uncorrelated with $X_{it}$, then the model is a random-effect model[13] and it may be formulated as:

$$Y_{it} = X'_{it}\beta + \alpha + u_i + \varepsilon_{it} \quad [6]$$

Where:

$\alpha_i = z'_i\delta$, embodies all the observable and unobservable effects and specifies α as conditional mean;

$u_i$ = an individual specific random element, not correlated with $X_{it}$ .

The Regression models have used as independent variables the firms' Profit, Sales, Added Value and Labour Productivity.

### *4.4.1. Profit Regression Model*

The first random model evaluates the impact, on the firms' profit value, of public innovative interventions and of other firm variables, in presence of innovative interventions. The model is the following (Vd. Tab. 4 – Canavese firms Profit regression model):

*Tab. 4: Canavese firms Profit regression model*

| $Y_{it}$ = Profit | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Sales | -0.015 | 0.005 | -3.09 | 0.002** | -0.0255 | -0.0057 |
| Employees | 3489.9 | 1938.9 | 1.80 | 0.072* | -310.4 | 7290.2 |
| Firm Age | 119445 | 55159.7 | 2.17 | 0.030* | 11333.9 | 227556 |
| Firm Size[8] | 2886702 | 1320011 | 2.19 | 0.029* | 299527 | 5473877 |
| Prod. Modific | 6911715 | 2458750 | 2.81 | 0.005** | 2092653 | 1.17e+07 |
| Success. Dev. | 4813323 | 2458255 | 1.96 | 0.050* | -4769 | 9631414 |
| Produc. Relap | -3943767 | 727998.2 | -5.42 | 0.000*** | -5370618 | -2516917 |
| New Orders | -8984826 | 4424921 | -2.03 | 0.042* | -1.77e+07 | -312141.3 |
| Pot. Engagem. | 1.15e+07 | 5720998 | 2.01 | 0.044* | 303943.1 | 2.27e+07 |
| Constant | -1426989 | 1657068 | -0.86 | 0.389 | -4674782 | 1820804 |

Wald test $\chi$ 2 (9) = 63.79 (p-value = 0,000)
Prob > $\chi$2 = 0.0000 Rho = 0.98

[13] The distinction between fixed and random effect models is about the correlation of the unobserved individual effects with the regressive variables in the model: it is tested by the Hausman test (Hausman and Taylor, 1981).

Significant levels: * 90% ** 95% *** 99%
*Source*: Stata

It fits the data in a good way and it highlights the large effects of 3 balance-sheet figures (*employees, size* and *firm age*) on the dependent variable (it shows as the bigger and older firms tend to perform better, in profit terms, when an innovative activity is realized. It could be justified by their initial higher financial solidity, which, in theory, increases their availability to invest in innovative products and processes renovations). This result is partially contrasting with the Probit models, which show how, in the short time, the innovative advantage exist only for the small firms.

A surprising result is the slightly negative effect of the sales on the profit, in presence of innovative interventions: it probably could be ascribed to the higher production costs existing in the first phase of production of innovative goods/services).

Looking at the Project variables, it is noticeable the deep impacts of some dummy (*Product Modifications, Successive Developments, Productive Relapses, New Orders Foresight and Potential Engagements*): they represent direct consequences of the interventions realized and they have high significance in the model. It means that, in a longer time, a dynamic reaction of the firms/SMEs to the public collaborations (represented by product modifications and project successive developments) could have a deep positive weight on their profit value. It results sensible to concrete interventions and real transformations in the firms' production process descending by innovative solutions.

On the contrary, the *Productive Relapses* and the *New Orders* have negative effects on the firms' profit, when innovative collaborations are realized: it could be justified, again. by the new production costs they could imply.

The *ATECO* dummy variable is absent in this regression model: it is surprisingly pointing out the lower importance of the sector to which the firms belong (if more oriented to technological and general consulting/research services or to more traditional activities)[14].

Similarly, the simple projects variable (not dummy) is absent too: this indicates a higher number of interventions seems to have no effects on the firms profit value. On the contrary, the variables *products/processes modifications* and *successive developments* show how only the continuity of the Consortium collaborations has a positive impact on the firms profit value, because it changes/improves the shape of products.

Concluding, these regression results show the ambivalent effects of the Center interventions: they bring innovative solutions, but they can imply new costs, in terms of time and labor force. From this model and from the previous analysis, we can deduce the firm reaction is positive only if the innovative projects are made by several steps (more collaborations subsequent in the time) and if they don't imply very high costs and big radical changes/deep transformations on the firms' existing structures.

By looking at the influence of specific types of interventions (Tab.5 - Canavese firms Profit regression model with specific interventions) on the firms' structure and balance-sheet elements, the positive impact of laser use (Collaboration C) and the negative effect of the Radio Frequency Identification Module (Collaboration N) could underline, once again, as the more traditional and applicable technologies (like the laser one, used for cutting, welding and smoothing) are more appreciated by both manufacturing and high technological units (even if, in the case of RFid Module services, it is clear that, their immediate negative influence on the firms' profit could evolve in some advantages deriving by the realization of successive feasibility studies, linked to this technology).

These last models show the negative influence of the firms' highly developed technological status too: this could be explained by the large costs and incertitude which characterized their investments.

[14] When the Ateco dummy variable is considered, it has a high weight in the models, but it partially reduces the positive effects of size.

*Tab. 5: Canavese firms Profit regression model with specific interventions*

| **Dependent variable: $Profit_{i,t}$** | **Model [A]** | **Model [B]** |
|---|---|---|
| Employees | -6482.3 (1387.8) *** | -7961.2 (1371.2) *** |
| Sales | -0.05 (0.004) *** | -0.05 (0.004)*** |
| Ebitda | 1.07 (0.04) *** | 1.18 (0.04)*** |
| ROS | -491045.2 (111217.4) *** | -455172.6 (107656.1)*** |
| ROE | 202349.9 (31776.5) *** | 186918.2 (30890.6) *** |
| Collaboration C | 3295689 (1631651) * | |
| Collaboration N | | -6.92e+07 (1.10e+07)*** |
| Feasibility Study | | 5512028 (1747463)** |
| Technological Status | -3362366 (954603.1) *** | -2832023 (920767.6)*** |
| Productive Relapses | | -1932546 (635818.4)** |
| Intervention Technological Utility | -2493379 (836662.8) ** | |
| Relationships with the Centre | 4755833 (2515760)* | |
| Constant | 1.15e+07 (3.18)** | 1.06e+07 (3483456)** |

Collaboration C: Wald test $\chi$ 2 (9) = 961,1 (p-value = 0,000)
Collaboration N: Wald test: $\chi$ 2 (9) = 1056,49 (p-value = 0,000)

Significant levels: * 90% ** 95% *** 99%
*Source:* Stata

### *4.4.2. Sales Regression Model*

Looking at the Sales regression model[15] (Tab.6 - Sales regression model), it shows *Employees*, *Added Value* and *Size* variables are statistically highly significant: the first two features have a slight positive impact on the sales, while firms small dimension shows the little advantage of the larger firms.(this is in accordance with Probit models). The *Location* variable has a negative impact on the sales, because of the general decline of thee area, while the *Number of projects* made (Project Discrete variable) and their successive evolutions (*Feasibility Studies*, *Productive Relapses* and *New Orders*) have an attended positive influences on the firms' evolution (it is only partially reduced by *Reached Results* and by the costs created by variation and new elements in the production process).

The firms which seem to have a better reaction, in terms of sales increase, have a more advanced *Technological Status*, although, surprisingly, their appear damaged by the relationship with the Centres. The lesson learned by this model highlights the opportunity that larger and technologically developed firms improve their sales through public innovative interventions.

*Tab. 6: Sales regression model*

| Y = Ln Sales | Coef. | Std. Err. | Z | P>\|z\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Employees | 0.0002 | 0.00004 | 4.49 | 0.000*** | 0.00009 | 0.00025 |
| Ln Add.Value | 0.73 | 0.0347 | 20.88 | 0.000*** | 0.657 | 0.794 |
| Small | -0.32 | 0.0711 | -4.51 | 0.000*** | -0.459 | -0.1810 |
| Canavese | -0.23 | 0.1238 | -1.87 | 0.062* | -0.474 | 0.0115 |
| Projects Num. | 0.11 | 0.0551 | 1.97 | 0.048* | 0.0008 | 0.2166 |
| Feasibility St. | 0.3 | 0.1396 | 2.19 | 0.029* | 0.0318 | 0.5791 |

[15] It is expressed in the logarithmic form and it fits very well the data: the proportion of variance explained is high (0,9293) and the regression is significant.

| | | | | | | |
|---|---|---|---|---|---|---|
| Reached Res. | -0.38 | 0.1462 | -2.62 | 0.009** | -0.6701 | -0.0971 |
| Produc. Relap. | 0.078 | 0.0359 | 2.19 | 0.029* | 0.0081 | 0.1489 |
| New Orders | 0.246 | 0.1312 | 1.87 | 0.061* | -0.0113 | 0.5026 |
| Technol. Stat. | 0.112 | 0.0597 | 1.87 | 0.061* | -0.0051 | 0.2291 |
| Centre Relation | -0.267 | 0.0949 | -2.81 | 0.005** | -0.4527 | -0.0808 |
| Constant | 4.89 | 0.5667 | 8.62 | 0.000*** | 3.775 | 5.997 |

Wald test $\chi^2(11)$ = 1331,6 (*p-value* = 0,000)
Prob > $\chi^2$ = 0.0000 Rho = 0.99

Significant levels: * 90% ** 95% *** 99%
*Source:* Stata

Observing the Sales models which consider the firms' participation to specific Consortium's interventions (the ones which have significance are the H, I, E and P services, Tab.7 - Sales regression model with specific interventions), it is possible to notice as they don't modify greatly the impact, on the Sales variable, of most of the firms figures: the only exception is for the location variable, which disappears in the case of cellular sheet activities - Model D, collaboration P, Tab.7 - Sales regression model with specific interventions). Since these results we can conclude the more concrete services, with an higher technological level (support in pressing activities and cellular sheets planning) are more useful than consulting collaborations (products certifications and future cooperation with the Centres): they can support the firms' growth and countervail some negative effects of the firms' structural characteristics.

*Tab. 7: Sales regression model with specific interventions*

| Dependent variable:Log $Sales_{i,t}$ | Model [A] | Model [B] | Model [C] | Model [D] |
|---|---|---|---|---|
| Employees | 0.0002 (0.00004) *** | 0.0002 (0.00004)*** | 0.0002 (0.00004)*** | 0.0001 (0.00004)*** |
| Ln Added Value | 0.74 (0.03)*** | 0.73 (0.035)*** | 0.75 (0.034)*** | 0.75 (0.033)*** |
| Small | -0.32 (0.07)*** | -0.32 (0.07)*** | -0.31 (0.07)*** | -0.34 (0.07)*** |
| Canavese | -0.24 (0.12)* | -0.23 (0.123)* | -0.23 (0.12)* | |
| Collaboration H | 0.16 (0.07)* | | | |
| Collaboration I | | 0.31 (0.159) * | | |
| Collaboration E | | | 0.2 (0.12)* | |
| Collaboration P | | | | 0.61 (0.19)** |
| Feasib. Study | 0.32 (0.139)* | 0.35 (0.14) * | 0.31 (0.14)* | |
| Gained Results | -0.39 (0.146)** | -0.38 (0.145)** | -0.38 (0.14)** | |
| Tech. Status | 0.11 (0.059)* | 0.12 (0.06)** | 0.12 (0.06)* | 0.096 (0.06)* |
| Product. Relapses | 0.08 (0.036)* | 0.06 (0.036)* | 0.06 (0.036) | 0.06 (0.03)* |
| Centre Relation | -0.22 (0.083)** | -0.17 (0.08)* | -0.17 (0.079)* | -0.16 (0.07)* |
| New Orders | 0.26 (0.1306)* | 0.21 (0.13)* | 0.28 (0.13)* | 0.26 (0.13)* |
| Constant | 4.78 (0.57)*** | 4.85 (0.56)*** | 4.56 (0.56)*** | 4.46 (0.53)*** |

Collaboration H: Wald $\chi^2$ (11) = 1346.07 (*p-value* = 0,000)
Collaboration I: Wald $\chi^2$ (11) = 1364.73 (*p-value* = 0,000)
Collaboration E: Wald $\chi^2$ (11) = 1435.38 (*p-value* = 0,000)
Collaboration P: Wald $\chi^2$ (8) = 1416.97 (*p-value* = 0,000)

*Source:* Stata

### *4.4.3. Added Value Regression Model (218)*

This regression model (Tab.8 - Added Value model) shows the impact on the firms' Added Value[16] of the Consortium innovative collaborations and of some firms' figures (in presence of innovative interventions). The observed relationships result perfectly explainable in their signs (they are in accordance with the previous models), except two odd elements:

- the absence of variables referred to the firm age,
- the negative sign of the ATECO dummy variable (indicating the firms active in the more advanced sectors, create a lower added value: it is a surprising result but it is in line with the one of the Profit regression model. It could be justified considering that more technologically advanced firms usually require more complex collaborations, which need more time and resources to give back positive results.

*Tab.8: Added Value model*

| LnAddValue | Coef. | Std. Err. | Z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Employees | 0.00005 | 0.0000178 | 3.01 | 0.003** | 0.00001 | 0.0001 |
| LnPersCost | 0.928 | 0.0136952 | 67.77 | 0.000*** | 0.9012 | 0.9549 |
| Lab.Produc | 0.095 | 0.0054621 | 17.48 | 0.000*** | 0.0847 | 0.1061 |
| ATECO Dummy | -0.169 | 0.0919025 | -1.84 | 0.066* | -0.3493 | 0.0109 |
| Canavese | -0.139 | 0.0432935 | -3.22 | 0.001** | -0.2244 | -0.0547 |
| Reached Results | 0.082 | 0.0355994 | 2.31 | 0.021* | 0.0123 | 0.1519 |
| Engagement | 0.186 | 0.0928761 | 2.01 | 0.045* | 0.0043 | 0.3684 |
| Constant | 1.29 | 0.2034612 | 6.38 | 0.000*** | 0.9000 | 1.698 |

Wald test $\chi^2(7)$ = 7519,76 (*p-value* = 0.0000)
Prob > $\chi^2$ = 0.0000 Rho = 0.99

Significant levels: * 90% ** 95% *** 99%
*Source:* Stata

### *4.4.4. Labour Productivity Regression Model*

The last model (Tab.9 - Labour Productivity model) appears very significant, although it explains a very low proportion of variance, and it indicates again relationships in accordance with the previous results: labour productivity is higher in the more traditional small firms, which don't change a lot their internal structure (it is indicated by the negative signs of *Size, Ateco Dummy* and *Productive Relapses*). It is easily explainable considering the difficulties linked to innovative changes in the production processes.

*Tab.9: Labour Productivity model*

| Labour Prod. | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Employees | 0.0005 | 0.0001 | 3.75 | 0.000*** | 0.00023 | 0.00070 |
| Ln PersCost | -0.750 | 0.1126 | -6.67 | 0.000*** | -0.97119 | -0.52992 |
| Ateco Dummy | -1.267 | 0.6298 | -2.01 | 0.044* | -2.50107 | -0.03232 |
| Size | -0.824 | 0.3081 | -2.68 | 0.007** | -1.42833 | -0.22067 |
| Product. Modif. | -0.761 | 0.3404 | -2.24 | 0.025* | -1.42877 | -0.09427 |
| Success. Devel. | 0.647 | 0.3396 | 1.90 | 0.057* | -0.01885 | 1.31238 |
| Product. Relap. | -0.189 | 0.1026 | -1.85 | 0.065* | -0.39072 | 0.01152 |
| Engagement | -3.266 | 0.6309 | -5.18 | 0.000*** | -4.50277 | -2.02933 |
| Constant | 13.16 | 1.7063 | 7.71 | 0.000*** | 9.81715 | 16.5057 |

[16] It has been considered in logarithmic version

Wald test $\chi^2(8)$ = 98,27 (*p-value* = 0.000)
Prob > $\chi^2$ = 0.0000 Rho = 0.99

Significant levels: * 90% ** 95% *** 99%
*Source:* Stata

## 5. Conclusions

The purpose of this article is to select some elements useful to previously verify the firms' receptivity to innovative impulses and then their capacity to overcome successfully the crisis recessive effects through public interventions. The investigation has identified a general rule: in the short time (2-3 years after the intervention) it's highly probable that innovative collaborations among SMEs or firms and public research bodies have a positive impact on the firms' economic performances.

On the contrary, the results in the longer period are more ambiguous: usually, the firms start again to follow their previous regressive path, except in the cases they are already technologically advanced and/or economically strong (if they have positive and stable balance-sheet values, they are able to tolerate exceptional costs to internalize the know-how transmitted by the interventions and to insert it in new productions).

If the SMEs/firms haven't these characteristics, the only "winning solution" is they keep on the collaborations with the research centres, through subsequent different interventions, gradually changing their productive structure. Here, it is important to underline that the interventions should last in the time: more collaborations realized by a firm in the same time have lower effects, on it, than subsequent interventions, probably because its difficulties to internalize the obtained results (because of its previously undeveloped technological status and its scarce economic resources).

On the contrary, continuous collaborations, if carefully monitored, could bring innovative solutions and the firms' internal renovation. They should suggest incremental innovations and concrete high-tech solutions, rather than consulting services; they should avoid new costs and radical transformations of the firms production structure; they should be in accordance with the firms technical level, to facilitate their internalization.

The whole of the previous elements offers a solid ground for the choice of innovative interventions to realize in a specific area and of the firms which should be involved.

It underlines the centrality of the timing/way of insertion of the implemented interventions and of the interventions and firms characteristics: they should have a relatively large size, a dynamic structure and an advanced technological status; they should be characterized by solid balance sheet values in the period before public interventions, they should be available to innovative transformations and they should insert incremental high-tech innovations, avoiding new costs and in accordance with the firms technical level.

This rule can be a valid instrument to overcome the crisis recessive effects and it gives new confirmations to some of the previous literature findings, which highlighted the importance of some specific elements of the firms structure and some difficulties in defining, in an unilateral way, whether more targeted innovation policies would have brought positive effects.

It shows it is possible to partially overcome recessive periods through public innovative collaborations, if the involved firms and the innovative interventions are carefully selected: if the over-quoted conditions are absent, the innovative impulses given to the firms could have null or negative results, with a waste of the invested public funds.

## 6. Acknowledgements

The author wishes to thank the Director of Ceris (Turin, Italy) for his precious suggestions and the staffs of Ceris-CNR and of Università Cattolica del Sacro Cuore (Milan, Italy) for their precious comments advices.

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## ATTACHED TABLES

*Tabella A1: Technological interventions supplied by the CTDC*

| | | | |
|---|---|---|---|
| A | A1 | Planning of mechanical components | 1 |
| | A2 | Planning of software and electric components | 12 |
| | A3 | Others planning | 2 |
| B | Metallographic analysis | | 8 |
| C | Laser use for welding, piercing, cutting and micro-processes | | 90 |
| D | Analysis and projects advices | | 70 |
| E | Certifying products | | 13 |
| F | Utilization of laboratories and services of the Centres | | 29 |
| G | Feasibility studies | | 27 |
| H | Future collaborations | | 37 |
| I | Pressing activities | | 20 |
| L | Sensors functioning | | 0 |
| M | Wireless communication systems | | 3 |
| N | RFId (Radio Frequency Identification) | | 11 |
| P | Cellular sheets | | 10 |
| Q | Micro-pumps on silicon | | 2 |
| R | Control systems | | 7 |
| S | Software simulators | | 5 |
| T | Materials analysis | | 6 |

Source: Canavese Technological District Consortium, 2008

*Tabella A2: Interventions: types and frequencies for project*

| Collaborations | TS FIRMS | PIA01 FIRMS | PIA02 FIRMS | DIADI FIRMS |
|---|---|---|---|---|
| A1 | | 1 | | |
| A2 | 5 | 3 | 6 | 2 |
| A3 | | | 4 | |
| B | 6 | 4 | 2 | 1 |
| C | 67 | 25 | 10 | 24 |
| D | 39 | 25 | 24 | 8 |
| E | | 11 | 9 | |
| F | 12 | 9 | 14 | 6 |
| G | 16 | 12 | 9 | 3 |
| H | 4 | 20 | 6 | 26 |
| I | 23 | | 2 | 5 |
| L | 13 | | | 4 |
| M | 1 | | | 2 |
| N | | | | 9 |
| P | 12 | | | |
| Q | 2 | | | |
| R | 9 | | | 2 |
| S | 3 | | | |
| T | 13 | | | |

Source: Canavese Technological District Consortium, 2008

*Tabella A3: Assindustria Canavese conjunctural indexes*

| | **CANAVESE INDEXES** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
| Employment | 12.70 | -0.73 | -10.15 | 0.28 | 0.82 | -1.75 | 7.34 | 8.86 |
| Production | 15.38 | -10.5 | -10.5 | 1.67 | 1.42 | 4.11 | 17.64 | 18.75 |
| Investments | 75.13 | 65.58 | 58.95 | 53.37 | | | | |
| Total Orders | | | | 2.58 | 5.60 | 3.23 | 16,08 | 19.38 |
| Foreign Orders | | | | 5.30 | 2.01 | 8.13 | 12.04 | 15.24 |

Source: Assindustria Canavese, 2009

*Tabella A4: Intervention effects in short and long time*

| | **Intervention impact effect (2-3 years following the collaborations)** | | | **Comparison with Canavese area in the following 8 years** | | |
|---|---|---|---|---|---|---|
| | **Variation** | | | **Variation** | | |
| **Projects** | Better | Worse | Not class. | Better | Worse | Not class. |
| **TS – 15%** | 59 | 21 | 38 | 41 | 39 | 38 |
| % Tot. | **50.0%** | **17.8%** | **32.2%** | **34.7%** | **33.1%** | **32.2%** |
| % Better/Worse | 73.8% | 26.3% | | 51.3% | 48.8% | |
| **PIA01 – 11%** | 29 | 12 | 20 | 22 | 18 | 21 |
| % Tot. | **47.5%** | **19.7%** | **32.8%** | **36.1%** | **29.5%** | **34.4%** |
| % Better/Worse | 70.7% | 29.3% | | 55.0% | 45.0% | |
| **PIA02 – 29%** | 15 | 3 | 13 | 8 | 10 | 13 |
| % Tot. | **62.5%** | **12.5%** | **54.2%** | **33.3%** | **41.7%** | **54.2%** |
| % Better/Worse | 83.3% | 16.7% | | 44.4% | 55.6% | |
| **DIADI – 7.8%** | 28 | 14 | 23 | 21 | 21 | 23 |
| % Tot. | **43.1%** | **21.5%** | **35.4%** | **32.3%** | **32.3%** | **35.4%** |
| % Better/Worse | 66.7% | 33.3% | | 50% | 50% | |
| **TOT.** | **131** | **50** | **94** | **92** | **88** | **95** |
| % Tot. | 47.6% | 18.2% | 34.2% | 33.4% | 32.1% | 34.5% |
| % Better/Worse | 72.4% | 27.6% | | 51.1% | 48.9% | |

Source: Internal elaboration

*Tabella A5: Probit model (longer time),with ATECO Dummy*

Log likelihood = -323.78
Wald $\chi 2$ (4) = 25374.95 (p-value = 0.000)
Prob > $\chi 2$ = 0.0000 Rho = 0.93

| Better / Worse | Coef. | Std. Err. | z | P>\|z\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Ateco dummy | 4.215 | 0.337 | 12.49 | 0.000*** | 3.5531 | 4.8765 |
| Employees | 0.0006 | 0.0005 | 1.15 | 0.251 | -0.0004 | 0.0016 |
| Sales | -5.91e-10 | 1.96e-09 | -0.30 | 0.763 | -4.43e-09 | 3.25e-09 |
| Profit | 6.04e-09 | 1.24e-08 | 0.49 | 0.626 | -1.83e-08 | 3.03e-08 |
| Product. Rel | 2.0062 | 0.256 | 8.36 | 0.000*** | 1.923.849 | 3.544.356 |
| Constant | -4.499 | 3.526 | 2.43 | 0.000*** | -5.026 | -3.852 |
| logged variance individual effects | 2.7189 | 0.0004 | 1.954 | 3.025 | | |
| Individual effects standard deviation | 3.8940 | 0.6978 | | | 2.589 | 4.561 |

Source: Stata

Significant levels: * 90% ** 95% *** 99%

## Sommario

Le difficoltà odierne derivanti dalla crisi economica mondiale hanno condotto numerosi governi europei a sostenere alcune PMI nazionali con interventi innovativi, orientati al loro sviluppo. I loro risultati appaiono spesso ambigui: essi risultano ampiamente influenzati non solo dalle tipologie di interventi realizzati, ma anche da alcune preesistenti caratteristiche (strutturali e di business) delle stesse imprese coinvolte. La considerazione di tali elementi (che risultano differenti nel breve e lungo termine) dovrebbe essere ampliamente valutata in fase di erogazione di servizi innovativi, al fine di incrementare le probabilità del loro successo e dello sviluppo delle imprese stesse.