Associazione per lo Sviluppo della Valutazione
e l'Analisi delle Politiche Pubbliche
(ASVAPP)

COUNTERFACTUAL IMPACT EVALUATION OF COHESION POLICY: IMPACT AND COST-EFFECTIVENESS OF INVESTMENT SUBSIDIES IN ITALY

Final Report to DG Regional Policy
"Counterfactual Impact Evaluation of Cohesion Policy.
Work Package 1: Examples from Enterprise Support"
Contract n° 2010.CE.16.B.AT.042

JUNE 2012

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ACKNOWLEDGMENTS

This document contains the final report for Work Package 1 of the Counterfactual Impact Evaluation of Cohesion Policy, submitted by the Associazione per lo Sviluppo della Valutazione e l'Analisi delle Politiche Pubbliche (ASVAPP) under contract with DG Regio. n° 2010.CE.16.B.AT.042.

Several people contributed to this project. We first would like to thank Sergio Gison of the Italian Ministry of Economic Development for the invaluable help in extracting the data from the law 488 unwieldy archives. We are grateful to Enrico Rettore, Dirk Czarnitzki, Manlio Calzaroni and Daniel Mouqué for encouragement, suggestions and advice. The Italian Statistics Agency (ISTAT) entered a joint research agreement with DG Regio to be a partner in this project. Under the supervision of Manlio Calzaroni, Monica Consalvi, Alessandra Fiore, Roberto Palumbo and Marco Ventura merged the law 488 and the SME Piemonte beneficiary data with ASIA data on employment and gross sales, and investment from balance sheet data.

The analysis work has taken place under the overall direction of Alberto Martini. Daniele Bondonio, the principal investigator for the project, provided guidance to the data processing and conducted the impact analysis of the 488 and SME Piemonte data, coordinating the work of Francesca Anglois, Gianluca Strada and Nicoletta Torchio. The writing of this report has been a joint effort of Alberto Martini and Daniele Bondonio.

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EXECUTIVE SUMMARY

A. MOTIVATION AND DESIGN OF THE STUDY

Lack of evidence. Despite billions spent every year by EU Member States to subsidize the investment of private enterprises, *there are very few rigorous evaluations assessing their impact* on investment decisions and on the performance of the subsidized firms. To date, most of the evaluations of these programmes have been descriptive in nature and driven by the need to be accountable for visible results. Such aggregate figures are of limited use for policy design because they do not establish any plausible causal link between the receipt of specific subsidies and the results claimed. The purpose of this study is to conduct a rigorous evaluation of the impact of grants and loans co-financed by Cohesion Policy in Italy. State of the art counterfactual non-experimental methods have been applied to estimate the impact on employment creation, growth in sales, level of investment and changes in labour productivity and average payroll costs.

Adopting counterfactual methods. Impact evaluation using comparison groups is an appropriate tool to answer the question "which are the effects on firm performance from obtaining an investment subsidy?" and more specific questions such as "which type of policy instruments are more effective in subsidizing which type of firms?" Answering these questions is neither easy nor cheap. To identify the (causal) effect of a subsidy one must compare the changes *observed* among supported enterprises (changes in a given indicator over a given period), with the changes that would have been observed in the *same time* period for the *same* firms, *had they not* received the support. This hypothetical change, not observable by definition, is labelled "*counterfactual*". The counterfactual change must be recovered from data pertaining to other enterprises that, while not receiving the subsidy, are similar enough to credibly *reproduce what would have happened* to the subsidized firms *in absence of the subsidy*.

The policies considered. We evaluate *enterprise support policies* at two distinct geographic levels. At the *national level* we focus on "Law 488/92", a large-scale very generous programme targeting industrial firms: it supported investments in physical capital through generous non-repayable grants assigned through open competitions implemented on a regional basis. We examine the impact of the competitions that took place between 2000 and 2004.

At the regional level we focus on a single Italian region, Piemonte (a NUTS 2 region of 4.5 million people in Northern Italy), for which we were able to build a unique database on the entire spectrum of 25 different investment support measures available to SMEs (introduced by separate regional and national laws as well as by the 2000-06 Objective 2 Unified Programming Document). The investments were subsidized between 2005 and 2009. We will refer to the set of such support measures as "SME-Piemonte".

Law 488 and SME-Piemonte differ along many dimensions, most notably in terms of average size of the subsidy. Law 488 made grants worth on average over *€400,000*, and there were no limits to eligibility for large firms nor for small firms: 50% of 488 recipients were micro enterprises of less than 10 employees). By contrast, the set of subsidies to SME in Piemonte excluded large firms and were predominantly tied to repayable subsidies (in the form of soft loans and subsidies to reduce the costs

for interest payments of loans awarded by private banks–the latter often referred to as "interest rate subsidies"). The average economic value of the support to a single SME in Piemonte was of the order of *€10,000*.

Data sources. The data come from several sources: while data on *beneficiary enterprises* are routinely collected by *monitoring systems*, data on *outcomes for all enterprises* must exist independently of the policy being evaluated. The latter in our case is the Statistical Archive of Active Enterprises (ASIA) assembled by the Italian Statistical Agency (ISTAT) by merging several administrative data sources. The availability of ASIA allows this study to go a step further with respect to previous studies of Law 488, which were forced to use commercially available data archives, typically limited to corporations. Moreover, a beneficiary survey was administered to about 1,000 firms, 500 drawn from the SME population of Piemonte, and about 400 from Law 488 recipients and rejected applicants. The main goal of the survey was gathering information on additionality (or deadweight) in the investment decisions, as perceived by the managers or by the owners of the beneficiary firms.

Impacts and cost-effectiveness. The econometric estimates of impact represent the difference between the average growth in employment (or sales, or investment) observed among beneficiary firms and the average growth in the same measures observed among a subset of non-beneficiary firms-chosen to represent in the best possible way what would have happened to the beneficiaries had they not received the subsidy. Making beneficiaries *as comparable as possible to non-beneficiaries* involves some complex estimation models: some of them are dealt in an intuitive way in the body of this report, while a more rigorous description of the entire spectrum is offered in the Technical Annex.

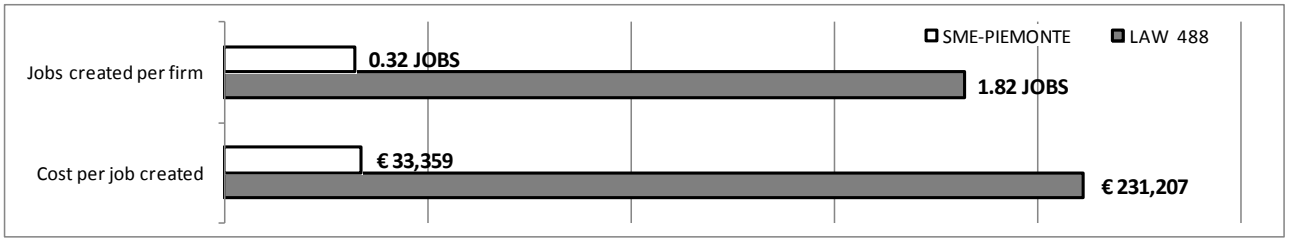
In addition to the impact estimates, we compute the *cost of obtaining such impact*, by using the information on the actual amount of the subsidy. In the case of employment, we calculate the *average cost of an additional job created thanks to the subsidy.* In the case of outcome expressed in monetary terms, we compute the average cost to obtain one extra euro of sales, or one extra euro of investment. These measures, because of their simplicity, are more appealing to policy-makers (and to the taxpayer), since they convey a more intuitive notion of "success" of a programme than the traditional impact estimates.

B. AVERAGE IMPACTS AND COST-EFFECTIVENESS ACROSS ALL RECIPIENTS

The top two horizontal bars in Figure ES1, ES2 and ES3 represent estimates of the ***average impact*** of each type of subsidy on employment, sales and investment. The bottom two bars contain the results of the simple, yet very informative, cost-effectiveness calculation.

Employment. Figure ES1 shows that *Law 488 creates almost 2 jobs per subsidized firm, while the SMEs only 1/3 of a job per subsidized firm.* If we were to take such impacts at face value, we would incorrectly conclude that the grants made under Law 488 were *more effective* than the small scale support given to SMEs in Piemonte. Such conclusion is completely reversed when costs of the subsidy are taken into account. It costs on average about € 33,000 to create a job with the mix of measures activated in Piemonte, while it takes on average over € 230,000 to do so with the non-repayable grants of Law 488.

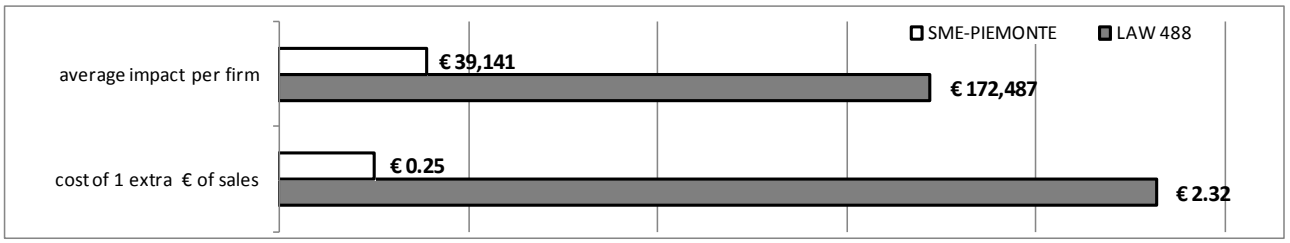
Figure ES1. Average impacts on employment and related cost-effectiveness



Comparison with monitoring data. In the case of Law 488, a useful comparison can be performed with the number of jobs to be created and declared in the grant application. These tend to be large figures, because in the 488 procedure, the higher the employment/investment ratio declared in the application, the higher the score the project received. Therefore, firms had the incentive to declare large figures for the number of new jobs to be created, in order to improve the probability of receiving the subsidy. If the jobs created *thanks* to the investments had been those promised in the grant application, we would have 82,000 new jobs, instead we estimate that only about 12,000 jobs were created. Jobs reported by the employers reflect actual hiring practices, but that does not prove at all that these jobs were created because of subsidy. According to our calculation, only a small fraction of those promised were actually additional jobs

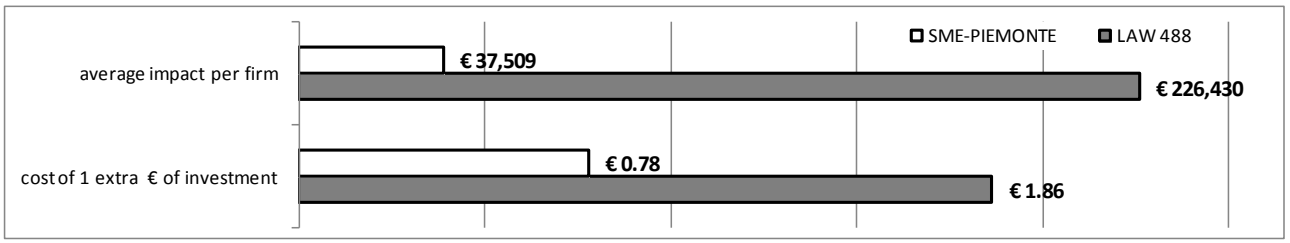
Sales. If taken by themselves, the impact figures for sales are misleading, as shown in Figure ES2: the top two bars show that the presence of the subsidy generates about €40,000 extra sales on average among SME, while the increase is over €170,000 for 488 beneficiaries. However, the 488 result is obtained at a very high cost: it takes only *25 cents* of subsidy to generate one additional euro of sales among SME, while it takes more than *2 euro* with Law 488 subsidies, almost 10 times as much.

Figure ES2. Average impacts on sales and related cost-effectiveness



Investment. Less extreme differences between groups are observed for investment, shown in Figure ES3. The average impact per firm is much larger for 488 grants than for the mix of support for the SMEs in Piemonte. Considering costs reverses the inequality: it takes more than twice as much public expenditure to increase private investment for Law 488 than for the interventions in support of SMEs.

Figure ES3. Average impacts on investment and related cost-effectiveness



C. HOW IMPACTS VARY ACROSS ENTERPRISES AND POLICY INSTRUMENTS

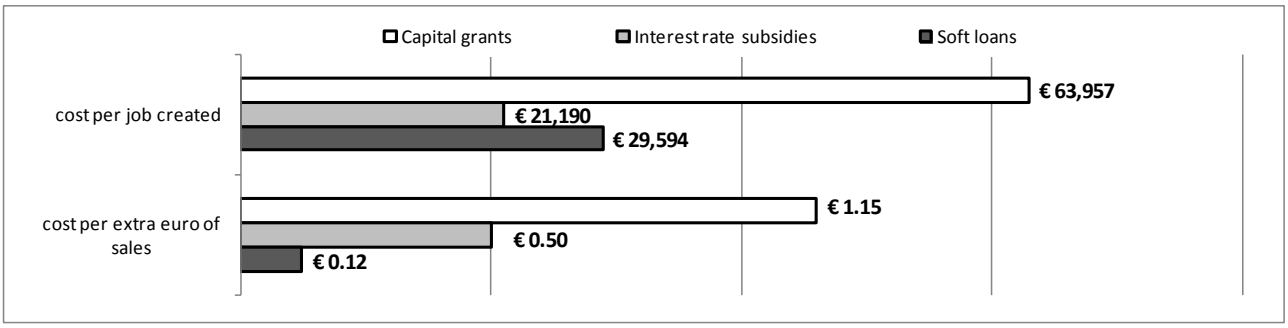
The information on how impacts vary across different types of firms or policy tools can be crucially important in order to target the intervention on the basis of *evidence of differential cost-effectiveness*, not just guesswork.

How impacts vary by policy instrument. A common policy question concerns the *relative effectiveness* of different instruments: is it more cost-effective to offer investment support through non-repayable capital grants or through either soft loans or subsidies offered to offset a fixed percentage of the firms interest-rate costs related to loans from private sector financial institutions ("*interest rate subsidies*")? In order to properly address this question it is important to take into account the actual cost to the public of the different instruments and to "hold constant" the economic value of the subsidy. This is done by computing the Gross Grant Equivalent (GGE) subsidy paid to the assisted firms and by focusing on the differential impacts of the subsidies given to the SMEs in Piemonte. The additional

costs due the possible defaults of the supported firms or the higher administrative burden of the soft loans and interest rate subsidies were also taken into account in the analysis through corrections the GGE figures by means of appropriate standardized coefficients.

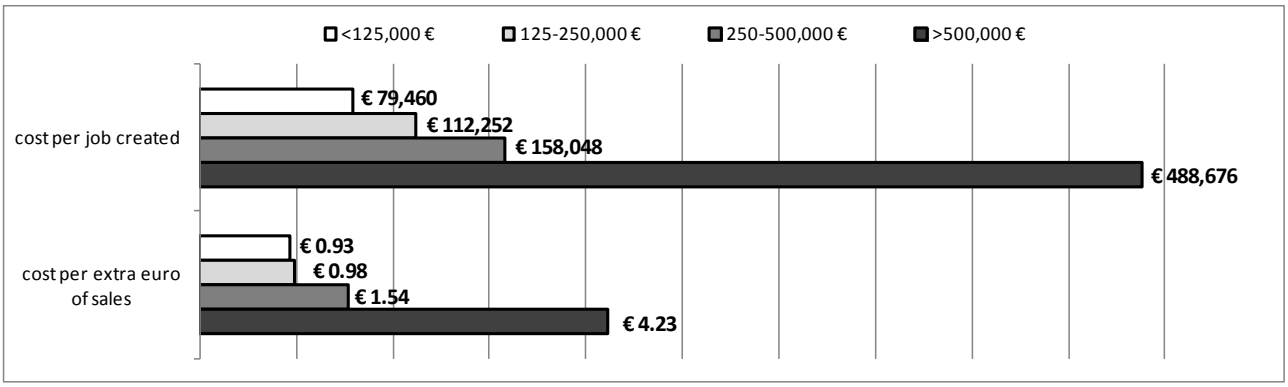
The results shown in figure ES4 strongly suggest that *soft loans* and *interest rate subsidies* are more cost-effective in creating employment and promoting additional sales than non-repayable capital grants. For investment outcomes, results are also somehow suggestive of a better cost-effectiveness for repayable subsidies. Due to the fact that investment data are only available for corporate SMEs, however, the small sample size of the analysis makes the differences in the impacts not statistically significant.

Figure ES4. The impact of different types of subsidies for SME-Piemonte



How impacts vary by the economic value of the grant. The analysis examines whether the impact varies significantly with the *economic value of the grant*, which is relevant mostly for Law 488, because of its generosity and the great variability of the grants awarded. We divided 488 grants in four groups, following the thresholds of the quartiles of the distribution, roughly equivalent to 125,000, 250,000 and 500,000 euro as cut-offs. The following figure summarizes the result for the impact on employment by size of the grant.

Figure ES5. The impact of Law 488 grants, by the economic value of the grant



The cost per job created increases steadily with the size of the grants up to the threshold of the fourth quartile (about €500,000) with a cost of about €79,000 for the smaller 488 grants and about €158,000 for the grants between €250,000 and €500,000. For the largest grants (above 500,000) the cost per job created increases dramatically, reaching nearly half a million euro. Sales impact estimates display a pattern very similar to employment (with a cost for each extra euro of sales generated by the grants ranging from €0.93 to €4.23). Investment impact estimates do not yield conclusive findings because balance sheet data were available only for corporate firms, sharply decreasing the sample size of the analysis.

How impacts vary by firm size. Under Law 488, impacts were consistent and significant for micro firms, small firms and medium firms, but not for large firms where impacts were insignificant or negative (see table). An interesting finding is that for each of the variables examined (employment, sales and

investment) impacts were similar across the first three size classes – it is only for large firms that the impact disappears.

Table ES6. The impact on employment of 488 grants by size of the assisted firms

	Micro firms 1-9 employees		Small firms 10-49 employees		Medium firms 50-249 employees		Large firms 250+ employees	
EMPLOYMENT								
Average impact	1.61	***	1.89	***	2.80	***	-2.34	***
Cost per job created	€ 230,700		€ 211,098		€ 235,590		-	
No. of firms used in the analysis	3,049		2,419		670		51	
SALES								
Average impact	€ 94,346	**	€ 266,299		€ 162,913	**	€ 211,292	**
Cost per extra euro of sales	€ 3.64		€ 1.48		€ 3.81		€ 4.00	
No. of firms used in the analysis	2,788		2,373		603		26	
INVESTMENT								
Average impact	€ 219,809	**	€ 221,004	**	€ 374,243	*	€ -2,950,862	
Cost per extra euro of investment	€ 1.60		€ 1.78		€ 1.47		-	
No. of firms used in the analysis	564		1384		506		20	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Even when restricting the analysis to Law 488 *grants worth more than half a million euro*, this finding attenuates somewhat, but is still detectable.

Table ES7. The impact of 488 grants by firm size for grants >€ 500,000[1]

	Micro firms 1-9 employees		Small firms 10-49 employees		Medium firms 50-249 employees		Large firms 250+ employees	
EMPLOYMENT [(a)]								
Average impact	3.82	***	2.68	***	3.24	***	-16.02	***
Cost per job created	€ 385,923		€ 403,778		€ 450,679		-	
No. of firms used in the analysis	437		512		240		33	
SALES [(a)]								
Average impact	€ 409,840		€ 534,018	**	€ -300,723		€ -3,593,431	
Cost per extra euro of sales	-		€ 2.01		-		-	
No. of firms used in the analysis	370		498		208		10	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Large firms, display (consistently throughout the different models used in the analysis) either negative impact estimates or impacts that are not statistically different from zero[2]. These findings lend support to the contention that public money should be spent on supporting enterprises that face some market failure, such as difficulties in getting access to credit.

How impacts vary by North-South location and between manufacturing and services. The data on the 488 grants are ideal to empirically test whether or not a generous capital grant programme yields different impacts across areas of different degrees of socio-economic distress. The 488 incentives

[1] Due to sample size limitations, the results for investment do not reach statistical significance in any size class. For the sake of brevity they omitted from the present report.
[2] Due to the small sample of corporate firms for which the balance sheet data were available, the investment estimates were retrievable only considering grants of all economic values (without restricting the analysis solely to the subsidies above 500,000€)

cover both Southern Italy, which is a former Objective 1 area with quite severe socio-economic distress, and Northern-Central Italy which has a more developed economy. The results of the analysis show that for micro and small firms employment impacts are not statistically different between Northern-Central and Southern Italy. For medium and large firms, instead, employment impacts are either negative or not statistically different from zero in Southern Italy, while they are positive in Northern-Central Italy. For sales, the cost of generating each additional euro of sales is 2.5 and 4.5 times higher in Southern Italy than in Northern-Central Italy for all sizes of the assisted firms. For investment outcomes, finally, the differential cost of generating each additional euro of investment between Northern-Central and Southern Italy is either not statistically different or slightly higher in Northern-Central Italy.

The quality of the jobs created. In Italy, as well as in most EU Member States, it is almost impossible to work with social security worker-level data merged with firm-level data. Such information would make it possible to examine the quality of the jobs generated by the incentives. Lacking such data, some indirect evidence can be gathered by estimating the programme impacts on average payroll costs and labour productivity observed at firm level.

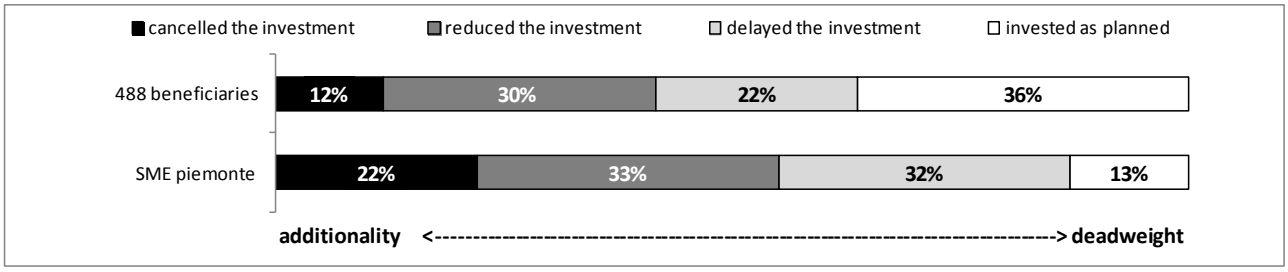
The analysis shows that the average effect of the subsidies on the firms average (per-employee) yearly payroll costs as well as on labour productivity is not significantly different from zero. However, the soft loans and interest rate subsidies part of the SME-Piemonte measures have a moderate positive impact on productivity. This suggests that the jobs created are not low quality – and in the case of financial engineering measures in Piemonte are likely to be of above average quality.

D. FINDINGS FROM THE BENEFICIARY SURVEY

The issue of additionality is often dealt with a beneficiary survey, aimed at obtaining directly from the assisted entrepreneurs or managers their opinion on whether their enterprise was induced to carry-on the investment by the existence of the subsidy, or it would have invested anyway. This can be done by questionnaires that ask the managers of the enterprises about their motives for requesting the subsidy. The entrepreneurs or managers are asked whether their enterprise was induced to carry-on the investment by the existence of the subsidy, or they would have invested anyway.

The main results from the beneficiary survey we ran are summarized in the following figures

Figure ES1. Answers to the question "what would have happened without the subsidy?"



For Law 488, only 12% of beneficiaries report full additionality (i.e. the beneficiaries would not have invested without the grants), while three times as many (36%) report zero additionality (i.e. they would have invested anyway even without the grants). Over half chose the intermediate answers. Even less polarized are the answers given by the SMEs in Piemonte, of which 22% report full additionality; 65% report that they would have either reduced the investment or that they would have delayed it; 13% report zero additionality (i.e. they would have invested anyway).

A classic evaluation strategy has been to estimate net impacts by multiplying monitoring figures by additionality coefficient deduced from the beneficiary survey. In the case of Law 488, for example, the monitoring figures of 82,000 jobs created cannot be reconciled with the econometric evidence of

12,000 jobs. Even a creative use of the additionality figures still suggests a net job creation between 28,000 and 44,000 jobs, way above the econometric evidence of 12,000.

While the impact estimates obtained from the econometric model are fairly robust (even changing the specification of the model), the beneficiary survey is far more subjective, including the matter of how we subjectively interpret the responses to the question "what would have happen to the project with no funding". Unfortunately, asking respondents during an interview to perform a mental counterfactual analysis is bound to produce scarcely interpretable quantities.

E. THE MAJOR POLICY IMPLICATIONS OF THIS WORK

We believe that this work has made significant contribution in several directions relevant for policy.

First, we showed that when *good data* are available, credible results can be generated, especially when differential impacts are analysed and when the analysis is capable of embracing the entire spectrum of coexisting support programmes available to SMEs. The latter aspect is of particular importance because the heterogeneity of multiple sources of support provides evidence on the differential impact of the different types of subsidies, monetary values of the incentives and characteristics of the assisted SMEs, increasing the policy relevance of the findings.

Second, we showed that large non-repayable grants, particularly when given to large firms, represent an ineffective way to stimulate additional private investment and to improve the performance of the subsidized firms. Small grants given to small firms have small impacts, but when all the dimensions are taken into account, they are more cost-effective.

Third, we showed clearly that, at least for SME in one region of Northern Italy, non-repayable grants are outperformed by repayable soft loans and interest rate subsidies. The latter was the most cost-effective form of support offered to assisted firms: they go to firms that request a loan from a private sector financial institutions, to offset a fixed percentage of the firms interest-rate cost. The effectiveness of this form of support might be due to the signal it sends to the banks regarding the reliability of the project and the credit-worthiness of the firm. We do not know how this result extends beyond the borders of Piemonte, but we believe it might.

Fourth, we found that gross jobs figures corrected using deadweight coefficients taken from beneficiary surveys did not, in the case of Law 488, reproduce the impact estimates – in fact, they were off by a factor of 3. We believe this calls into question the credibility of a classic method of evaluating impacts, by combining evidence from monitoring data and beneficiary surveys.

INTRODUCTION

Across the European Union, billions of euro are spent every year on enterprise support programmes, using ERDF funds and Member States own resources. The largest share of ERDF support has been used to support *investments in physical capital* such as acquisition of plants and equipment. About 60% of all support for enterprises in Objective 1 regions within the EU15, and 40% of all support in Objective 2 regions, went for this purpose during the 2000-06 cycle. These levels have been matched in Objective 1 regions within the EU10 since 2004. Between 6 and 8 billion have been spent every year to support investment in physical capital, mostly through non-repayable grants, but also other tools, such as soft loans.

Despite the large sums disbursed, there is surprisingly *little rigorous evidence using methods such as counterfactual impact evaluation,* showing what difference investment subsidies make for the investment decision itself and for the performance of the supported firms. Figures from monitoring data are useful for tracking programme progress, but do not reveal much about the effectiveness of the support nor the reasons why the support is effective or not, which can only be explored by impact evaluations. Acknowledging this knowledge gap, the *Fifth Cohesion Policy Report* calls for a greater use of rigorous evaluation methods, including *counterfactual* impact evaluation.

The purpose of the report is to conduct a rigorous evaluation of the cost-effectiveness of investment subsidies of different types and economic value. The report transforms the raw impact estimates produced by the statistical models into more interpretable quantities. Finally, the methods are made intuitively accessible by graphical illustrations, rather than being clouded by abstruse formulas.

The methods used in this project can be extended to most member states, provided the necessary micro data on enterprises are available. However, while the policy implications are of general interest, some of the findings might be inextricably tied to the Italian context.

PART I. OBJECTIVES, METHODS, AND DATA

The study has a well defined *objective:* applying existing quantitative methods – and exploring variants of these methods – to identify and estimate the impact of investment subsidies on the performance of enterprises. The methods are applied to Italian firm-level data, drawing conclusions relevant to the Italian context and to some extent also to other ERDF beneficiary countries or regions.

The central methodological concern is *causal attribution*. To what extent the performance of the firms that receive public support is attributable to the support itself? To what extent is the support able to alter firms' behaviour in the desired direction, compared to what would have happened in the absence of the programme intervention? To what extent are enterprises induced to carry-on the investment versus simply taking advantage of the subsidy for investment already under way.

1. ESTIMATING DIFFERENTIAL IMPACTS AND COST-EFFECTIVENESS

The decision policy-makers make is more often on the intensive margin ("who gets how much of what type of subsidy") than on the extensive margin ("do we maintain or cancel the subsidy?"). Thus, the main objective of this evaluation is estimating the impacts of different forms of enterprise support. The ability to differentiate the impact by policy tool and firm characteristics greatly increases the policy relevance of the study.

More specifically, separate effects are estimated for: (i) different levels of the economic value of the incentives; (ii) different types of incentives (distinguishing between below market rate loans "soft-loans", grants to repay interest-rate costs and non refundable capital grants); (iii) different sizes and (iv) industrial sectors of the assisted firms; (v) different geographic areas where the programme is implemented (distinguishing between regions with higher socio-economic disadvantaged former Objective 1 areas in the 2000-06 period, and regions with better socio-economic conditions).

Estimating specific impacts for different ranges of the economic value of the incentives is of special interest to policy makers because one of the most useful pieces of empirical evidence (in order to redefine future policy interventions) is the cost per each additional unit of desirable outcome induced by the programme. Disentangling the impacts of different types of programme incentives is also of crucial importance. These choices often involve trade-offs. For example, loans are more economical than non-repayable capital grants and may also be more effective if credit market imperfections are of significant concern, resulting in the underfunding of new or small businesses with not enough assets as collateral guarantee. With the same amount of public funds, they allow a much larger number of investment projects to be funded; "soft loans" may also be more effective if credit market imperfections are of significant concern, resulting in the underfunding of new or small businesses with not enough assets as collateral guarantee. On the other hand, capital grants offer assisted enterprises a financial advantage largely superior to that of below-market interest rate loans. As a result, they may have a greater potential (than loans) to modify the investment decisions that assisted firms would make without the incentives.

Estimating separate impacts for different firm sizes and industrial sectors is also important. Smaller and larger firms may face different degrees of credit market imperfection (leading to different impacts of the intervention). Moreover, operating in different sectors (primarily distinguishing between manufacturing and service sectors) may lead to different employment outcomes if the propensities to use the subsidized investment for substituting labour with capital is differently distributed across the sectors.

Finally, estimating separate impacts across regions with different socio-economic conditions is also important, particularly in the case of generous non-refundable capital grants. This is because in areas

with quite severe economic distress, on the one hand, such grants have a higher potential to spur additional investment activities (that would have not occurred in the absence of the incentives) than in areas with better economic conditions On the other hand, generous non-repayable grants may face greater challenges in distressed areas – for example the relative difficulty of attracting and sustaining economic activity there .

2. THE MAIN FEATURES OF THE POLICIES BEING EVALUATED

The present study evaluates the cost-effectiveness of investment subsidies implemented in Italy at *two distinct geographical levels*: (a) a ***national*** (NUTS I) level analysis of a large-scale nation-wide effort targeted to industrial firms located in disadvantaged areas, supporting investments in physical capital through large non-repayable grants assigned through a competitive process; and (b) a ***regional*** (NUTS II) level analysis of the impact of the whole set of coexisting measures available to SME in Piemonte, a region of 4.5 million people in Northern Italy.

The National level analysis: Law 488/92

The so called Law 488 is the largest Italian enterprise support programme of the last 20 years, and it has been co-funded by the ERDF. The support provided by Law 488 takes the form of project-related non-repayable capital grants. The type of investment projects covered are start-ups, extension, restructuring, reconversion, reactivation and relocation. The location of the firms assisted by Law 488 encompasses both Southern Italy (which had the status of Objective 1 area in the 2000-2006 programming period) and Northern and Central Italy (in which a number of Objective 2 areas were located in 2000-2006). Such wide geographical coverage increases the external validity of the results. On the basis of the data used for the analysis, between 2000 and 2006 Law 488 financed about 6,200 firms, at a cost of about € 2.6 billion.

Law 488 support was assigned by competitive auctions repeated almost every year. These auctions were run separately in each of the 20 Italian Regions. In each auction, as a first step, each submitted application underwent a first quality check of all the required credentials, documentations and features of the proposed investment project. Then, all the applications that surpassed the first quality check were ranked based on the following five criteria, illustrated in Table 1:

Table 1. Admissibility criteria for 488 grants

Criterion	Purpose	Since
1. Proportion of own funds invested in the project	Minimize moral hazard and adverse selection	1992
2. Number of jobs to be created by the project	Foster employment	1992
3. Value of assistance sought as a proportion of the maximum award rate	Minimize moral hazard and adverse selection	1992
4. Priorities of the Regional government about location and sector	Support local strategies	1998
5. Environmental impact of the project	Minimize environment impact	1998

The five criteria carried equal weight: the sum of five standardized criteria determined the final application score and, accordingly, the position of each project in the regional ranking. Separately for each region, applicants were admitted to financing following their ranking, *until the available funds were exhausted.* The auctions considered in the analysis took place in 2000, 2001, 2002 and 2004[3].

[3] One more auction was issued in 2006, offering both capital grants and soft loans. This auction was excluded from the analysis due to the small number of supported firms that completed the subsidized investment by the year 2008, the last year for which the available outcome data allow us to estimate the programme impacts.

Applications had to be submitted by a specific deadline; within four months of the deadline, the Ministry for Economic Development published the rankings. If the project was funded, the value of the support granted to the assisted firms was determined by applying the requested rate of assistance (criteria 3) to the size of the approved investment.

Law 488 archives maintain data for all applicants, included those that surpassed the first quality check but that were denied the assistance because their investment project fell below the budget induced cut-off point. These eligible-non-funded firms are almost three times as many as the funded ones. This programme feature allows us to use the data on the rejected applicants that surpassed the first quality check as one of the base for estimating the effects of the subsidy. This is because, as further explained in Section 3, the beneficiaries and the rejected applicants share the same desire to invest (a crucial, otherwise unobservable, firm characteristic to be controlled for in the analysis). Finally, firms applying to the incentives of Law 488 were barred from applying to other public programmes on the same investment project, a feature of Law 488 that eases the concern of not observing all of the concurring programme interventions that may affect the outcomes.

The Regional level analysis: SMEs support in Piemonte

The evaluation looks at the impact of the whole spectrum of support targeted to SMEs in one region, namely Piemonte. The analysis focuses on the 2005-2009 period, for which complete recipient data are available for the entire set of coexisting support programmes funded by National and Regional legislation and by the measures co-funded by the ERDF within the former Obj. 2 area. Over 10,000 SMEs receive one or more form of assistance, under the heading of one of 25 enterprise support programmes, listed in Table 2, with the indication of the type of support received.

The Piemonte region is ideal for evaluating the effectiveness of different forms of support to SMEs because:

- The total number of SMEs operating in Piemonte is over 100,000: these are the source for the comparison group of non-assisted firms. This guarantees large numbers of non-assisted firms for each different type of support;
- The heterogeneity of programme support and the large number of assisted SMEs provides evidence on the differential impact for different types of subsidies, monetary values of the incentives and characteristics of the assisted SMEs;
- The complete data coverage avoids having to rely on the assumption (implicit in the evaluation study focusing on a single enterprise support programme) that the firms not participating in the programme under study do not receive any support from other sources.

Table 2: Programmes providing support to SMEs in Piemonte

	Programme objective	Eligibility		Instrument		
		Area	Enterprises	Capital grants	Int. rate subsidies	Soft loans
NATIONAL FUNDING						
N.Law 488/92	Develop distressed areas	Piemonte	All firms	✔		✔
N.Law 185/2000	Promote self employment	Obj. 1 & 2	Individuals	✔		✔
N.Law 240/81	Support craft enterprises	Piemonte	Craft firms		✔	
N.Law 949/52	Support craft enterprises	Piemonte	Craft firms		✔	
N.Law 1329/65	Support SME'S	Piemonte	SMEs		✔	
REGIONAL FUNDING						
R. Law 4/06	Promote local development	Obj.2 & Ph.O	SMEs	✔		
R. Law 22/97	Support start-ups	Obj.2 & Ph.O	Young women	✔		✔
R. Law 23/04	Promote employment	Obj.2 & Ph.O	Cooperative firms	✔		✔
R. Law 21/97	Promote local development	Obj.2 & Ph.O	Small retail and craft firms			✔
R. Law28/99 art.18	Promote local development	Obj.2 & Ph.O	Small retail and craft firms		✔	
R.Law 21/97 art.14	Support craft enterprises	Obj.2 & Ph.O	Craft firms			✔
R.Law 21/97 art.15	Support craft enterprises	Obj.2 & Ph.O	Craft firms	✔		
R.Law 21/97 art.16	Support craft enterprises	Obj.2 & Ph.O	Craft firms	✔		
R.Law 21/97 art.20	Improve competitiveness	Obj.2 & Ph.O	Craft firms	✔		
R.Law 21/97 art.21	Improve competitiveness	Obj.2 & Ph.O	Associations of craft firms	✔		
Regional agri plan	Aid to small farmers	Obj. 5b	Small farmers	✔		
ERDF FUNDING						
DOCUP 1.2a	Promote exports	Obj.2	SMEs	✔		
DOCUP 2.1b	Support investment projects	Obj.2	SMEs			✔
DOCUP 2.1d	Support EIB financing	Obj.2	SMEs	✔		
DOCUP 2.2b	Equity based instruments	Obj.2	SMEs			✔
DOCUP 2.2c	Use of consulting services	Obj.2	SMEs	✔		
DOCUP 2.4c	Develop e-commerce platforms	Obj.2	SMEs	✔		
DOCUP 2.6a	Environmental investments	Obj.2	SMEs			✔
DOCUP 3.3	Local requalification program	Obj.2	SMEs	✔		
DOCUP 4.2a	Support start-ups	Obj.2	SMEs	✔		✔
POR ESF-D3	Support start-ups	Piemonte	Individuals	✔		✔

Tables 3 describes and compares the characteristics of the firms supported by Law 488 and by the spectrum of measures available to the SMEs in the Piemonte region.

Table 3: Characteristics of firms supported by Law 488 versus SME-Piemonte (*)

	Law 488	SME - Piemonte
Total public expenditure	€ 2,6 billion	€ 114 million
Number of supported firms	6,189	10,526
Average public expenditure per assisted firm	€ 419,777	€ 10,830
Capital grants	100%	15%
Soft loans	-	10%
Interest-rate subsidies	-	74%
Mixed assistance	-	2%
Micro firms (0-9 employees)	50%	77%
Small firms (10-49 employees)	38%	21%
Medium firms (50-249 employees)	11%	1%
Large firms (250+ employees)	1%	-
Manufacturing sector	79%	78%
Service sector	21%	22%
Firms in former Obj. 1 areas (Southern Italy)	81%	0%

(*) The figures reported are those used in the employment analysis. Other analyses used smaller samples, as indicated in each instance in the remainder of this report.

Table 4 compares the average values of the assistance provided to Law 488 beneficiaries and to the SMEs in Piemonte region, using the GGE (gross grant equivalent, explained in Section 3).

Table 4: Average public expenditure per beneficiary of Law 488 versus SME-Piemonte (*)

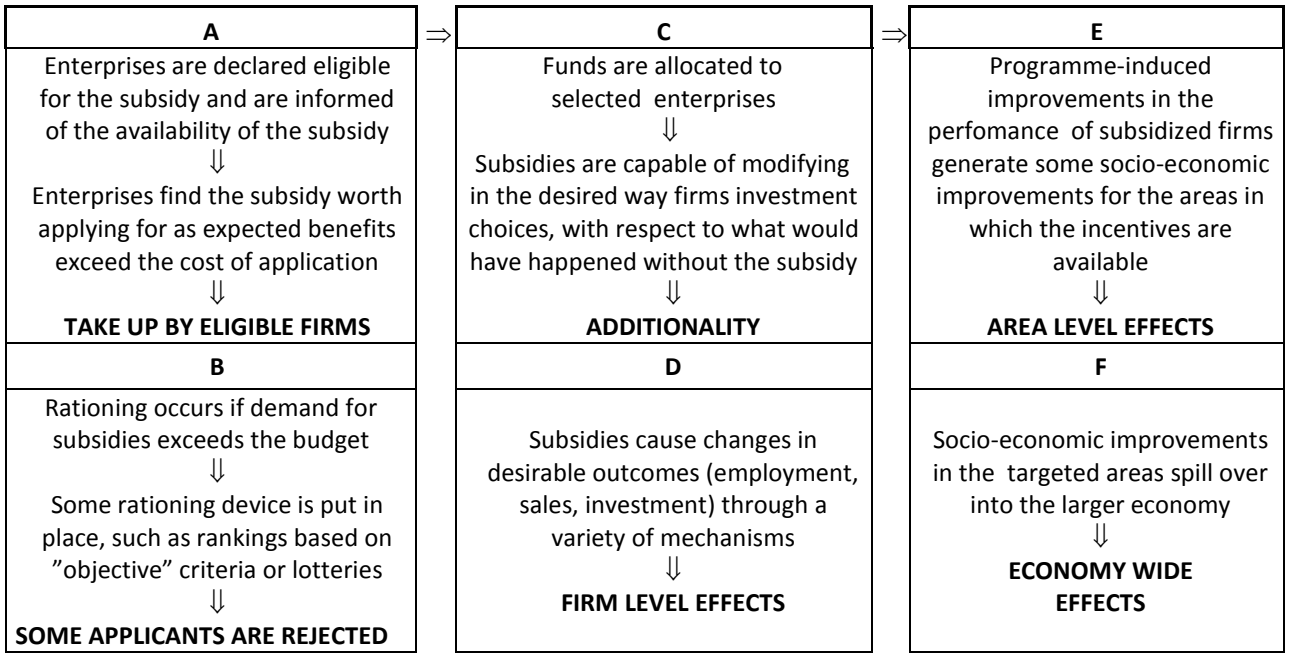
	Law 488	SME - Piemonte
Firms receiving capital grants	€ 419,777	€ 27,760
Firms receiving soft loans	-	€ 16,187
Firms with interest rate subsidies	-	€ 5,655
Firms with mixed assistance	-	€ 50,105
Micro-firms (0-9 employees)	€ 371,597	€7,185
Small-firms (10-49 employees)	€ 398,429	€ 21,909
Medium-firms (50-249 employees)	€ 660,746	€ 50,108
Large-firms (250+ employees)	€ 1,150,475	-
Firms in service sector	€ 353,953	€ 14,026
Firms in manufacturing sector	€ 437,028	€ 10,010
Firms in former Obj. 1 areas (Southern Italy)	€ 538,335	-
Firms outside former Obj. 1 areas (Northern/Central Italy)	€ 274,396	€ 10,830

(*) The figures reported are those used in the employment analysis. Other analyses used smaller samples, as indicated in each instance in the remainder of this report.

3. THE DESIGN OF THE IMPACT EVALUATION

The following diagram articulates the logical steps involved in the evaluation of enterprise support programmes. In order for an incentive programme to succeed, eligible enterprises need to be informed about the existence of the incentive. They apply if the perceived benefits exceed the perceived cost of application.

The logic model for evaluating enterprise support programmes



However, even if the programme is managed so that all the funds are allocated to applicant enterprises, the actual impact of the programme could even be *nil*. Measuring how much of **outcomes A** a programme is producing does **not** provide information on the true impact if the policy. Unfortunately, most official monitoring and evaluation reports focus solely on outcomes A.

Outcomes of type B are relevant in the presence of *rationing*—that is, when the demand for the support exceeds the budget allocated for that measure. *Rationing can be a powerful tool in evaluating the impacts of the programme*, if used properly. Excess demand with respect to the availability of funds implies that a number of eligible firms (with projects deemed to be of acceptable quality) willing to invest are left without a subsidy (for that measure at least). *Rejected applicants* could lead to more credible inference about the impact of a subsidy than generic non-applicants[4]. If there is no rationing and *all* those willing to accomplish the subsidized activity are given a subsidy to do so, it becomes much harder to isolate the effect of the subsidy.

Whether or not passing through rationing, eventually a number of firms receive a subsidy to perform the targeted activity. Those who perform the subsidized activity as planned represent an **outcome of type C.** The evaluation question at this stage is: are the incentives really capable of modifying the investment behavior of the assisted enterprises, or simply the enterprises who had already planned the investment end up intercepting the programme and applying for the subsidy?

Outcomes of type E and F are beyond the scope of this study because they involve analysis with geographical units of observation (not firm-level ones), while the major focus will be on **outcome of type D**. This involves assessing whether or not the programme produces the change in key performance indicators among assisted enterprises—that is, to what extent the change can be plausibly attributed to the subsidy—so that a judgment on the cost-effectiveness of the measure can be formulated. The difficulty of attributing the observed change to the programme support must not be underestimated. While all other forms of evaluation—particularly so in the area of Structural Funds—involve some observable entity (outputs produced, projects completed, targets reached, customers satisfied), impact evaluation involves quantities that are inherently *unobservable*, and must be approximated with observable quantities. *The plausibility of the conclusions crucially depends of the credibility of such approximation.*

Making causal inference about what works and what does not in enterprise support requires some challenging analytic steps and the use of appropriate tools. It is not a mere question of *collecting* data and *observing* change: evaluating impacts involves dealing with a much complex and challenging set of concepts—namely causality and *counterfactuals*.

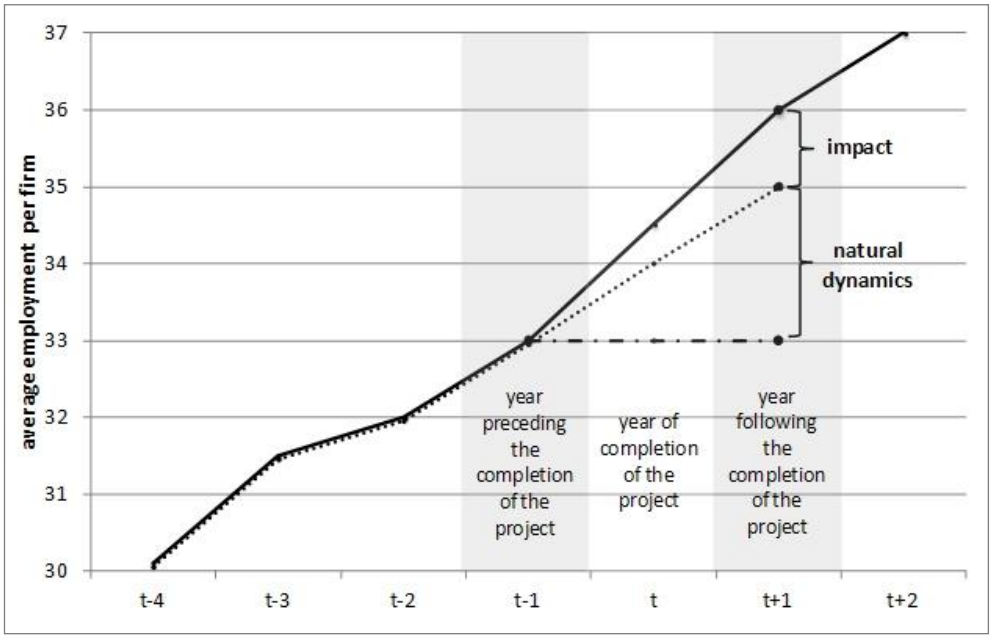
Causality and counterfactuals

To identify the (causal) effect of the subsidy one must compare the changes *observed* among supported enterprises (changes in a given indicator over a given period), with the changes that "most plausibly" would have been observed in the *same time* period for the *same* firms, *had they not* received the support. This hypothetical change, not observable by definition, is named "counterfactual". Thus the main strategy is to compare actual with counterfactual change. The counterfactual change must be recovered from data pertaining to other enterprises that, despite not receiving any subsidy, are similar enough to represent what would have happened to the subsidized firms in absence of the subsidy.

An ideal situation is depicted in Figure 1. The outcome indicator is represented on the vertical axis: for example, average employment per firm. The solid line represents the evolution over time of the average outcome among firms that received a subsidy at some point prior to t. We adopt the convention that the investment is completed in year t. *We define effect of the subsidy the change in average outcomes that is attributable to the subsidy and takes place between year t-1 and year t+1.*

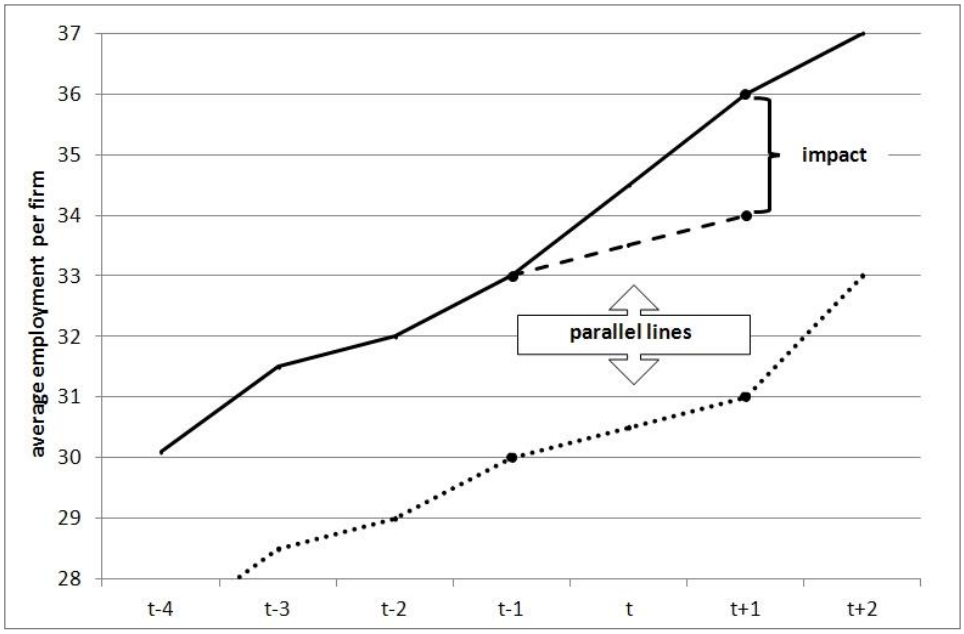
[4] This is true provided that there is no abundance of coexisting similar programmes that could allow most of the rejected applicants to be supported by other subsidies.

Figure 1. Decomposing observed change into impact and natural dynamics



The goal of impact evaluation is to measure in a credible way *how much of the observed before-after change can be credibly attributed to the intervention*. In Figure 1 the before-after change in the outcome is equal to 3 (=36 employees in year t+1 minus 33 employee in year t-1). The ideal would be observing a group of firms that have followed the same path up to time t-1, but have been randomly excluded from funding. If the dotted segment between t-1 and t+1 truly represents *what would have happened* to the beneficiaries in the absence of the intervention, then the observed change can be decomposed into change due to the programme (impact or effect), and change that would have occurred anyway (natural dynamics—that is, everything else that causes employment to change.We cannot usually assign investment subsidies using randomization. The situation that most often takes place is represented in Figure 2. Non-subsidized firms follow a different trajectory than subsidized firms, so the difference observed in year t+1 between recipients and non recipients cannot be used to infer the impact of the support.

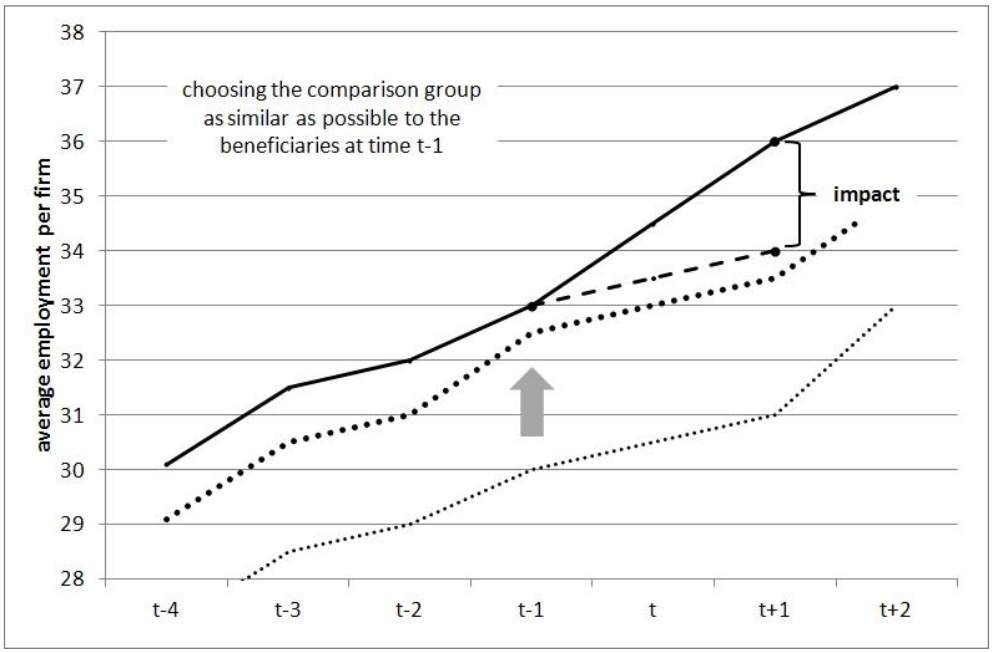
Figure 2. The basic difference-in-difference showing the parallelism assumption



Parallelism. The approach is to make a *prima facie* reasonable assumption: without the subsidy, the supported firms would have followed a trajectory ***parallel*** to that of the non supported firms, and represented by the *dotted* segment in Figure 3. In year t+1 they have a value of 36 for the outcome, while if their trajectory would have been parallel to that of not supported firms, they would have scored 34. So the impact, under the assumption of parallelism, is equal to 2. However, beyond its *prima facie* plausibility, nothing guarantees such parallelism to be true. It is more plausible to assume that the counterfactual trend would have been parallel to that observed among the non-supported firms, than assuming that the all change is due to the intervention. Thus, the parallelism assumption is a step forward with respect to the assumption that all the observed change must be attributed to the subsidy. We can do even better if we have other data available, in particular on the characteristics of the enterprises and/or on the exact mechanism that separated recipients and non-recipients.

Matching. The basic intuition behind this evaluation strategy can be gleaned by comparing Fig. 2 and Fig. 1. The fundamental objective is to *select a subset of non supported firms* that is able to come close to the ideal situation depicted above. This situation is represented in Fig. 3. There are two general ways of pursuing this goal. The first is based on the availability of *pre-intervention observable characteristics* for both the supported firms and all the other eligible ones that did not apply for support, whose number is typically many times larger than the number of supported firms. With the appropriate techniques, we can select firms that share the same pre-intervention characteristics but did not receive the support, giving more weight to those characteristics that are correlated with the participation in the programme. There are a number of techniques to implement this idea, such as matching (by "stratification and reweighting" or "propensity scores) and multiple regression. We use all three, as explained in detail in the Technical annex on Methods. The second strategy depends upon the presence of *rejected applicants.* The latter share with the beneficiaries the same desire to invest, which is an important proxy of unobservable such as business strategies and managerial abilities, as well as specific market trends to which the firms are exposed. However, due to the presence of excess demand of subsidies with respect the available resources, some rationing device is put in place in order to realign resources and expenditures. One of the most common rationing devices is to construct a ranking of applicants, on the basis of a set of pre-specified criteria. Some applicant firms do not receive funding because their proposed investment project scores below a cut-off point determined by the available budget.

Figure 3. Choosing controls as similar as possible to support the assumption of parallelism



Choosing the best methods

The final choice of methods used in the analysis depends on a) whether rejected applicants are used as a source of controls (when rationing exists) vs. using a sample of non-applicants; b) whether the matching is done using "stratification and reweighting" or "propensity score"; c) when rejected applicants are used, whether the comparison between beneficiaries and non beneficiaries is further restricted around the cut-off point used to determine acceptance and rejection (a mild form of discontinuity design). Combining these different choices and criteria, we constructed five different estimation methods. One is the preferred method for the 488 analysis, and the second is the preferred method for the SME analysis. They are described in Table 5 and 6. The other three estimation methods are explained in the Technical annex.

Table 5. Method used to estimate the impact of law 488

Type of method	Conditional difference in difference: control group selected by matching using a stratification & reweighting approach
Source of control group	Rejected applicants
Intuitive description of the method	Supported firms are matched with non-supported firms in identical sector (2 digit), size class (micro, small, medium, large), geographic area (north/south Italy) in each cell an estimate of the impact is obtained by difference in difference: aggregate impacts are obtained by a weighted average of the cell-specific impacts, computed as differences in difference; the weight of each impact estimates depends on the proportion of treated in the cell
Differences between treated and non treated firms controlled for by this method	• sector-specific economic trends; • size effects (large and small firms may face different types of market failures); • geographic areas (proxy for possible socio–economic -institutional-transportation and labour cost-differences that may affect outcomes); • unobserved characteristics that may lead to the decision to apply for the subsidy; • remaining unobserved differences between treated and non-treated firms, as long as they do affect the outcomes in a constant-over-time manner

Table 6. Method used to estimate the impact for Piemonte SMEs

Type of method	Conditional difference in difference: control group selected through matching on the propensity score and impact obtained with regression
Source of control group	Non-assisted firms
Intuitive description of the method	Treated and non-treated firms are included in the analysis only if they share (on aggregate) similar characteristics (as indicated by their propensity score). Specific remaining difference between treated and non-treated are then controlled for with a regression difference in difference design
Differences between treated and non treated firms controlled for by this method	• sector-specific economic trends; • size effects; • geographic location (at the Province level); • pre-intervention trends (as a proxy for same need/desire to invest); • remaining unobserved differences between treated and non-treated firms, as long as they do affect the outcomes in a constant-over-time manner

When does an impact take place?

Choosing the appropriate dates to locate in time the completion of the interventions is also extremely important. Such choice can have major implications for the impact estimates. If a programme intervention is wrongly placed in a year *earlier* than the time in which the outcome of interest could be potentially affected by the investment, the outcomes of such year would be erroneously considered as exposed to the treatment. By contrast, if a programme intervention is wrongly placed in a year *later*

than the time in which the outcome of interest could be potentially affected by the investment, the firm outcomes of such year would be erroneously considered as not-exposed to the treatment. In our study we choose the dates to locate in time the programme intervention using the following criteria. For the analyses focusing on employment, sales, labour productivity and payroll costs, the public support received is located at a time closely after the date in which the supported investment/expenditure was inspected and was deemed to be ready to enter the production process. This is because in this period it is most likely that the assisted entrepreneurs decide to finalize the personnel hiring related to the new investment/expenditures and that the additional production activity spurred by the new investment would be exposed to the market.

In this way, the bulk of our analysis focuses mainly on the proximate programme effects, with a typical time span up to a maximum of two years after the time at which the programme-subsidized investments began operating[5]. The reasons for this choice are twofold.

First, because using rigorous counterfactual evaluation designs to assess whether business incentives had impacts on the long term performances of the assisted firms is best to be avoided when the evaluation is carried out with firm-level data. Assisted firms are economic units embedded in a network of economic transactions from one to the others. In the long-run, a possible positive programme shock on the performance of each single assisted firm is likely to have enough time to generate subsequent impacts (either negative or positive) also on non-assisted firms. Over time, the treatment leaks to the non-assisted group.

Second, because the ultimate objective of enterprise support policies is to boost the long-term performance of communities and not single firms. Positive collective outcomes could be clearly achieved even in the absence of long-term impacts detectable at the firm-level. This could be the case of long term positive spill-overs into non-supported firms. These spill-over, in the long term, could generate positive programme outcomes at the level of local/regional economies without necessarily generating any long-term competitive advantage for the single beneficiary firms compared to similar non-supported firms.

Finally, for the analysis focusing on investment outcomes, the public support received is instead located in a time frame between the date in which the supported investment/expenditure was deemed to be ready to enter in the production process and two years before that date. This is because in this period it is most likely that the additional investment expenditures spurred by the programme would be actually recorded in the firm balance sheet (which is the source of the investment data).

4. THE DATA

The data used in the analysis come from different sources, playing different analytic roles. First, we used data on the beneficiaries and on the *treatment received* by beneficiaries. In the case of Law 488, we needed data for both supported and rejected applicants, because in that case applicants are a crucial source of information to recover the counterfactual. For the Piemonte SME analysis, we needed to select the comparison group from the *universe of all SME* of that region. Finally we needed data on *outcomes* (employment, sales, productivity, investment and payroll costs) for all firms.

The data on beneficiaries. The data archives of Law 488 contain a record for each project that was ever submitted by the firms applying for the grant, including the information on whether or not the submitted investment project passed the first quality check and the firm ranking in the competitive application process. The data was provided to us by extracting the relevant variables directly from the

[5] A maximum time span of two years after the completion of the investment occurs when the completion date happens early in the year t (e.g. first days of January).

administrative system used to manage the application process and the payments. The data on the **Piemonte SMEs** beneficiaries were provided by the following Italian programme managing authorities: Ministry of Economic Development; Mediocredito Centrale; Regione Piemonte; Finpiemonte; Sviluppo Italia. The databases provided by these managing authorities are each organized differently, but with some common features: unique firm identifier (VAT identification code) and firm name; value of approved investment project (and/or approved expenditures); value of the support granted (for soft loans, total granted for the approved expenditures); Date of application approval.

The data on outcomes. The outcome variables that are considered in the analysis are employment, sales (production), investment impact, labour productivity and average payroll cost per employee The **employment** and **production** outcomes used in the analysis are based on Statistical Archives of Active Firms (ASIA) produced by ISTAT (the Italian National Statistical Agency). The ASIA database played a pivotal role for the analysis. Besides containing important outcome data, particularly employment and production, the demographic information for all of the active firms (of all types and size, including non-corporations) located in all Italian regions were crucial for the construction of the matched sample of non recipients. Due to their confidentiality, these data were processed by ISTAT staff.

ISTAT-ASIA, however does not contain data on **investment** and the **cost for wages and salaries**. Data on investment expenditures, and expenditures for salaries and stipends were provided by ISTAT through their balance sheet information archives that ensure coverage for the entire population of corporate firms of Italy. All databases mentioned above were merged thanks to the common unique firm identifier, the VAT identification code.

Table 7. Sources of data and their use

Type of data	Archive	Owner of the data
Data on beneficiaries	Beneficiaries administrative archives of measures active in Piemonte	Ministry of Economic Development; Mediocredito Centrale; Regione Piemonte; Finpiemonte; Sviluppo Italia
Data on applicants	Law 488 applicants and beneficiaries administrative archive	Ministry for Economic Development
Demographic data for the universe of active firms	Statistical Archive of Active Firms (ASIA), including special edition with data on all firms that have multiple establishments	Italian National Statistical Institute (ISTAT)
Data on outcomes	Statistical Archive of Active Firms (ASIA) for employment and production (sales) outcomes	
	Archives on balance-sheet information for all Italian corporations	(Purchased by) ISTAT

Computation of Gross Grant Equivalent (GGE). In order to use the data for Law 488 and the Piemonte SMEs, the economic value of the subsidies were transformed into Gross Grant Equivalent (GGE) values. The GGE values used in the analysis are computed as the net present values of the gross grant equivalent subsidy paid to the assisted firms (considered in terms of absolute value of the equivalent grant rather than as the ratio between the equivalent grant and the value of the assisted investment). In practical terms, all data on the payments concerning non-repayable grants are close to be readily interpretable as GGE.

Data on the soft loans programmes, in order to be computed as GGE, needed to be transformed into the net present value of the difference between the flow of interest payments made by the assisted firms at the below-market-rate provided by the programme and the flow of interest payments that the assisted firms would have made at market rates. For soft loans and interest rate subsidies, the GGE values that we computed incorporate (through applying to each programme the appropriate standardized coefficient) either the additional costs due the possible defaults of the supported firms or the higher administrative burden.

Beneficiary survey. The survey have been conducted via Computer Assisted Telephone Interviewing (CATI). For the national study on Law 488/92 we attempted to interview all the 550 beneficiaries of the last tender ("31° Bando Industria"), which was announced in 2006 and actually implemented in 2007. Firms were interviewed approximately four years after they were awarded the grant/loan. We obtained 232 completed interviews, for a response rate of about 60%. We attempted to interview about 500 firms that participated in the 2006 call, qualified for the subsidy but were excluded from the incentives because of lack of funds. For the regional SME study, we sampled the firms that received incentive form the different measures in 2008. We extracted a sample of 1,000 SMES and stopped interviewing when reached 500.

On the basis of our experience and of the few well documented examples one can find on this topic, we contend that beneficiary surveys can be used when:

(i) the respondents do not have a strong *incentive to misrepresent* their answers

(ii) the person(s) *who made the decision* can be identified

(iii) the *cognitive burden* imposed on the respondents is kept within reasonable limits.

The first condition might appear as the weakest spot of this method, but our experience (see Rocca and Strada, 2008), as well as other examples in the literature suggest otherwise: under given circumstances entrepreneurs can be fairly open in revealing that they would have done the same without state aid.

On the other hand, we find condition (ii) very critical: the most serious drawback of this approach, when dealing with firms—and large ones in particular--is the need of identifying the person who can report reliably on the decision taken several years in the past, often by a plurality of individuals. Often such person either does not exist or simply cannot be identified given the constraint of a typical interview process.

Finally, as far as the cognitive burden is concerned (iii), there is no objective rule to determine what is reasonable, other than sheer common sense and experience in dealing specifically with this. We believe that asking about salient events in the recent past can be reasonable. We avoid asking questions that are likely to elicit unusable answers

The questionnaires contains a *small* number of questions, in order to focus the attention of the respondents on the additionality of the investment performed with ERDF support, to limit the burden on the respondent and to obtain higher response rates and better quality data[6].

[6] The complete questionnaires (in Italian) are available from the authors upon request.

PART II. RESULTS FROM THE ECONOMETRIC ANALYSIS AND FROM THE BENEFICIARY SURVEYS

The approach we adopt in reporting the results has the ambition of being *both* rigorous *and* understandable by readers without knowledge of statistics. To this end, we transform the raw impact estimates we obtain from the econometric analysis into more interpretable quantities. Let us use employment as an example. By applying the methods illustrated earlier, we obtain impact estimates representing the difference between the average growth in employment observed among beneficiaries and the average growth observed among a subset of non-beneficiaries, *suitably chosen* to represent the counterfactual situation with credibility. This quantity can be made more informative by adding cost information, thus obtaining simple cost-effectiveness measure—the *average cost per job created*, simply computed as:

$$\text{Cost per job created} = \frac{\text{total funds disbursed to subsidized firms}}{\text{average employment impact} * \text{number of firms subsidized}}$$

A category of firms might exhibit a small number of job created, but they might do so receiving relatively fewer resources. For example, large firms getting large grants tend to generate large gains in employment per firm, but they also receive huge amounts of money, so that the cost of job creation is much higher too.

Analogously to employment, we present the impact on sales and investment in the following form**:**

$$\text{Cost per extra € of sales} = \frac{\text{total funds disbursed to the firms subsidized}}{\text{average impact on sales} * \text{number of firms subsidized}}$$

$$\text{Cost per extra € of investment} = \frac{\text{total funds disbursed to the firms subsidized}}{\text{average impact on investment} * \text{number of firms subsidized}}$$

5. THE AVERAGE IMPACTS OF THE SUBSIDIES ACROSS ALL RECIPIENTS

Table 8 summarizes the average impact estimates of the national programme Law 488 and the set of programmes available to the SMEs located in the Piemonte region.

For the Law 488, the results show an average increase of almost two jobs (1.82) per subsidized firm. Such average impact estimates implies that the over 6,000 projects used for the analysis generated about 12,000 new jobs. This *significant* result was achieved at the aggregate cost of €2.6 billion, or €230,000 per job created.

For Law 488, another useful comparison can be conducted between the number of jobs generated as resulting from the counterfactual impact evaluation analysis and the number of jobs *declared* in the 488 application forms. The latter tend to be large figures, because in the 488 procedure, the higher the employment/investment ratio declared in the application, the higher the score the project receives. If all of the jobs indicated in the subsidy applications were additional compared to the number of jobs that would have been generated in the absence of the incentives, we would have had a total impact of the subsidies of 82,000 jobs, at a cost of about €31,700 per job, instead of the estimated 12,000 jobs at a cost of €230,000.

Sales increased on average by about €170,000 per firm with respect to the counterfactual status that we estimated from the non subsidized firm used as controls. When cost is brought into the picture, we

learn that the cost of the one additional million of aggregate sales experienced by subsidized firms over that two-year period is about 2.3 million (i.e. the cost of generating each extra euro of sales ,is about €2.3) which is difficult to take as a sign of efficiency. Similarly, it takes €1.86 of grant money to generate one extra euro of investment.

Up to this point it is not obvious what the policy implications are of these aggregate figures. Taken by themselves, they are suggestive (of inefficiency in the case of Law 488) but not conclusive. And the fact that the impact parameters are *very* statistically significant is not of much help. The real challenge is to make sure estimates have a causal interpretation and to make comparisons that are relevant for decisions.

One such comparison can be made with the results of the variety of programmes (from national-legislation, regional-legislation and ERDF co-sponsored sources) available to the SMEs located in the Piemonte region. The pictured offered by the heterogeneous programmes available to the SMEs in the Piemonte region is different. The average number of jobs created per firm (0.32) is much smaller than in the 488 case, but, given the substantially smaller resources devoted to SME support in Piemonte, jobs are created at a much moderate cost of €33,000. Such comparison is highly suggestive of a better overall result than the generous scheme represented by Law 488. The three cost effectiveness indicators (cost of a job, cost of extra sales, cost of extra investment) are dramatically better for the support to the SMEs in the Piemonte region.

Table 8. Average impacts and cost-effectiveness of the subsidies

	LAW 488		PIEMONTE SMEs	
EMPLOYMENT				
Average impact	1.82	***	0.32	***
Cost per job created	€ 231,207		€ 33,359	
No. of supported firms used in the analysis	6,189		10,526	
SALES				
Average impact	172,487	***	39,141	***
Cost per extra euro of sales	€ 2.32		€ 0.25	
No. of supported firms used in the analysis	5,790		10,072	
INVESTMENT				
Average impact	226,430	***	37,509	***
Cost per extra euro of investment	€ 1.86		€ 0.78	
No. of supported firms used in the analysis[(a)]	2,474		1,499	

(a) Corporate firms only.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

One possible objection is that a large fraction of the subsidies under Law 488 were concentrated in the South of Italy, which has disadvantaged economic conditions. This different geographical coverage could skew the results in favour of the results obtained for the Piemonte SMEs. When the 488 analysis is replicated on the subsample of firms solely located in Northern-Central Italy, however, the differences in average impacts and costs between Law 488 and the programmes available to the Piemonte SMEs still hold (albeit with a reduced magnitude, Table 9).

Table 9. Average impacts and cost effectiveness of the subsidies (488 only Northern-Central Italy)

	LAW 488		PIEMONTE SMEs	
EMPLOYMENT				
Average impact	2.14	***	0.32	***
Cost per job created	€ 164,872		€ 33,359	
No. of supported firms used in the analysis	2,008		10,526	
SALES				
Average impact	€ 311,600	***	€ 39,141	***
Cost per extra euro of sales	€ 1.04		€ 0.25	
No. of supported firms used in the analysis	1,905		10,072	
INVESTMENT				
Average impact	€ 147,654	***	€ 37,509	***
Cost per extra euro of investment	€ 1.95		€ 0.78	
No. of supported firms used in the analysis [(a)]	1,168		1,499	

(a) Corporate firms only.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

6. HOW IMPACTS VARY BETWEEN CAPITAL GRANTS, SOFT LOANS AND INTEREST-RATE SUBSIDIES

The results shown in Section 5 suggest a greater cost-effectiveness of the policy instruments used in the support to SMEs in the Piemonte (predominantly composed by small interest-rate subsidies[7] and soft loans) than the large capital grants typically offered by Law 488.

In order to provide further evidence on the differential impacts produced by different types of support (capital grants vs. soft-loans vs. interest-rate subsidies), however, it is important to "*hold constant*" the economic value of the subsidy. For this reason, it is useful to focus on the differential impacts of the capital grants, soft loans and interest-rate subsidies offered to the SMEs of the Piemonte region (Table 10). The results from the Piemonte SMEs are more robust indicators of the differential impacts of the different types of subsidies because there are no large variations in the economic values of the subsidies across the three different types of support. The results from Table 10 highlight a greater cost-effectiveness of soft loans and interest rate subsidies than capital grants for the employment and sales outcomes, with an average cost of about €63,000 per job for capital grants versus about €29,500-21,000 per job for soft-loans and interest-rate support.; and an average cost of €1,15 per extra euro of sales for capital grants versus €0.50-0.12 per extra euro of sales for soft-loans and interest-rate support.

[7] Interest rate subsidies are defined as non-repayable grants offered to assisted firms that have obtained a loan from a private sector financial institutions. Such grants are set to offset a fixed percentage (e.g. 50%) of the firms interest-rate cost. In practice, the acceptance of the proposed investment by the public entity in charge of managing the programme greatly enhances the chances of having the investment financed by the banking establishment, because such acceptance is interpreted a signal of the reliability of the project.

Table 10. The impact for SME-Piemonte subsidies by type of instrument

	Capital grants		Soft loans		Interest rate subsidies	
EMPLOYMENT						
Average impact	0.43	***	0.55	***	0.27	***
Cost per job created	€ 63,957		€ 29,594		€ 21,190	
No. of supported firms used in the analysis	1,531		1,007		7,762	
SALES						
Average impact	€ 23,249	***	€ 30,205	***	€ 42,900	***
Cost per extra euro of sales	€ 1.15		€ 0.50		€ 0.12	
No. of supported firms used in the analysis	1,389		938		7,556	
INVESTMENT [(a)]						
Average impact	€ 18,547		€ 125,299	***	€ 11,210	
Cost per extra euro of investment	-		€ 0.18		-	
No. of supported firms used in the analysis (b)	821		206		415	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
(b) Corporate firms only.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

The results for the investment outcomes are also somehow suggestive of a better cost-effectiveness for the repayable subsidies versus capital grants. Due to the fact that investment data are only available for corporate SMEs, however, the small sample size of the analysis makes the differences in the impacts not statistically significant. In order to further test the robustness of such findings we replicated the analysis also by estimating separate impacts for six different categories of subsidies (Table 11). Such six categories are obtained by cross-tabulating each of the three types of assistance (capital grants, soft-loans, interest-rate subsidies) by two categories of economic values (in terms of Gross-Grant-Equivalent GGE) of the subsidy. In this way we can compare the differential impacts at exactly the same intervals of economic values of the subsidies, testing whether or not the different impacts of the repayable support (as opposed to the capital grants) were actually due to the nature of financial engineering as an instrument or simply to a residual size effect.

Overall, the results of Table 11 are quite in agreement with the findings of a greater cost-effectiveness of soft loans/interest-rate subsidies than capital grants; however, sales outcomes are more volatile across the different alternative specifications and fail to reach statistically significant differences across the different types of incentives. Moreover, the distributions of the GGE values of the incentives for the capital grants and the repayable subsidies have sufficient overlapping only for the values above the median threshold. For this reason, the results from Table 11 are able to confirm those of Table 10 only for the subsidies of largest GGE values (those above the threshold of €4.397 in terms of GGE). For the subsidies with lower GGE values, and for the investment analysis[8] (based on the small sample of corporate SMEs), instead, the estimated impacts failed to reach statistical significance.

[8] All impact estimates for the investment analysis are not statistically significant and are not included in the report.

Table 11. The impact of SME-Piemonte subsidies by the type of the instrument for different sizes of GGE

	Capital grants		Soft loans		Interest rate subsidies	
SUBSIDIES WITH SMALL GGE VALUES[9]						
EMPLOYMENT [(a)]						
Average impact	0.08		0.27	***	0.21	***
Cost per job created(	-		€ 10,472		€ 7,856	
No. of supported firms used in the analysis	251		294		5,781	
SALES [(a)]						
Average impact	€ 40,291	**	€ 42,996	***	€ 36,523	***
Cost per extra euro of sales	€ 0.04		€ 0.07		€ 0.04	
No. of supported firms used in the analysis	240		287		5,694	
SUBSIDIES WITH LARGE GGE VALUES[10]						
EMPLOYMENT [(a)]						
Average impact	0.49	***	0.67	***	0.43	***
Cost per job created	€ 68,102		€ 32,146		€ 40,199	
No. of supported firms used in the analysis	1,274		713		1,962	
SALES [(a)]						
Average impact	€ 9,736		€ 24,532	**	€ 60,216	***
Cost per extra euro of sales	-		0.86		0.27	
No. of supported firms used in the analysis	1,141		649		1,840	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the 0.1 level.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

To investigate the hypothesis that firms of different sizes may benefit differently from the different types of assistance (or that part of the differential impacts is be due to some composition effect in terms of differences in the sizes of the assisted firms) finally, we replicated the analysis (Table 12) also by cross tabulating each of the three types of assistance by three size classes (micro, small, medium firms). In this way we can compare the differential impacts holding constant the size of the firms across the three different types of incentives. Due to the limited number of medium firms in the Italian economy, however, the differential impact estimates for the medium firms fail to reach statistical significance. The results for micro and small firms, instead, show consistently a greater cost effectiveness of the subsidies tied to the re-payable assistance (soft-loans and interest-rate subsidies) than the capital grants[11].

Taken together, these findings provide support to the claim that public subsidies are more cost-effective when correcting credit market imperfections that do not allow micro and small firms without strong collateral to borrow for their investment projects. In the case of Italy, moreover, the results of the analysis support the hypothesis that non-repayable grants may be less effective than repayable assistance in preventing the rent seeking behaviour of firms with enough resources to implement the planned investment projects on their own.

[9] Below the median threshold of 4,397€ in terms of GGE.
[10] Above the median threshold of 4,397€ in terms of GGE. The distribution of the GGE values for the assisted firms is computed across all the different types of subsidies and before excluding the firms with incomplete / inaccurate outcome data. For this reason the total number of assisted firms considered in the analysis is not equal between the low and high GGE value categories.
[11] Impact estimates for investment are also suggestive of a better cost-effectiveness .of the re-payable assistance than the capital grants. However, due to small sample of corporate SMEs, most of the investment impact estimates fail to reach statistical significance and, for the sake of brevity, they are omitted from this report.

Table 12. The impact of SME Piemonte subsidies by the type of instrument for different firm sizes

	Capital grants		Soft loans		Int. rate grants	
RESULTS FOR MICRO-FIRMS (1-9 employees)						
EMPLOYMENT						
Average impact	0.41	***	0.55	***	0.22	***
Cost per job created	€ 54,906		€ 24,636		€ 19,455	
No. of supported firms used in the analysis	755		743		6,527	
SALES						
Average impact	€ 8,406	***	€ 54,843	***	€ 23,305	***
Cost per extra euro of sales	€ 2.69		€ 0.24		€ 0.18	
No. of supported firms used in the analysis	715		716		6,432	
RESULTS FOR SMALL FIRMS (10-49 employees)						
EMPLOYMENT [(a)]						
Average impact	0.45	***	0.57	***	0.48	***
Cost per job created	€ 71,163		€ 39,184		€ 25,443	
No. of supported firms used in the analysis	725		253		1,174	
SALES [(a)]						
Average impact	€ 28,568	***	€ -39,454		€ 0.07	
Cost per extra euro of sales[(a)]	€ 1.07		-		-	
No. of supported firms used in the analysis	634		223		1,100	
RESULTS FOR MEDIUM FIRMS (10-49 employees)						
EMPLOYMENT [(a)]						
Average impact	0.24		0.14		0.43	**
Cost per job created	-		-		€ 74,083	
No. of supported firms used in the analysis	80		21		47	
SALES [(a)]						
Average impact	€ 52,719		€ -0.33		€ 0.03	
Cost per extra euro of sales	-		-		-	
No. of supported firms used in the analysis	39		7		19	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

7. HOW IMPACTS VARY WITH THE ECONOMIC INTENSITY OF THE SUBSIDY

The different impacts highlighted in section 5 between the 488 and the support to the SMEs in the Piemonte region could be also explained by the differences in the economic value of the assistance, with subsidies with high economic intensity being less cost-effective than subsidies with low economic intensity. Also in this case, however, in order to produce reliable empirical evidence on the differential effectiveness, it is necessary to compare subsidies of the same type. Law 488 is ideal to produce such evidence because it offers a large variation in the per-firm amount of the subsidies, holding constant the type of the subsidy (non-repayable capital grants).

We divided the distribution of the size of the 488 grants in four groups defined by the thresholds of the quartiles of the distribution (such thresholds are close to €125,000, €250,00 and €500,000 as cut-offs[12]). Table 13 contains the results of the analysis, with the usual information, broken down by *size of the subsidy.* The results of the table show that the impact goes from less than one job when the grant is below €125,000, to about 2.7 when the grant is larger than half a million. These estimates, however, implies very differentiated cost per job created, which increases dramatically with the size of the

[12] The actual thresholds are €119,000, €255,000 and 537,000. For ease of readability, throughout the remainder of this report such thresholds will be rounded to €125,000, 250,000 and €500,000.

grant. The small 488 grants created 1,500 jobs at the cost of about €79,500. At the opposite side of the spectrum, large grants (over half a million of euro) display a cost per additional job of about 488 million.

For sales outcomes, the impact estimates (Table 13) display a pattern similar to employment, with a cost for each extra euro of sales that is the highest for the large grants of over €500,000 of value. The investment outcomes results are also somehow suggestive of a pattern similar to employment and sales. However, the smaller sample of the corporate firms for which the balance sheet data were available does not allow the analysis to reach definite conclusions because of the impact estimates not reaching statistical significance.

Table 13. The impact of law 488 grants by the economic value of the grant

	<€125,000		**€125,000 €250,000**		**€250,000 €500,000**		**>€500,000**	
EMPLOYMENT								
Average impact	0.91	***	1.61	***	2.38	***	2.69	***
Cost per job created	€ 79,460		€ 112,252		€ 158,048		€ 488,676	
No. firms used in the analysis	1,702		1,637		1,534		1,222	
SALES								
Average impact	€ 77,338	**	€ 184,610	***	€ 243,545	***	€ 293,828	***
Cost per extra euro of sales	€ 0.93		€ 0.98		€ 1.54		€ 4.23	
No. firms used in the analysis	1,615		1,553		1,446		1,086	
INVESTMENT								
Average impact	€ 30,800		€ 57,231		€ 133,157	*	€ 726,302	
Cost per extra euro of investment[(a)]	-		-		€ 2.87		-	
No. firms used in the analysis [(b)]	634		598		667		575	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
(b) Corporate firms only.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

To further assess the robustness of the findings, we explore whether the "grant-size effect" we notice in the case of employment and sales is due to the positive correlation between size of the grant and the size of the firms. To achieve this goal we cross tabulated the four grant intensity categories with four size classes to yield differential impacts controlling for firm size (Tables 14 and 15)[13]. The employment impact estimates, summarized in Table 14, show that the cost per each additional job generated by the programme is higher the higher is the grant value for both micro and small firms. While the small grants (less than €125,000) yield a cost per additional job of about €74,500 and €61,200 for the micro and small firms, respectively, the large grants yield a cost per additional job of about €386,000 and €404,000 . For medium firms and large firms, due to the small sample size, the empirical evidence that can be produced by the analysis is less conclusive since the impact estimates are statistically significant only for the grants of the largest economic values. However, for the medium firms, the largest grants (>€500,000) proved to be less cost-effective than the grant between €250,000 and €500,000,, and for the large firms the impact estimates are negative for the largest grants (>€500,000). Such negative result for the large firms benefitting from large grants, although based on a small sample (33 firms in all), is very robust since it is consistent throughout all of the five different models that we used to replicate the analysis.

[13] Due to the small sample of corporate SMEs available for the analysis, the model with the sixteen categorical impact estimates of Table 14 and 15 yields results that are not statistically significant for the investment outcomes. For the sake of brevity such results are omitted from the present report. Complete results are available upon request to the authors.

Table 14. The impact on employment of 488 grants by the value of the grant and by the size of the firms

	< € 125,000		€ 125,000 € 250,000		€ 250,000 € 500,000		> € 500,000	
MICRO FIRMS								
Average impact	0.93	***	1.24	***	2.16	***	3.82	***
Cost per job created	€ 74,541		€ 143,981		€ 172,894		€ 385,923	
No. of firms used in the analysis	984		899		715		437	
SMALL FIRMS								
Average impact	1.22	***	1.77	***	2.39	***	2.68	***
Cost per job created	€ 61,191		€ 103,195		€ 158,519		€ 403,778	
No. of firms used in the analysis	600		623		666		512	
MEDIUM FIRMS [(a)]								
Average impact	-0.91		3.88		3.58	**	2.68	***
Cost per job created	-		-		€ 105,925		€ 403,778	
No. of firms used in the analysis	118		112		150		512	
LARGE FIRMS [(a)]								
Average impact	-		-		-		-16.02	**
Cost per job created	-		-		-		-	
No. of firms used in the analysis	0		3		3		33	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Table 15 summarizes the same impact estimates for sales. The results of Table 15, overall, follows quite a similar pattern as employment. Contrary to the employment analysis, however, for the micro firms, the results are consistently too volatile to yield statistically significant estimates. This is due to the fact that the sales figured reported in the income returns by the smallest firms are also affected by the sales threshold set by tax authorities as the minimum standards needed to avoid a possible tax audit.

Table 15. The impact on sales of 488 grants by the economic value of the grant and by the firms size

	< € 125,000		€ 125,000 € 250,000		€ 250,000 € 500,000		> € 500,000	
MICRO FIRMS [(a)]								
Average impact	€ 13,029		€ 61,318		€ 109,458		€ 409,840	
Cost of extra euro of sales	-		-		-		-	
No. of firms used in the analysis	914		832		655		370	
SMALL FIRMS								
Average impact	€ 152,143	***	€ 270,792	***	€ 243,995	***	€ 534,018	**
Cost per extra euro of sales	€ 0.49		€ 0.67		€ 1.55		€ 2.01	
No. of firms used in the analysis	590		613		650		498	
MEDIUM FIRMS [(a)]								
Average impact	€ 209,268	**	€ 463,822	**	€ 900,817	*	€ -300,723	
Cost per extra euro of sales	€ 0.38		€ 0.39		€ 0.42		-	
No. of firms used in the analysis	111		106		139		208	
LARGE FIRMS [(a)]								
Average impact	-		-		-		€ -3,593,431	
Cost per extra euro of sales	-		-		-		-	
No. of firms used in the analysis	0		2		2		10	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

As before, the empirical evidence on the differential sale impacts for medium and large firms is not conclusive, due to the small sample sizes. For the medium firms, no statistically difference is detected in the cost per each additional euro of sales between the three lowest classes of the grant value. Estimates for the largest grant values (above €500,000) are negative but not statistically significant. As for the case of employment, also for sales, despite the small sample size, the programme impact for the large firms is consistently negative for the largest grant values (above €500,000) throughout five different models that we used to replicate the analysis.

In the next section we will discuss with more details the differential impacts for the SMEs versus the large firms.

8. HOW IMPACTS VARY WITH THE SIZE OF THE ASSISTED FIRMS

Estimating different impacts by size classes of the assisted firms is of great interest to refine future policy intervention. Large firms may not be subject to the same market imperfections that could prevent SMEs from implementing their investment projects. Moreover, in the case of capital grants, the more abundant staff and managerial resources of the large firms could make it easier for them to engage in "shopping for incentives" for investment projects that would have been implemented any way. In order to reliably estimate the differential impacts due to the different size of the assisted firms it is necessary to hold constant the type of the subsidy awarded. For this reason, the best empirical evidence is retrievable from Law 488 (to which also large firms were admissible).

Table 16 summarizes the results for the capital grants of Law 488. The findings highlight a limited and often non-significant difference between the impacts for micro, small and medium firms. Large firms, instead, despite the small sample size, do display (consistently throughout the five different model used as robustness check for the analysis) either negative impact estimates (for employment and investment) or impacts that are not statistically different from zero (for sales[14]).

Table 16. The impact on employment of 488 grants by size of the assisted firms

	Micro firms 1-9 employees		Small firms 10-49 employees		Medium firms 50-249 employees		Large firms 250+ employees	
EMPLOYMENT [(a)]								
Average impact	1.61	***	1.89	***	2.80	***	-2.34	***
Cost per job created	€ 230,700		€ 211,098		€ 235,590		-	
No. of firms used in the analysis	3,049		2,419		670		51	
SALES								
Average impact	€ 94,346	**	€ 266,299		€ 162,913	**	€ 211,292	**
Cost per extra euro of sales	€ 3.64		€ 1.48		€ 3.81		€ 4.00	
No. of firms used in the analysis	2,788		2,373		603		26	
INVESTMENT [(a)]								
Average impact	€ 219,809	**	€ 221,004	**	€ 374,243	*	€ -2,950,862	
Cost per extra euro of investment	€ 1.60		€ 1.78		€ 1.47		-	
No. of firms used in the analysis (b)	564		1384		506		20	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
(b) Corporate firms only.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Since large firms tend to be supported with grants of higher economic value, in order to capture correctly firm-size effect, ruling out possible composition effects, it is useful to compare the coefficient

[14] The sales impacts for the large firms also show negative point coefficients (without statistical significance) in the alternative models used to replicate the analysis.

estimates and cost-effectiveness of the subsidies to large firms, versus SMEs, considering a same size class of economic values of the incentives. Due to sample size limitations, this can be done solely for the grants of the highest class (above €500,000, Table 17[15]).

Results from Table 17 follows a similar pattern of those of Table 16: while no statistical difference is detectable between the grants awarded to micro, small and medium firms, the programme impacts for the large firms is instead consistently either not significantly different from zero (in the case of sales) or negative (in the case of employment).

Table 17. The impact of 488 grants by firm size for grants >€ 500,000[16]

	Micro firms 1-9 employees		Small firms 10-49 employees		Medium firms 50-249 employees		Large firms 250+ employees	
EMPLOYMENT [(a)]								
Average impact	3.82	***	2.68	***	3.24	***	-16.02	***
Cost per job created	€ 385,923		€ 403,778		€ 450,679		-	
No. of firms used in the analysis	437		512		240		33	
SALES [(a)]								
Average impact	€ 409,840		€ 534,018	**	€ -300,723		€ -3,593,431	
Cost per extra euro of sales	-		€ 2.01		-		-	
No. of firms used in the analysis	370		498		208		10	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

9. HOW IMPACTS VARY BETWEEN MANUFACTURING AND SERVICE SECTORS

Disentangling impacts between manufacturing and service firms could be important (particularly for employment outcomes), because assisted firms operating in the service sectors may have a propensity to use the subsidized investment for substituting labour with capital that is different from the manufacturing sectors. The results of the analysis, however, show that for the 488 grants, impacts do not vary much between the manufacturing and the service sectors (Table 18). Except for a slim advantage of the manufacturing sectors over the service sectors in terms of cost per job created by the incentives (€228,674 versus €243,647) and except for a slim advantage of the service sectors over the manufacturing sectors in terms of cost of extra € of sales and investment (€2,46 versus €1,73; and €1,93 versus €1,52, respectively).

These same findings are confirmed also when holding constant the size of the firms (by cross-tabulating two size classes -micro-small / medium-large firms- with two the two sector coding -service/ manufacturing-) and the region where the assisted firms are located (distinguishing between Northern-Central Italy and Southern Italy –former Obj. 1 area)[17].

[15] Table 17 contains the same information already reported in Tables 15 and 16. For ease of readability, however we choose to replicate also in this section that information.
[16] Due to sample size limitations, the results for investment do not reach statistical significance in any size class. For the sake of brevity they omitted from the present report.
[17] For the sake of brevity, results from these specifications are not included in the report. Complete results are available upon request to the authors.

Table 18. The impact of 488 grants by sector of the assisted firms

	Manufacturing sector		Service Sector	
EMPLOYMENT				
Average impact	1.91	***	1.45	***
Cost per job created	€ 228,674		€ 243,647	
No. of firms used in the analysis	4,899		1,290	
SALES				
Average impact	€ 167,481	***	€ 192,294	***
Cost per extra euro of sales	€ 2,46		€ 1,73	
No. of firms used in the analysis	4,622		1,168	
INVESTMENT				
Average impact	€ 222,451	**	€ 249,431	**
Cost per extra euro of investment	€ 1.93		€ 1.52	
No. of firms used in the analysis[(a)]	2.191		365	

(a) Corporate firms only.

*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

In Table 19 are summarized the results for the SMEs in the Piemonte region. Also in this case, the cost per each additional job generated by the incentives is greater in the service sector than in the manufacturing sector (€29,735 versus €49,100), while for investment outcomes, the cost of each extra euro of investment is higher in the manufacturing sectors than in the service sectors (€0.94 versus €0.56). For sales outcomes, instead, contrary to the results for the 488 grants, the cost of each additional euro of investment generated by the subsidies is higher in the manufacturing sectors than in the (€0.22 versus €0.48).

Table 19. The impact of SME-Piemonte subsidies by sector of the assisted firms

	Manufacturing Sector		Service Sector	
EMPLOYMENT				
Average impact	0.34	***	0.29	***
Cost per job created	€ 29,735		€ 49,100	
No. of firms used in the analysis	8,6262		2,272	
SALES				
Average impact	€ 42,135	***	€ 27,394	***
Cost per extra euro of sales	€ 0.22		€ 0.48	
No. of firms used in the analysis	7,897		2,179	
INVESTMENT				
Average impact	€ 30,214	**	€ 55,994	**
Cost per extra euro of investment	€ 0.94		€ 0.56	
No. of firms used in the analysis[(a)]	1.150		347	

(a) Corporate SMEs only.

*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

10. HOW IMPACTS VARY BETWEEN FORMER OBJECTIVE 1 AREAS AND NON-OBJECTIVE 1 AREAS

The data on the 488 grants are ideal to also empirically test whether or not a generous capital grant programme yields different impacts across areas of different degrees of socio-economic distress. The 488 incentives cover both Southern Italy (composed by the regions of Campania. Molise, Puglia, Calabria , Sicilia and Sardegna), which is a former Objective 1 area with quite severe socio-economic distress, and Northern-Central Italy which has a more developed economy.

The results of the analysis show that, at first glance (Table 20), the 488 grants produce additional investments (compared to what would have happen without the incentives) at cost slightly lower in Southern Italy than in Northern Italy (€1.82 versus €1.95 per each additional euro of investment). The average employment and sales impacts of the 488 grants, however, are far worse in Southern Italy than in Northern-Central Italy: the cost per each additional job generated by the incentives is less than two thirds in Northern-Central Italy than in Southern Italy (€164,872 versus €272,237), while the cost of each extra euro of sales is in Northern-Central Italy one fourth than in Southern Italy (€1,04 versus €4,14).

Table 20. The impact of 488 grants by geographic location of the assisted firms

	Northern-Central Italy		Southern Italy (former Obj. 1 area)	
EMPLOYMENT				
Average impact	2.14	***	1.66	***
Cost per job created	€ 164,872		€ 272,237	
No. of firms used in the analysis	2,008		4,181	
SALES				
Average impact	€ 311,600	***	€ 104,273	***
Cost per extra euro of sales	€ 1,04		€ 4,14	
No. of firms used in the analysis	1,905		3,885	
INVESTMENT				
Average impact	€147,654	**	€ 296,884	**
Cost per extra euro of investment	€ 1.95		€ 1.82	
No. of firms used in the analysis[(a)]	1,168		1,306	

(a) Corporate firms only.

*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

In order to draw definitive conclusions on the differential impacts of the incentives due to the geographic location of the assisted firms, however, we need to take into account the fact that the distribution of certain firm characteristics of the assisted firms is different across Northern-Central and Southern Italy. In particular: Medium and large enterprises are 10% of the assisted firms in Southern Italy, while they are 26% in Northern-Central Italy; firms in the manufacturing sector are 76% of the assisted firms in Southern Italy, while they are 91% in Northern-Central Italy; firms that received grants with an economic value above approximately €250,000 are 54% in Southern Italy, while they are 30% in Northern-Central Italy. All of these differences can produce composition effects and they need to be controlled for in the analysis.

This is done by replicating the analysis with three additional model specifications that hold constant size (Table 21), sector of the assisted firms (Table 22) and the economic value of the grants (Table 23).

Results from Table 21 highlight that the employment impact of the subsidies vary the most between Southern and Northern-Central Italy for medium and large firms. Consistently throughout all model specifications (as detailed in Technical appendix), the employment impact of the 488 grants is either negative or statistically not different from zero for firms above 50 employees. For sales, the cost of generating each additional euro of sales is 2.5 and 4.5 times higher in Southern Italy than in Northern-Central Italy (€0.84 versus €3.92 for micro and small firms and €2.52 versus €6.35 for medium and large firms). For investment outcomes, the differential cost of generating each additional euro of investment between Northern-Central and Southern Italy, instead, is either not statistically different or slightly higher in Northern-Central Italy.

Table 21. The impact of 488 grants by geographic location and by size of the assisted firms

	Micro & small firms				Medium & large firms			
	Northern-Central		Southern		Northern-Central		Southern	
EMPLOYMENT[(a)]								
Average impact	1.55	***	1.80	***	4.16	***	-0.45	
Cost per job created	€204,299		€227,063		€114,206		-	
No. of firms used in the analysis	1,556		3,912		452		269	
SALES								
Average impact	€ 348,391	**	€ 101,243	**	€ 172,292	**	€ 152,200	**
Cost per extra euro of sales	€ 0.84		€ 3.92		€ 2.52		€ 6.35	
No. of firms used in the analysis	1,507		3,654		398		231	
INVESTMENT								
Average impact	€ 133,961	**	€ 283,021	**	€ 179,269	**	€ 387,674	**
Cost per extra euro of investment	€ 1.68		€ 1.74		€ 2.41		€2.18	
No. of firms used in the analysis [(b)]	815		1,133		353		173	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
(b) Corporate firms only.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

When holding constant the sector of the assisted firms (Table 22) or the economic value of the subsidies (Table 23), results are quite similar to those of Tables 20 and 21. The cost for each additional job generated by the incentive is higher in Southern than in Northern-Central Italy for both manufacturing and service firms (about €158,000 versus €277,000, and €218,000 versus €253,000, for manufacturing and service firms, respectively, Table 22). Also higher in Southern than in Northern-Central Italy is the cost of the incentives of both low and high economic values (about €71,000 versus €168,000, and €260,000 versus €304,000, for incentives below and above €250,000, respectively, Table 23).

Table 22. The impact of 488 grants by geographic location and by sector of the assisted firms

	Manufacturing firms				Service Firms			
	Northern-Central		Southern		Northern-Central		Southern	
EMPLOYMENT								
Average impact	2.18	***	1.76	***	1.89	***	1.34	***
Cost per job created	€158,019		€277,201		€218,244		€252,659	
No. of firms used in the analysis	1,748		3,151		260		1,030	
SALES								
Average impact	€ 294,560	**	€ 96,128	**	€ 428,145	**	€ 130,335	**
Cost of extra euro of sales	€ 1.07		€ 4.85		€ 0.88		€ 2.46	
No. of firms used in the analysis	1,662		2,960		243		925	
INVESTMENT [(a)]								
Average impact	€ 152,424	*	€ 292,811	*	€ 102,240		€ 313,754	*
Cost of extra euro of investment	€ 1.88		€ 1.95		-		€1.32	
No. of firms used in the analysis[(b)]	1,057		1,052		111		254	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
(b) Corporate firms only.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Results for sales follow a pattern similar to employment, with higher costs per euro of additional sales in Southern than in Northern-Central Italy (although, estimates are not statistically significant in the case of incentives with an economic value below €250,000). Once again similarly to the results of Table 20, the two specifications of Tables 22 and 23 show instead that the differential cost of inducing

each additional euro of investment between Southern and Northern-Central Italy is either not statistically different or slightly higher in Northern-Central Italy.

Table 23. The impact of 488 grants by geographic location and by economic value of the subsidies

	< € 250,000				≥ € 250,000			
	Northern-Central		Southern		Northern-Central		Southern	
EMPLOYMENT								
Average impact	1.52	***	0.81	***	3.66	***	2.42	***
Cost per job created	€71,124		€167,591		€259,931		€304,051	
No. firms used in the analysis	1,425		1,983		583		2,198	
SALES [(a)]								
Average impact	€ 24,168		€ 12,780		€ 313,290	**	€ 204,540	**
Cost of extra euro of sales	-		-		€ 2.71		€ 3.30	
No. of firms used in the analysis	950		1,719		328		1,809	
INVESTMENT [(a)]								
Average impact	€ 80,076		€ -27,089		€ 302,418	*	€ 449,922	*
Cost of extra euro of investment	-		-		€2.26		€1.62	
No. of firms used in the analysis[(b)]	813		419		355		887	

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
(b) Corporate firms only.
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Overall, the set of results in Tables 20-23, highlight that the generous non-repayable grants of Law 488 generate additional investment activities (that would have not occurred in the absence of the incentives) at an equal cost between former Objective 1 areas (Southern Italy) than elsewhere. In Southern Italy, however, the 488 grants do display a much higher cost per additional job and per each additional euro of sales than in Northern-Central Italy. Such findings provide support to the hypothesis (which is also corroborated by anecdotal evidence) that generous non-repayable grants do face challenges in the program monitoring and controlling activities that are greater in economically distressed areas than elsewhere. Such greatest challenges (possibly due a highest degree of inefficacy in preventing scam investment projects to occur) temper the actual efficacy of the intervention in terms of additional jobs and sales generated in Southern Italy.

11. THE IMPACTS ON LABOUR PRODUCTIVITY AND AVERAGE PAYROLL COSTS

In Italy, as in the vast majority of the other EU countries, social security (worker-level) databases are not readily available (or cannot be disclosed) so that they can be merged with the firm-level data used in the analysis. As a consequence no detailed information is available to reconstruct the profile (in terms of previous work-experience, age, education, job position and/or salary) of the workforce of the firms included in the analysis. Nevertheless, the important research questions concerning the quality of the jobs generated by the incentives can be partially addressed looking at the impacts on labour productivity and average payroll costs.

Focusing on average payroll costs can offer some evidence on the quality of the jobs generated by the incentives because a significant and positive impact on payroll costs, in conjunction with a positive impact on employment, can signal that the new jobs generated by the incentives are sufficiently qualified to raise the average salary paid to the workforce. Labour productivity can also offer some indirect evidence on the quality of the jobs generated by the incentives, because a significant and positive impact on labour productivity, in conjunction with a positive impact on employment, can signal that the new jobs generated by the incentives are sufficiently qualified to handle a shift toward a more capital intense production process. At the opposite, a negative and significant impact on

productivity, in conjunction with a positive impact on employment, can signal a shift toward a more labour intense production process, with the new jobs generated by the incentives that are likely to require low human capital accumulation.

Table 24 summarizes the impact of the Law 488 incentives on the firms average (per-employee) yearly payroll costs. On average, the effect of the incentives on the payroll costs is not significantly different from zero. As highlighted in the table, the impact of the Law 488 grants on the average payroll costs is also estimated as not significantly different from zero across the different classes of the economic value of incentives and the size and sector of the assisted firms.

Table 24. The impact of 488 grants on average payroll costs

Impact on yearly payroll costs (per employee)			€ -136	
No. of firms used in the analysis[(a)]			2,474	
BY ECONOMIC VALUE OF THE GRANT	< € 125,000	€ 125,000 € 250,000	€ 250,000 € 500,000	> € 500,000
Impact on yearly payroll costs (per employee)	€ 633	€ -179	€ -137	€ -939
No. of firms used in the analysis [(a)]	634	598	667	575
BY SIZE OF THE FIRMS	Micro firms 1-9 employees	Small firms 10-49 employees	Medium firms 50-249 employees	Large firms 250+ employees
Impact on payroll costs (per employee)	€ -783	€ 45	€ 79	€ 133
No. of firms used in the analysis [(a)]	564	1,384	506	20
BY SECTOR		Manufacturing	Service	
Impact on payroll costs (per employee)		€ 282	€ 708	
No. of firms used in the analysis [(a)]		2,109	365	

*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.
(a) Corporate firms only.

Table 25 summarizes the results on average payroll costs for the incentives awarded to the corporate SMEs in the Piemonte region. The impact estimates for the corporate SMEs in the Piemonte region show that (in agreement with the results for the law 488 grants) the average payroll costs is not statistically different from zero for both capital grants and soft loans and interest rate grants..

Table 25. The impact on average payroll costs by type of assistance (corporate SME-Piemonte)

	Capital Grants	**Soft loans**	**Interest rate grants**
Impact on payroll costs (per employee)	€ 220	€ 348	€ 260
No. of firms used in the analysis[(a)]	794	396	200

*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.
[(a)] Corporate firms only.

For labour productivity, the results of the analysis show a negative, albeit not statistically significant (due to the high volatility of the sales figures reported in the ISTAT data), average effect of the Law 488 grants (Table 26). As highlighted, the average negative impact (with impact estimates that fail to reach statistical significant levels) on labour productivity of the Law 488 grants is quite stable across the different types of incentives and the size and sector of the assisted firms.

Table 26. The impact of 488 grants on labour productivity

Avg. Impact on labour productivity [sales per employee]		-€ 9,046		
No. of firms used in the analysis		5,847		
BY ECONOMIC VALUE OF THE GRANT	< € 125,000	€ 125,000 € 250,000	€ 250,000 € 500,000	> € 500,000
Impact on sales per employee	€ -14,291	€ 4,266	€ -16,416	€ -26,721
No. of firms used in the analysis	1,544	1,459	1,344	968
BY SIZE OF THE FIRMS	Micro firms 1-9 employees	Small firms 10-49 employees	Medium firms 50-249 employees	Large firms 250+ employees
Impact on sales per employee	€ -14,322	€ -4,041	€ -5,040	€ 1,875
No. of firms used in the analysis	2,802	2,386	630	29
BY SECTOR	Manufacturing		Service	
Impact on sales / per employee	€ -9,058		€ -8,997	
No. of firms used in the analysis	6,659		1,188	

*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Table 27 illustrates the labour productivity estimates for the entire spectrum of incentives awarded to the SMEs in the Piemonte region. The impact estimates for the MEs in the Piemonte region show that (in agreement with the results for the law 488 grants) the average impact on labour productivity is negative for capital grants assistance, while is positive for soft-loans and interest rate grants.

Table 27. The impacts on labour productivity by type of assistance (all SMEs in Piemonte)

	Capital Grants	Soft loans	Interest rate grants
Impact on sales per employee	€ -18,330 ***	€ 16,872 **	€ 34,581 ***
No. of firms used in the analysis	1,531	1,007	7,762

*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

The results of Table 27 are robust across all model specifications and are confirmed also when the type of assistance is cross-tabulated by two categories of economic values of the incentives, in order to properly compare estimates holding constant the value of the incentives[18].

12. COMPARING ECONOMETRIC RESULTS WITH EVIDENCE FROM BENEFICIARY SURVEYS

The econometric analysis presented above is complemented by a beneficiary survey aimed at obtaining directly from the assisted entrepreneurs their view on whether their enterprise was induced to carry-on the investment by the existence of the subsidy, or it would have invested anyway. This can be done by questionnaires that ask the managers of the enterprises about their motives for requesting the subsidy. *This amounts to asking directly the respondents to do a mental reconstruction of the counterfactual.* For example, a team at the Bank of Italy (Cannari et al, 2007) writes explicitly:

> "*We asked the firms that had received subsidies to provide a counterfactual assessment of what their investment activity would have been, had they not been financed. Unlike evaluation methods, in our approach the evaluator is the recipient firm rather than the econometrician*."

[18] For the sake of brevity, results from this specification are not included in the report. Complete results are available upon request to the authors.

Other researchers (Criscuolo *et al*., 2012) adopt a counterfactual approach but they notice that :

> "*Most of the previous evaluation studies are based on "industrial survey" techniques where senior personnel of a randomly drawn sample of assisted firms are asked to give their subjective assessment of what the counterfactual situation would have been had they not received the grant.*"

To be sure, an advantage of these surveys lies in the fact that, in very specific circumstances – to be carefully assessed – beneficiaries might possess information on the causal mechanisms producing the effects. The answers to the questions asked to beneficiaries, even if somewhat distorted, in principle can contain useful information. And these surveys are very *easy to implement*, since they do not require to identify and extract a control group of non recipients. In our experience, however, the results from beneficiary surveys risk of being heavily influenced by the wording of the questions, by the type of rapport established with the respondents, and by the difficulty of the mental effort required of the respondents in order to reconstruct a counterfactual investment outcome.

Our approach to the beneficiary survey

The solutions that we adopted to address these concerns include: a careful selection of the respondents within the sampled firms in order to identify the persons that were actually in charge of the investment decisions; a redundancy check within the questionnaire in order to test the reliability of the answers to the counterfactual question; exploiting the data on rejected applicants for the analysis of Law 488. This last feature of our beneficiary survey analysis is quite important as the rejected applicants are not asked (difficult) counterfactual questions, rather relatively simple factual questions on what happened to the investment for which they were denied funding. In principle, the two sets of answers (those of the beneficiaries and those of the rejected applicants) should coincide. To exploit this potential parallelism (crucial for the credibility of the whole exercise) we designed the two questionnaires in a parallel way.

The beneficiaries of Law 488 (as well as for SME Piemonte) were asked:

> *In case you would have been denied the [name] financing, what would have happened to the investment project for which you received the subsidy?*

The four possible answers are:

a. We would have gone ahead with the same project
b. We would have delayed the project
c. We would have invested a smaller amount
d. We would have cancelled the project entirely

The 488 rejected applicants instead were asked

> *After you did not received the 488 subsidy, what happened to the investment project?*

The four possible answers are:

a. We went ahead anyway with the same project
b. We delayed the project
c. We invested a smaller amount
d. We cancelled the project entirely

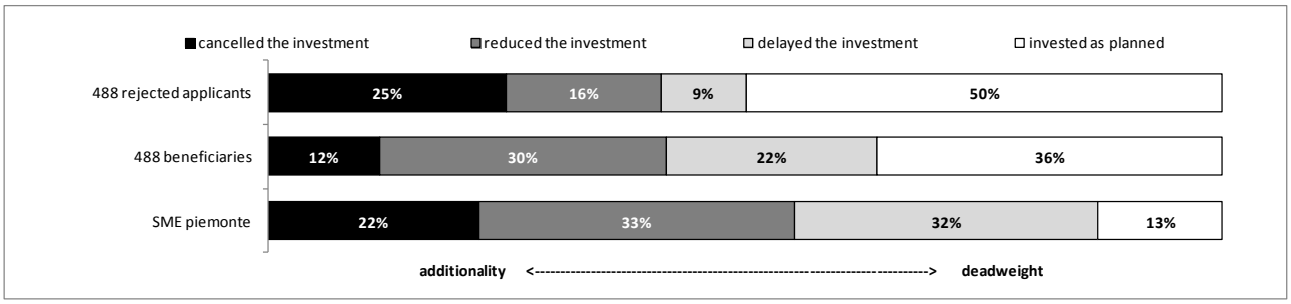
Note the strict parallelism between the two sets of possible answers. Basically, one adds the words "would have" to the questions in the second set. However, the cognitive task faced by the two groups remains quite different.

The first and the last answers in each set are the two "pure" situations: ideally, it would be preferable to receive only answers a), implying pure *deadweight,* or d) implying pure *additionality,* respectively. The interpretation of the results would be rather straightforward. Either the firm responds to the incentive by doing something it would not have done, and picks the d) answer; or the firm takes advantage of a subsidy while it does what would have done anyway, self-financing it or getting a loan, and picks the a) answer. This is not quite what happened.

The results

The distribution of the answers to the key question "what happened/what would have happened to the project without the subsidy" is shown in Figure 5. It is immediately apparent that the responses vary across groups, with a lot of weight put on the intermediate values.

Figure 5: Answers to the question "what happened/what would have happened without the subsidy?"



488 rejected applicants. Among rejected applicants, *responses are much more polarized* than among the other two groups beneficiaries. Half of the rejected applicants declare they went ahead with the same investment after having their application rejected. These firms were then asked how they financed the investment, in absence of 488 grants: 64.8% turned to banks or other private sources of funding; 59.7% used internal resources by giving up other investments opportunities; only 11.3% said they applied for alternative forms of public support.

Another 25% of rejected applicants report that they cancelled the project. Of these, 37% declare they gave up their investment project because of heavy credit constraints, 52% were discouraged by adverse market/sector conditions and 20% said that, without subsidy, the investment was no longer profitable.

The remaining 25% chose an intermediate answer, either reporting they delayed and those saying they reduced the size on the investment. We ask in a subsequent question how much they reduced and how long they postponed the project. The distribution of the delay and on the reduction are shown in Table 27.

488 beneficiaries. The distribution of the answers to the key additionality question is significantly different between the 488 rejected applicants and 488 beneficiaries. The latter are less polarized, with about half of the respondents indicating an intermediate answer. This is consistent with the fact that they answer a hypothetical question. Only 12% of 488 beneficiaries report *full additionality*. At the opposite side of the spectrum, over a third report that they would have done the same investment, that is, full *deadweight*. Of the intermediate answers, slightly more go to the "delayed investment", than to the "reduced investment". The distribution of the delay and of the reduction are shown in Table 27.

SME Piemonte beneficiaries. The distribution of answers given by SME recipients in one respect is similar to that of 488 recipients: in both distributions the two intermediate answers take almost two third of the responses. On the other hand, the two distributions have very different tails. There is a very small percentage of "invested as planned" answers (only 13% vs. 33% of 488 recipients and

50% among rejected applicants). At the opposite side, 22% reporting full additionality is similar to that of 488 rejected applicants. The sharp difference in the pure values suggest something structurally different in the response of SME recipients. This goes against the intuitive notion that larger grants carry higher probability of influence on the investment choices. The truth might be the opposite. If the fundamental mechanism behind low additionality is the presence of "subsidy-hunters", then their presence "follows the money". During in-depth interviews conducted under a different project (Rocca and Strada, 2007) we were told that the grant portion of the subsidy was considered by firms as a way of paying for the cost of the consultants. It is possible that the typical amount of a SME subsidy is too small to make it worthwhile for the typical consultant to be interested.

Table 27. The delay and reduction declared by the respondents

		488 beneficiaries	488 rejected applicants	SME beneficiaries
DELAY	Less than 6 months	13.2%	5.9%	25.5%
	6 to 12 months	34.0%	23.5%	32.4%
	13-24 months	39.6%	41.2%	33.8%
	More than 24 months	13.2%	29.4%	8.3%
REDUCTION	Up to 50%	27.1%	39.4%	36.8%
	More than 50%	72.9%	60.6%	63.2%

Table 27 shows a remarkable similarity between the distributions of the delays and of the reductions indicated by those respondents who chose the two intermediate answers. Only a minority of respondents would have delayed the project more than two years, while the majority would have reduced it more than 50%.

Comparison with "net" impact obtained from monitoring data and beneficiary survey[19]

A widely used evaluation strategy has been to estimate "net" impacts by multiplying monitoring figures by the additionality coefficient deduced from a beneficiary survey. In the case of Law 488, the monitoring figure of 82,000 jobs created cannot be reconciled with the econometric evidence of 12,000 jobs, not by any plausible use of the survey results. Even a creative use of the additionality figures still suggests a net job creation of 31,000, way above the econometric evidence. We came to this figure by starting from the 82,000 jobs and applying all the information taken form the survey.

- A *lower bound* is calculated by taking 12% of 82,000 and *adding* in 72,9% of the 30% who report reducing the investment by more than 50%. This produces a lower bound estimate of 28,000 additional jobs.
- An *upper bound* is calculated by taking 64% of 82,000 (those reporting some additionality) but *subtracting* 47% of the 22% (those who said the delay would be 12 months or less). This produces an upper bound estimate of 44,000 additional jobs.

Even choosing the midpoint of 36,000, this result is difficult to reconcile with the 12,000 additional jobs obtained from the counterfactual analysis. We find the latter figure more believable than the "back-of-the-envelop" calculations that can be done with monitoring data and subjective responses to difficult questions asked during an interview.

[19] We write "net" impact because we firmly believe that term such as "gross" or "net" impacts make little sense in this context. One should talk of "observed changes" and "impacts", and the challenge is to disentangle the latter from the former.

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TECHNICAL ANNEX: ESTIMATION METHODS AND RESULTS OF THE SENSITIVITY ANALYSIS

A.1 ADDITIONAL DETAILS ON THE DATA USED FOR THE EVALUATION

The databases used in the analysis derive from merging the following multiple sources of information:

The Law 488 archives. The data on Law 488 contain a record for each project that was ever submitted by the firms applying for the grant (including the information on the firm's ranking in the competitive application process). The data provided to ASVAPP contain the following fields:

- Unique firm identifier (VAT identification code) and firm name
- Regional, province and city location of the firm
- Value of the investment grant awarded to the firm
- Value of the financing granted for the project as below-market-rate (soft) loan
- Information on the deadline for the call for application procedure
- Dates of the different instalments of the grant payments
- Score of the proposed investment project.

Piemonte SMEs beneficiaries archives. The data on SMEs beneficiaries in the Piemonte region were provided to ASVAPP in different files with heterogeneous formats but with some common features. Each row of the spreadsheet generally corresponds to a single episode of granted assistance, and they are typically organised as spreadsheet files (one for each year within the period 2005-2009) with the following data fields:

- Unique firm identifier (VAT identification code) and firm name
- Value of approved investment project (and/or approved expenditures)
- Value of the support granted (for soft loans, total granted for the approved expenditures)
- Date of application approval
- Dates of the different instalments of the payments.

The ISTAT Statistical Archives of Active Firms (ASIA). ISTAT-ASIA provides accurate information on: employment (with figures on the average yearly stock of workers coming directly from the monthly data of the Italian Social Security Agency archives); sales (with yearly figures coming directly from the Italian National Revenue Service "Agenzia delle Entrate"); and firm demographic information (with data coming from the Registry of Enterprises maintained by the Network of Italian Chambers of Commerce).

The most relevant fields included in the database are:

- VAT unique identification code and firm name
- Geographical location (province, city and street address)
- Standard industrial classification code (ATECO)
- Whether or not the firm is legally a craft enterprise
- Total number of workers (average of monthly figures provided by INPS)
- Value of yearly sales (as reported to the "Agenzia delle entrate").

The access to ASIA is restricted and a special joint agreement between ISTAT and DG-Regio was signed in order to use the data for the analysis. The ASIA data is an essential source of outcome data, both for the Piemonte SMEs and for the 488 analysis.

The ISTAT balance sheet archives. The balance sheet archives owned by ISTAT provide the information on the firms' investment activities and payroll costs information used in the analysis. Such database is skewed toward larger firms since it covers the entire population of Italian corporations, and it does not include any non-corporate firm. For evaluating the support provided by Law 488, such limitation has little consequences, since the large majority of to assisted firms (roughly 80%) are corporations. By contrast, to evaluate the enterprise support offered to SMEs of Piemonte, excluding non-corporate firms does reduce the sample size by a considerable amount. Unfortunately in Italy there are no official sources of data on investment activities and payroll costs for small non-corporate firms and no other data options were available.

Merging the databases and checking the quality of the data. All databases mentioned above were merged into a unique file thanks to the common unique firm identifier, the VAT identification code. The beneficiaries databases for both Law 488 and the spectrum of support programmes available to the SMEs located in the Piemonte region were organized with multiple entries (one for each single installment of the subsidy payment). Such databases were reduced to firm-level spreadsheet in order to merge it with the ISTAT-ASIA and balance sheet information annual databases.

The availability of both the ISTAT-ASIA and the ISTAT balance sheet information archives for the entire population of the Italian corporations, allowed the following empirical check on the quality of the data. Firms dropping in or out from the balance sheet archives because of a change in their corporate legal status can be tracked by the ISTAT-ASIA data, allowing us to empirically estimate the existence of non trivial "attrition bias" in estimating the programme impacts on investment and payroll cost outcomes. Such attrition bias issues are often overlooked when relying on outcome data derived from balance sheet information restricted to corporate firms. This is because some firms can drop out of the sample because of a firm downsizing/upsizing process resulting in a change in their corporate status. Such non-random exclusions from the sample can result in both an upward or downward bias in the impact estimates. For example, if some firms lost their legal status after the programme intervention because of a downsizing process, such firms were drop out from the balance sheet archives sample and the impact evaluation estimates were based only on the sample of firms not subject to such downsizing processes.

A.2 THE IMPACT IDENTIFICATION STRATEGIES & ESTIMATION MODELS

As stated in the main body of this report, the purpose of the analysis is to produce differential impact estimates for different characteristics of the assisted firms and different types of treatment. Technically, such differential estimates are in the form of average treatment effects on the treated (ATT) parameters that can be defined formally as follows. Let us assume for each unit of observation a set of potential outcomes: the value denoted by Y^0, indicating the outcome that would be observed if unit *i* received no treatment of any kind, and the other ones denoted by Y^1_c, indicating the outcome of receiving a categorical treatment of type *c*, with $\{c = 1,2,....,n\}$ being the different discrete treatment categories. $T^c \in \{0,1\}$ is a binary indicator for the treatment of category c (with $T^c=0$ corresponding to no treatment, and $T^c=1$ corresponding to treatment c). In case of a single treatment category, notations simplifies to Y^0, Y^1,$T\in\{0,1\}$. The ATT parameter for a single homogenous binary treatment is then represented by:

$$(1) \qquad \tau = E\,(Y^1 - Y^0 \mid T = 1)$$

When the treatment offered by the policy has quite different economic values across the population of eligible units or it offers different types of support (or when the impact is expected to be different according to different categories w of pre-intervention observable characteristics of the eligible units), empirical evidence useful for decision makers can be produced by estimating separate ATTs for different subpopulations of the treated units based on the type of categorical treatment c they received or their categorical pre-intervention characteristics w:

$$(2) \qquad \tau\,(c, w) = E\,(Y_c^1 - Y^0 \mid T^c = 1, w)$$

with $\tau\,(c, w)$ being the ATT for a specific subset of the treated units based either on the specific treatment c received (by the treated firms) and the specific categorical pre-intervention characteristic w (applicable to all firms), defined against a counterfactual status of not receiving any type of treatment[20].

In detail, such $\tau\,(c, w)$ categorical ATT parameters are operationalized as follows:

- For Law 488 and SMEs in Piemonte we estimated categorical ATT parameters with the treatment categories c differentiated by the intensity of the *economic value* of the support received (in terms of Gross Grant Equivalent figures when in the presence of a mixture of grants and soft loans). Non assisted firms receive a value of zero.
- For SMEs only, the heterogeneity of existing programmes allows the estimation of ATT parameters with treatment categories c differentiated by the *types of support* provided to the assisted firms, distinguishing between:
  - capital grants
  - soft loans
  - interest rate grants
- For either Law 488 and SMEs, the estimation of the impacts for each treatment category are separately replicated distinguishing between categories w of the treated firms based on their pre-intervention size (large, medium and small enterprises), industrial sector and geographic location (distinguishing between Northern-Central and Southern Italy).

[20] Such definition of the categorical ATTs parameters $\tau(c, w)$ allows ease of interpretation of the differential impacts for the different subpopulation of the treated units based on c and w compared to estimating the composite effects (for any given type of firms w) corresponding to the effects of the treatment of type c against a counterfactual state were the treated firms ($T^c=1$) would be randomly assigned to one of the other treatments with probabilities given by weights defined by the relative participation frequencies (Gerfin and Lechner 2000, Lechner 2002).

Comparison group design and the threat of selection bias. In order to estimate the categorical ATT parameters of interest we rely on a comparison group design approach in which the counterfactual outcomes are estimated based on the data from a group of non-supported firms. Evaluating the impact of public programmes with a comparison group design yields reliable impact estimates only if the analysis successfully control for all factors that may cause the outcome to be different between the groups of firms in the different treatment categories and the group non non-treated firms. As discussed elsewhere (e.g. Bondonio and Greenbaum 2006 Forthcoming, Bondonio 2009), the main factors that may affect the outcome of enterprise support policies apart from the programme can be summarized as follows:

I) Macro-business cycles that similarly affect profitability, investment, and hiring decisions for all firms operating in the same national economy

II) Economic conditions that affect the costs and revenues of all firms located within the same local/regional economy. Such common local economic conditions may affect investment and hiring decisions for all firms located within the same geographic area regardless of whether or not the firms are eligible to receive public subsidies.

III) Business sector-specific market conditions that could affect costs and revenues for all firms operating in a similar industrial sectors

IV) Various firm characteristics (such as size, years on the market, know-how, managerial skills) which may be differently distributed between the groups of firms in the different treatment categories and the group non non-treated firms, and may produce different outcomes even in the absence of the programme intervention.

Obviously, the national- or regional-business cycle factors of point I (commonly affecting all firms taken into consideration in the analysis) do not pose any particular threats to the validity of the analysis. Such national- regional-business cycles can be assumed to have the same effect for treated and non-treated firms and would therefore not bias the impact estimates.

The local economic conditions and sector-specific market conditions of points II and III, along with any firm specificity of point IV, potentially pose more significant threats to the validity of the analysis, creating the potential for selection bias. The methods used in the analysis to deal with selection bias depend on a) whether rejected applicants are used as a source of controls (when rationing exists) vs. using a sample of non applicants; b) whether the matching is done using "stratification and reweighting" vs. "propensity score"; c) when rejected applicants are used, whether the comparison between beneficiaries and non beneficiaries is further restricted around the cut-off point used to determine acceptance and rejection (a mild form of discontinuity design). Combining these different choices and criteria, we constructed five different main estimation models (Tables A1 and A2). For ease of readability, the results illustrated in the main body of this final report were based on methods A and B of Table A1. Nevertheless, the estimates from the methods C-E of Table A2 constitute an extensive sensitivity analysis to check the robustness of the results.

Table A1. Preferred estimation models

Name	Description	Controls for possible (treated –non treated) heterogeneity due to different:	Used in
A) Stratification &Reweighting Matching (control group: Applicants)	Treated firms are matched with the non-treated firms with identical: • sector (2 digit) • size class • geographic area (northern-central Italy vs Southern Italy) • desire to invest	• sector-specific economic trends; • size effects (larger vs small firms may face different challenges/achieve different economies of scales) • geographic areas (proxy for possible cultural-socio –economic -institutional-transportation & labor cost-differences that may affect outcomes) • unobserved characteristics (e.g. brand value, market position, managerial abilities) that lead to the decision to apply for the subsidy • remaining unobserved differences between the treated and the non-treated firms (as long as they do affect the outcomes in a constant-over-time manner or as long as they are captured by the same desire to invest)	**Law 488**
B) Propensity score & regression (control group: non-assisted firms)	Treated and non-treated firms are included in the analysis only if they share (on aggregate) similar characteristics (as indicated by their Propensity score). Specific remaining difference between treated and non-treated are then controlled for with a regression difference in difference design	• sector-specific economic trends • size effects • geographic location (at the Province level) • pre-intervention trends (as a proxy for same need/desire to invest) • unobserved differences between the treated and the non-treated firms (as long as they do affect the outcomes in a constant-over-time manner)	**Piemonte SMEs**

Table A2. Additional estimation models (sensitivity analysis)

Name	Description:	Controls for possible (treated –non treated) heterogeneity due to different:	Used in
C) Propensity Score Matching (control group: non-assisted firms)	Treated firms are matched with groups of rejected applicants who have similar: sector; size class; pre-intervention trends & province location	• sector-specific economic trends; • size effects; • geographic location (at the Province level); • pre-intervention trends (as a proxy for same need/desire to invest); • unobserved differences between the treated and the non-treated firms (as long as they do affect the outcomes in a constant-over-time manner)	**Law 488 & Piemonte SMEs**
D) Discontinuity design on ranking of applicants	Treated firms are compared solely to rejected applicants who applied to the same auction & have same size & similar application scores (+- 1 std. dev from the threshold)	• size effects; • geographic location (at the regional level); • similar quality of the proposed investment projects (same application scores) • time un-varying unobserved differences between the treated and the non-treated firms;	**Law 488**
E) Stratification & Reweighting Matching (control group: applicants from same regional auctions)	Treated firms are matched with groups of rejected applicants who applied to the same regional programme auction & have same size	• size effects; • regional effects; • time un-varying unobserved differences between the treated and the non-treated firms;	**Law 488**

All of the estimation model summarized in Table A1 and A2 exploit the availability of panel data to implement a difference in difference (DD) scheme that is capable of controlling for local economic and sector specific market conditions that may affect the outcome of interest in different ways between treated and non-treated units and independently from the programme intervention. This is because by differencing the outcome variable, all pre-intervention characteristics that may be assumed to affect the outcome variable in a constant manner across different times are neutralized.

However, simple DD approaches [21] would have the limit of heavily relying on the assumption that every type of heterogeneity between treated- and non-treated-firms must have a constant influence on the level of the outcome variable in any of the times considered in the analysis. For most of the enterprise support programmes such strict assumption on the influence of unobserved heterogeneity may be hard to justify. This is because, in many cases, pre-intervention characteristics of firms may generate multipliers effects with no constant influence on levels or on the linear trends of the outcome variable.

For this reason, the estimation model used in the analysis (Tables A1 and A2) are all conditional Difference in Difference (CDD) approaches implemented with various techniques. In general terms, CDD approaches make use of data on same observable pre-intervention characteristics (such as, for example, size, industrial sector, location, age on the market) by including them in the analysis as control variables. In this way, the estimation model yields unbiased impact estimates without having to assume that the observable pre-intervention characteristics are fixed effects, while the remaining possible unobserved heterogeneity between the treated and non-treated firms is still controlled for by the pre-post intervention differencing the outcome variable Y.

Next we will illustrate in details the models A-E that we used in the analysis.

MODEL A: STRATIFICATION &REWEIGHTING MATCHING (CONTROL GROUP: REJECTED APPLICANT)

The stratification and reweighting matching procedure (used as preferred specification in the analysis of Law 488) can be summarized as follows:

I) separately for each year *t* from 2001 and 2008, we constructed a unique firm-level database that included all of the treated firms for which the subsidized investment was deemed to be operational in year t and that did not have any other subsidized investment deemed

[21] For the case of a single a single homogenous binary treatment category, the difference in difference (DD) estimators can be defined as:

$$\tau_{DD} = E\,[Y^1_{t+p} - Y^0_{t-r} \mid T_i=1] - E\,[Y^0_{t+p} - Y^0_{t-r} \mid T=0]\ .$$

Simple DD estimators yields unbiased estimates only if:

$$E[Y^0_{t+p} - Y^0_{t-r} \mid T=0] - E[Y^0_{t+p} - Y^0_{t-r} \mid T=1] = 0\ .$$

Such condition requires that the expected value of the pre-post intervention change of Y, recorded in the excluded firms, corresponds to the counterfactual change of the treated firms. The size of the selection bias caused by any non-null difference:

$$E[Y^0_{t+p} - Y^0_{i,t-r} \mid T=0] - E[Y^0_{t+p} - Y^0_{t-r} \mid T=1]$$

can be reduced if a third observation, at a time t-r-1, is added for each area in the data sample. The availability of a third temporal observation allows one to further refine the estimate of the counterfactual change and, thus, to reduce the amount of selection bias in the impact estimate. This is because a third observation, recorded at a time (t-r-1), allows one to estimate the difference between the pre-intervention growth rate recorded in the treated firms and the pre-intervention growth rate recorded in the non-treated firms. This difference is then used to correct the estimate of the counterfactual change that would be obtained with the availability of just two temporal observations. The estimator Difference in Difference in Difference (DDD) τ_{DDD} that can be implemented with a third temporal observation is defined as:

$$\tau_{DDD} = E[Y^1_{t+p} - (Y^0_{t-r} - Y^0_{t-r-1}) \mid T=1] - E[Y^0_{t+p} - (Y^0_{t-r} - Y^0_{t-r-1}) \mid T=0].$$

operational in the period from t-3 and t+1. The comparison group included in each year t database is composed by all firms that did apply for the incentives in the t-3 years but were not granted the incentives over the entire period (t-3 - t+1) because of the budget induced cut-off points in the list of accepted applicants.

II) the database for each single year t are collapsed into a set of homogeneous strata of treated and non-treated firms possessing the following characteristics: same industrial sector (2 digit level); same size class (micro, small, medium or large firms); same geographic area (Northern-Central Italy vs Southern Italy);

III) a difference in difference (DD) scheme is applied within each stratum of identical firms, to compute the difference of the pre-post intervention variation [(t+1)- (t-1)] of y between the treated and the non-treated firms belonging the same stratum i.

IV) the local impacts computed for each stratum are then averaged out (with weights equal to the number of treated firms within each stratum) across each stratum and each of the different years (within the 2001-2008 period) to produce the final impact estimates.

V) the variance used to compute the statistical significance for each impact estimate τ (c, w) is retrieved as in Ichino and Becker (2002):

(3) $$\text{Var}\,[\tau\,(c, w)\,] = \frac{1}{N^{Tc}}\left[\text{Var}\left(Y_i^{Tc}\right) + \sum_{s=1}^{S}\frac{N_s^{Tc}}{N^{Tc}}\frac{N_s^{Tc}}{N_s^0}\text{Var}\left(Y_j^0\right)\right]$$

where:

S $\{s = 1,2,\ldots,S\}$ = strata of homogeneous firms in terms of industrial sector (2 digit level); size class (micro, small, medium or large firms); and geographic area (Northern-Central Italy, Southern Italy)

N^{Tc}= total number of (category c) treated firms

N^0= total number of non-treated firms

N_s^{Tc}= number of (category c) treated firms within the stratum s

N_s^0= number of non-treated firms within the stratum s

$\text{Var}\left(Y_i^{Tc}\right)$ =variance of (category c) treated firms

$\text{Var}\left(Y_j^0\right)$ = variance of non-treated firms

The stratification and reweighting matching procedure described above is capable of controlling for a number of important factors (independent from the subsidies) that could affect the outcome Y of the treated firms differently from the non-treated firms. These factors, controlled for by the model, are:

- sector-specific economic trends;
- size effects (large firms may face different challenges or achieve different performances due to different economies of scale and/or credit crunch conditions than smaller firms);
- the geographic location of the firms (with firms located in Northern-Central Italy that could face socio –economic, institutional and labour and transportation cost conditions that are different from those faced by firms in Southern Italy);
- the unobserved firm characteristics (e.g. brand value, market position, managerial abilities) that lead to the willingness to invest and to apply for the subsidy
- the remaining unobserved differences between the treated and the non-treated firms (as long as they do affect the outcomes in a constant-over-time manner or as long as they are captured by the same desire to invest).

MODEL B: PROPENSITY SCORE & REGRESSION (CONTROL GROUP: NON-ASSISTED FIRMS)

The preferred estimation model used for the analysis on the subsidies to the Piemonte SMEs Piemonte is a CDD estimator on a common support (Ho et al. 2007) that can also be referred to as "Three stages CDD" (Bondonio 2009, Bondonio and Greenbaum -forthcoming). The model is implemented using a propensity score estimation that leads to reducing the observed differences between the groups of treated and non-treated firms. Next a parametric regression, with a DD scheme, run solely on the firms on the common support, allows to control for the observed etherogeneity between treated and non-treated firms without having to rely on fixed effects assumptions.

Moreover, the first two steps of the procedure (by eliminating from the estimation sample the treated firms with characteristics that are completely incomparable with non-treated firms) make the parametric outcome regression (implemented in the third step) less sensitive to the choice of the functional forms used to insert the control variables in the model.

In details the procedure can be summarized as follows:

As a first step, separately for each of the *c* treatment categories, we estimated the probability of a firm to choose treatment c. Such estimation is carried out through a probit function of the same pre-intervention firm characteristics constituting the control variables of the standard parametric CDD models discussed in the literature:

$$(4) \qquad Pr(T^c=1|X) = \Phi(X\gamma)$$

where X_i = set of observable control variables such as: sector, location, size and firm's age dummies and craft enterprise binary status.

The predicted value

$$(5) \qquad \hat{T} = \Phi(X\hat{\gamma})$$

derived from equation (4), is referred to as the *propensity score*. For each single firm in the database, the set of $P(X)^c$ (one for each of the c treatment categories) summarizes in a single parameter (from zero to one) all the observable pre-intervention firm characteristics that differentiate the treated firms of category c from the non-treated firms. As well established by the literature, such PS estimation, through its balancing property, partly surpasses the difficulties of having no clear guidance in choosing the proper functional forms.

As a second stage of the procedure, separately for each treatment category c (and for the additional category (T^0=1) of firms not receiving any support), the firms of treatment category c with a PS too high compared to the non-treated firms are discarded from the analysis.[22]

In the third stage of the procedure, a parametric CDD model is estimated on the reduced sample of firms with comparable characteristics, by regressing the outcome of interest on a set of categorical treatment status and control variables.

The detailed model specifications of such CDD approach is different according to the types of categorical treatment variables to be included in the CDD design. For the Piemonte SMEs, the model specifications is replicated for each year in which the support data are available. Since all of the available sources of incentives are observed in the data, the analysis is replicated with two sets of control variables X:

X^l = [industrial sector, geographic location, size, age of the firm, craft enterprise status];

[22] For the category of firms T^0=1 that do not receive any support, the discarded firms are those with a PS too high compared to the entire group of the treated firms.

X^{II} = *[industrial sector, geographic location, size, age of the firm, pre-intervention employment, sales and investments changes].*

Including in the set of control variables X^{II} also the pre-intervention trends in employment, sales and investments might reduce selection bias at the expense of some efficiency and external validity in the estimates. This is because in order to include pre-intervention employment, sales and investment trends, the first years of the incentive payments had to be excluded from the analysis (because for those years no data are available to detect whether or not those trends were potentially affected by earlier rounds of incentives) and because the estimation sample had to be limited to those firms (treated and not treated) for which no other incentives were received in the pre-intervention period.

Impact estimates by the economic intensities of the incentives

The model specification used to estimate differential impacts of the programme incentives at different levels of the economic value of the incentives has the following general features:

I) Estimation of a set of *4+1* probit models in which the dependent variable is one of the *4* different binary treatment status based on the quartiles of the Gross Grant Equivalent value of the incentives awarded to the assisted firms[23]:

(6)
$$\begin{cases} P[T^{c=1}=1] = \Phi[h(X)] \\ [\ldots] \\ P[T^{c=4}=1] = \Phi[h(X)] \\ P[T^{0}=1] = \Phi[h(X)] \end{cases}$$

Where:

$T^{c=1}$ = 1 if a firm received a GGE economic value of the incentives below the threshold of the first quartile of the distribution
= 0 if a firm did not received any incentives

$T^{c=4}$ = 1 if a firm received a GGE economic value of the incentives below the threshold of the fourth quartile of the distribution
= 0 if a firm did not received any incentives

T^{0} = 1 if a firm *i* did not receive any incentives
= 0 if a firm *i* did receive any type of incentives

X = observable control variables (either the set X^{I} or X^{II} of covariates)

II) The propensity scores $P(X)^{c}$ obtained from each of the probits estimated in step I) are separately ordered for the firms having $T^{c}=1$ and the untreated firms ($T^{0}=1$) for each of the *four* treatment status categorical variables. For the last treatment status category (complete absence of support), the propensity score of the non-treated firms ($T^{0}=1$) are separately ordered from the ones of the treated firms in any of the different c categories ($T^{0}=0$).

[23] For the analysis of Law 488 we estimated two model specifications: the first one with n=4 categorical treatment variables (based on the quartiles of the distribution of the CGE economic value of the incentives); the second one with n=2 categorical treatment variables (based on the threshold of the median of the distribution of the CGE economic value of the incentives). For the analysis of the Piemonte SMEs (given a low variation of the CGE values of the incentives) we only estimated the model specification with (n=2) categorical treatment variables based on the threshold of the median of the distribution.

Next, the firms outside the common support are eliminated with the following procedure: Separately for each of the *4+1* treatment category, the firms with $T^c=1$ are eliminated if they have a propensity score higher than the maximum $P(X)^c$ of the untreated firms [or in alternative higher than the 99.9; or 99.5; or 99.0th percentile of the $P(X)^c$ of the untreated firms] [24];

III) Programmes impact estimates are retrieved through a parametric outcome regression estimated from the sample of firms resulting from step II):

(7) $$\Delta Y = F(\sum_c \beta T^c, \alpha X)$$

Where:

ΔY =pre-post intervention change in the outcome variable of interest (employment, sales, investments, productivity, payroll costs)

$\sum_c T^c$ = set of categorical treatment status variables[25]

X = observable control variables (set of either X^I or X^{II} covariates)

α, β = parameters to be estimated

Impact estimates by type of programmes incentives

In the SME analysis of Piemonte, the differential impacts of the programme interventions due to the different types of incentives awarded to the assisted firms are estimated by an additional specifications of the baseline CDD model described above.

Such specification includes three categorical treatment variables used in the three steps model of equations (6-7) in order to separately estimate the impacts of the incentives under the form of non-repayable grants, repayable loans (including financial engineering for additional loan resources), and interest rate grants:

I) Estimation of 4 probit models:

(8)
$$\begin{cases} P[T^{c=grant}=1] = \Phi[h(X_i)] \\ P[T^{c=loans}=1] = \Phi[h(X_i)] \\ P[T^{c=int\_rate}=1] = \Phi[h(X_i)] \\ P[T^{=0}=1] = \Phi[h(X_i)] \end{cases}$$

Where:

$T^{c=grant}$ = 1 if a firm was subsidized exclusively with non-repayable grants
= 0 if a firm did not received any incentives

$T^{c=loans}$ = 1 if a firm was subsidized exclusively with soft loans
= 0 if a firm did not received any incentives

$T^{c=int\_rate}$ = 1 if a firm was subsidized with interest rate grants
= 0 if a firm did not received any incentives

T^{0} = 1 if a firm did not receive any incentives

[24] For the last treatment category of complete absence of assistance, the non-treated firms eliminated from the analysis are those with a propensity score not comparable with the propensity score of the entire group of treated firms.

[25] For ease of interpretation of the coefficient estimates, the c=0 (no support of any kind) are the categorical treatment left in the intercept of the model. The statistical significance of the differences in the impact estimates for pair-wise comparisons between different non-null treatments c can be achieved by mean of standard T-test statistics through replicating the model estimation with different treatment categories left in the intercept of the model.

= 0 if a firm did receive any type of incentives

X = control variables (X^{I} or X^{II} covariates)

II) The propensity scores $P(X)^{c}$ obtained from each of the probit specifications estimated in step I) are separately ordered for the firms having $T^{c}=1$ and the untreated firms ($T^{0}=1$) for each of the *four* treatment status categorical variables. For the last treatment status category (complete absence of support), the propensity score of the non-treated firms ($T^{0}=1$) are separated from the ones of the treated firms in any of the different c categories ($T^{0}=0$). Next, the firms outside the common support were eliminated with procedures similar to the ones seen in the previous section on the CDD model for estimating the impacts by the economic value of the incentives.

III) Estimation of programme impacts through a parametric outcome regression implemented on the sample of firms resulting from step II:

(9) $$\Delta Y = F(\sum_{c} T^{c}, X)$$

$\{c$ = cap grant, loans, int. rate grants$\}$

X = (X^{I})or (X^{II}) control variables.

In order to control for possible composition effects, the model of equations (8) and (9) is replicated using six different categorical treatment variables. Such variables are aimed at estimating the impacts of the different types of incentives by simultaneously controlling for the economic value of the incentives (as expressed by 2 categories of GGE intensities based on the threshold of median of distribution the treated firms). This is achieved by generating each categorical treatment variable from cross tabulating two different degrees of the economic value of the incentives with the distinction between capital grants, soft loans and interest rate grants.

CDD impact estimates by size, industrial sector and geographic location of the assisted firms

In order to estimate possible differential impacts of the programme intervention based on the size and the industrial sector of the assisted firms, the same specifications of the three steps CDD model described in the previous section are separately replicated on:

- four different subsets *w* of treated and non-treated firms based on firms size (distinguishing between: micro firms, 9 or less employees; small firms, from 10 to 49 employees; medium firms, from 50 to 249 employees; large firms, 250 or more employees);
- two subsets w of treated and non-treated firms based on the industrial sector of the assisted firms (distinguishing between firms in the services and manufacturing sectors);
- two subsets w of treated and non-treated firms based on the geographic location of the assisted firms (distinguishing between firms in Northern-Central and Southern Italy).

Also in this case, the complete set of estimated specifications include models with n categorical treatment variables obtained by cross-tabulating size, sector and geographic location of the assisted firs with different degrees of the economic value of the incentives or the types of incentives.

MODEL C: PROPENSITY SCORE RADIUS MATCHING (CONTROL GROUP: NON-ASSISTED FIRMS)

The propensity score estimation (described in general terms in eq. 4 and 5) is also used to replicate all of the analyses on both the Law 488 and the support to the Piemonte SMEs described in the previous sections with an approach based on propensity score matching (PSM) in conjunction with a DD estimator.

With such PSM-DD estimator, the observable pre-intervention characteristics which may be different between firms in the treatment and comparison groups, and that would affect the outcomes of the evaluation even in the absence of the programme intervention, are first controlled for by a PSM design.

After having implemented such PSM procedures, impact estimates are then obtained by adding a DD design to the analysis, in the form of comparisons (within each matched group of similar firms) of the pre-post intervention changes in the outcomes recorded in the treated and non-treated firms.

For ease of interpretation, the final ATT impacts τ(c, w) for each subpopolation (c, w) of treated firms (based on both on a specific categorical treatment c received and a pre-intervention characteristic w) are estimated with respect of a counterfactual status of not receiving any type of support (the treatment category T^0=1) while maintaining the same pre-intervention characteristics w.

Estimating such categorical ATT impacts τ(c, w) is performed in the following way:

I) Estimation (separately for each categorical treatment c and for each specific category of firms w) of the predicted probabilities of receiving the treatment c, based on an estimation sample formed solely by the subset of firms with characteristics w either receiving treatment c or no treatment of any kind (T^c=1 and T^0=1)

II) Separately for each categorical treatment c and category of firms w, matching of the T^c=1 firms with the T^0=1 firms with similar propensity score $P(X)^c$. Such procedure is implemented with a radius matching algorithm in which each treated firm is paired with the group of non treated firms having a PS parameter within a radius of tolerance from the PS of the treated firm (e.g. Dehejia and Wahba 1998 and Heckman, Ichimura and Todd 1998, Becker and Ichino 2002, Caliendo and Kopeinig 2005, Zaho 2005)

III) Estimation of the sets of CDD categorical impacts τ(c, w) by aggregating, separately for each category of firms (c, w), the local impacts for each matched group of treated firms (T^c=1) and comparable non-treated firms (T^0=1). Such local impacts are in the form of differences between the mean pre-post intervention outcome changes of the treated (T^c=1) and the matched non-treated firms (T^0=1)

In order to assess the pair-wise statistical significance of the differences between the various categorical impacts τ(c, w), the steps I)-III) are replicated by estimating the complete set of all of the [(n)*(n-1)] pair-wise categorical average impacts on the treated (with treatment c and categorical characteristic w) defined against a counterfactual state of receiving a different non-null treatment (d≠c), while maintaining the same categorical characteristics w.

MODEL D: DISCONTINUITY DESIGN

For the case of Law 488, the application process yields data on rankings of applicants that are available based on an observable score assigned to each firm that passed a first quality check on the required credentials, documentations and features of the proposed investment project (with budget-induced cut-off points for programme admissions, unrelated to the underlying quality of the submitted investment proposals). With such data availability the analysis is also replicated with a sharp Regression Discontinuity Design (RDD) approach (Trochim 1984; and Bronzini and de Blasio 2006 for an application of law 488)[26].

[26] It should be noted that the so called "partially fuzzy" (PF) RDD set-ups (Battistin and Rettore 2008) is not applicable to the analysis. Such PF RDD set ups would be capable of yielding a specification test (in the neighborhood of k) to assess the local properties of any non-experimental estimators usable to retrieve the treatment impacts on the whole population of treated. PF RDD set-ups require data availability on non-eligible units, eligible units that choose not to

With sharp RDDs, the treatment impacts is estimated by comparing the outcomes of interest from the applicant firms ranked just above (treated units) and below (non-treated units) the cut-off point *k* that determines the admission into the programme.

This is because in such neighborhood of *k* the firms in the rejected application pool may be as close as possible to the treated firms located just above the threshold *k*: they are very similar to the treatment group in terms of the firm characteristics considered in the application process, and they include firms eligible to receive the programme intervention with the same desire to perform a similar investment of the treated firms.

With a sharp RDD, differentiating the impact estimates based on the different economic intensities of the incentives and on the size and industrial sector of the treated firms [i.e estimating the categorical ATT parameters τ(c, w)] is performed by exploiting the heterogeneity of the treated firms above the admission threshold *k* in each of the different regional rankings produced by the incentive awarding procedures (separately in each of the different five tenders of the programme). Such heterogeneity of the treated firms (in the neighbourhood of k) across the different repeated regional tenders allows the analysis to estimate categorical ATT parameters τ(c, w) by aggregating the local impacts retrieved (within any given single regional competition) comparing the outcomes of each group of treated firms above k with those of the non-treated firms below k with the same characteristic w and the same requested economic value of the incentives.

However, .in the case of Law 488 the final score assigned to each applicant firm is based on criteria that reflect, for a significant part, the specific features of the proposed investment project rather than features of the entire firm for which the outcomes are measured. As a result, the application score alone is not capable of perfectly detecting similar firms.
For this reason, the discontinuity approach that we develop for Law 488 does not relies entirely on similar application scores to define the suitable control group of rejected applicants from which to retrieve the counterfactual outcomes for the beneficiaries.
The sharp RDD approach that we implemented, indeed, complements the comparison of beneficiaries with rejected applicants of similar scores with the availability of panel data (that enables the analysis to control for all remaining time unvarying unobserved differences between beneficiaries and rejected applicants) and pre-treatment firm covariates (that ensures comparing beneficiaries with rejected applicants of the same size).

MODEL E: STRATIFICATION & REWEIGHTING MATCHING (CONTROL GROUP: NON APPLICANTS)

The analysis of Law 488 has been lastly replicated with a stratification and reweighting matching model implemented on a control group composed by non applicant firms. Such model replicates Model A, with the exception of including solely non-applicant firms in the comparison group instead of the rejected applicants. Thus compared to Model A , there is no guarantee that treated and non-treated firms share the same desire to invest. By focusing instead on non-applicant firms, however, the method yields impact estimates with greater statistical precision of Model A.

participate in the programme, and programme participants. For the case of law 488/1992, unfortunately, the programme eligibility rules are based primarily just on the regional location of the firm (with a different call for application run separately for each region) and on a simple binary coding of firms' sector classification (with the only exclusion of non-industrial firms). With such eligibility rules, a neighborhood of the eligibility threshold is hard to find, and eligible and non-eligible firms are likely to be exposed to quite different economic exogenous dynamics in the times during the programme implementation, making of little use exploiting the PF RDD set up in order to derive useful specification tests for the analysis.

A.3 SENSITIVITY ANALYSIS

In order to assess the robustness of the impact estimates, all of the results presented in the main body of this final report have been extensively tested by replicating the analysis with the various model specifications described in the previous section. In this section we summarize the results from such sensitivity analysis (composed by a total of over 500 different specifications of the 5 different estimation models) by presenting the set of the main result tables presented in the final report with the indication of the minimum-maximum range of the various coefficient impacts estimates (and related and costs per unit of output) obtained by the various different model specifications[27].

The results from such extensive sensitivity analysis show that impact estimates for sales, investment, labour productivity and average payroll costs are generally more volatile than those for employment. This is because investment and average payroll costs data are available solely for the smaller subgroup of firms that have corporate status, while for sales data (as previously described in the main body of this report) there are quality issues related to the tendency by small firms to always report the sales figures equivalent to the minimum standards needed to avoid possible tax audits.

The overall range of the impact estimates yielded by the various models and specifications, however, is such to grant a sufficient robustness of all of the main findings in all the cases in which the sample size was large enough to give statistical significance to the results.

Table A3. Average impacts and cost-effectiveness of the subsidies

	LAW 488		SME-PIEMONTE	
EMPLOYMENT				
Average per-firm impact				
(min)	1.82	***	0.32	***
(max)	2.67		0.35	
Cost per job created				
(min)	€ 158,205		€ 30,925	
(max)	€ 252,138		€ 33,359	
SALES				
Average per-firm impact				
(min)	€ 93,431	***	€ 32,950	***
(max)	€ 254,440		€ 39,430	
Cost per extra euro of sales				
(min)	€ 1.84		€ 0.25	
(max)	€ 3.68		€ 0.30	
INVESTMENT [(a)]				
Average per-firm impact				
(min)	€ 143,045	***	€ 27,504	***
(max)	265,430		45,230	
Cost per extra euro of investment				
(min)	€ 1.65		€ 0.68	
(max)	2.96		0.89	

(a) Estimates based on corporate firms only.
The reported statistical significance level is the lowest among all different model specifications
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

[27] For the sake of readability, this technical annex includes the findings from the sensitivity analysis solely for the main result tables included in the final report. The complete set of results from the sensitivity analysis is available upon request to the authors.

Table A4. Impacts on employment and sales by instrument used: all SMEs in Piemonte Capital Grants vs. Soft loans vs. Interest-rate subsidies

	Capital grants		Soft loans		Interest rate sub.	
EMPLOYMENT						
Average per-firm impact						
(min)	0.43	***	0.49	***	0.24	***
(max)	0.57		0.63		0.27	
Cost per job created						
(min)	€ 45,560		€ 25,670		€ 18,880	
(max)	€ 63,957		€ 33,280		€ 23,440	
SALES						
Average per-firm impact						
(min)	€ 19,420	***	€ 26,401	***	€ 38,700	***
(max)	€ 27,580		€ 34,650		€ 46,230	
Cost per extra euro of sales[(a)]						
(min)	€ 1.01		€ 0.38		€ 0.10	
(max)	€ 1.21		€ 0.56		€ 0.17	

(a) Estimates based on corporate firms only.
The reported statistical significance level is the lowest among all different model specifications
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Table A5. The impact of 488 grants by the economic value of the grant

	<125,000 €		125,000 € 250,000 €		250,000 € 500,000 €		>500,000 €	
EMPLOYMENT								
Average per-firm impact								
(min)	0.82	***	1.40	***	2.32	***	2.69	***
(max)	0.91		1.61		2.59		3.30	
Cost per job created								
(min)	€ 78,503		€ 112,252		€ 145,710		€ 406,336	
(max)	€ 86,976		€ 128,730		€ 162,283		€ 488,676	
SALES								
Average per-firm impact								
(min)	€ 66,053	**	€ 98,872	***	€ 187,348	***	€ 215,899	***
(max)	€ 89,473		€ 184,610		€ 243,545		€ 350,243	
Cost per extra euro of sales								
(min)	€ 0.81		€ 0.98		€ 1.54		€ 3.55	
(max)	€ 1.07		€ 1.84		€ 2.01		€ 5.43	
INVESTMENT								
Average per-firm impact								
(min)	€ 15,450		€ 46,740		€ 107,490	*	€ 436,980	
(max)	€ 57,800		€ 87,273		€ 153,260		€ 726,302	
Cost per extra euro of investment[(a)]								
(min)	-		-		€ 2.27		-	
(max)					€ 2.68			

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
The reported statistical significance level is the lowest among all different model specifications
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Table A6. The impact of 488 grants by size of the assisted firms

	Micro firms 1-9 employees		Small firms 10-49 employees		Medium firms 50-249 employees		Large firms 250+ employees	
EMPLOYMENT								
Average per-firm impact								
(min)	1.61	***	1.78	***	2.44	***	-2.34	***
(max)	2.09		1.89		3.43		-5.06	
Cost per job created								
(min)	€ 193,232		€ 211,098		€ 192,419		-	
(max)	€ 230,700		€ 265,687		€ 333,386			
SALES								
Average per-firm impact								
(min)	€ 92,263	**	€ 257,939		€ 162,913	*	€ -227,450	**
(max)	€ 130,155		€ 325,028		€ 246,920		€ 322,637	
Cost of extra € of sales [(a)]								
(min)	€ 2.92		-		€ 2.49		-	
(max)	€ 3.73				€ 3.81			
INVESTMENT								
Average per-firm impact								
(min)	€ 106,450	**	€ 140,050	**	€ 181,680	*	€ 255,040	
(max)	€ 230,121		€ 221,004		€ 374,243		€ -2,950,862	
Cost of extra euro of € investment[(a)]								
(min)	€ 1.56		€ 1.78		€ 1.47		-	
(max)	€ 2.01		€ 2.05		€ 2.45			

(a) Figures not reported in case of negative coefficient estimates or results with no statistical significance at the level of 0.1.
The reported statistical significance level is the lowest among all different model specifications
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Table A7. The impact of 488 grants by sector of the assisted firms

	Manufacturing sector		Service Sector	
EMPLOYMENT				
Average per-firm impact				
(min)	1.91	***	1.32	***
(max)	2.82		2.16	
Cost per job created				
(min)	€ 155,950		€ 169,299	
(max)	€ 228,674		€ 278,552	
SALES				
Average per-firm impact				
(min)	€ 101,273	**	€ 65,624	*
(max)	€ 176,854		€ 192,294	
Cost per extra euro of sales				
(min)	€ 2,33		€ 1,73	
(max)	€ 3.47		€ 4.80	
INVESTMENT				
Average impact				
(min)	€ 110,235	*	€ 107,434	*
(max)	€ 287,540		€ 301,230	
Cost per extra euro of investment				
(min)	€ 1.68		€ 1.55	
(max)	€ 3.04		€ 3,32	

The reported statistical significance level is the lowest among all different model specifications
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Table A8. The impact of the subsidies to Piemonte SMEs by sector of the assisted firms

	Manufacturing sector		Service Sector	
EMPLOYMENT				
Average per-firm impact				
(min)	0.31	***	0.26	***
(max)	0.36		0.33	
Cost per job created				
(min)	€ 27,521		€ 45,450	
(max)	€ 32,040		€ 52,024	
SALES				
Average per-firm impact				
(min)	€ 38,124	***	€ 22,741	***
(max)	€ 44,891		€ 35,454	
Cost per extra euro of sales				
(min)	€ 0.19		€ 0.32	
(max)	€ 0.23		€ 0.52	
INVESTMENT				
Average per-firm impact				
(min)	€ 26,590	**	€ 30,950	*
(max)	€ 32,120		€ 65,420	
Cost per extra euro of investment				
(min)	€ 0.89		€ 0.51	
(max)	€ 0,97		€ 0.92	

The reported statistical significance level is the lowest among all different model specifications
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Table A9. The impact of 488 grants by geographic location of the assisted firms

	Northern-Central Italy		Southern Italy (former Obj. 1 area)	
EMPLOYMENT				
Average per-firm impact				
(min)	2.14	***	1.66	***
(max)	2.97		1.77	
Cost per job created				
(min)	€ 92,362		€ 272,237	
(max)	€ 164,872		€ 316,294	
SALES				
Average per-firm impact				
(min)	€ 311,600	***	€ 104,273	***
(max)	€ 600,316		€ 171,174	
Cost per extra euro of sales				
(min)	€ 0.44		€ 3.02	
(max)	€ 1,04		€ 4,14	
INVESTMENT				
Average per-firm impact				
(min)	€ 106,351	*	€ 151,452	*
(max)	€ 199,105		€ 316,104	
Cost per extra euro of investment				
(min)	€ 1.84		€ 1.69	
(max)	€ 3.20		€ 2.96	

The reported statistical significance level is the lowest among all different model specifications
*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Table A10. The impact of 488 grants on average payroll costs

Impact on yearly avg. payroll costs, per employee	
(min)	€ 26
(max)	€ 136

*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Table A11. The impact on avg. payroll costs by type of assistance (corporate SMEs in Piemonte)

	Capital Grants	Soft loans	Interest rate grants
Impact on yearly avg. payroll costs, per employee			
(min)	€ -96	€ 105	€ 145
(max)	€ 220	€ 348	€ 311

*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Table A12. The impact of 488 grants on labour productivity

Impact on sales, per employee	
(min)	€ 4,340
(max)	€ 9,046

*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.

Table A13. The impacts on labour productivity by type of assistance (all SMEs in Piemonte)

	Capital Grants	Soft loans	Interest rate grants
Impact on sales, per employee			
(min)	€ -12,101 ***	€ 11,490 **	€ 25,910 ***
(max)	€ -18,330	€ 18,620	€ 34,581

*** Statistical significance at the 0.01 level; ** 0.05 level; * 0.10 level.