EU Cohesion Incentives for Collaborative Industrial Research. A RDD Evaluation

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The focus of the paper

Evaluating the impact of a specific Program supporting innovative activities within the EU 2007-2013 Cohesion Policy: The Collaborative Industrial Research Program (CIR)

- Roughly **1 billion euros of public resources** of European Regional Development Fund with National Cofinancing
- Beneficiaries are **firms located in a persistently underdeveloped area** of Europe (Italian Mezzogiorno)
- Firms apply to the CIR grant by **presenting innovative projects**, alone or in partnership with other firms and/or Universities
- **Industrial research incentives**: differently from other forms of support of Research and Development, the CIR grant should be rapidly absorbed by firms to develop new products and to modernize production processes

The focus of the paper (cont.)

- Some aspects of the CIR anticipate specific measures of the EU 2014-2020 **Smart Specialization Strategy (S-3)**
  - e.g., projects could be presented autonomously or in partnership with other firms, Universities and research organizations; resources are concentrated in different but specific pre-selected sectors

  The S-3 is a building block of the reformed EU Cohesion Policy: it aims at integrating sectorial approaches of incentives into explicitly spatial regional policies

The focus of the paper (cont.)

More generally, the paper is about:

European Cohesion Policy

- Impact still controversial (Becker et al., 2010; Pellegrini et al., 2013; Giua, 2014; Crescenzi and Giua, 2015; Accetturo et al., 2015; Ciani and de Blasio, 2015; Di Cataldo, 2015)
- Lack of evidence on the short term impact of Programs financed during the 2007-2013

Incentives for Innovation, Research and Development

- Largely questioned, recently reviewed by What Works Centre for Local Economic Growth (2015)

Smart Specialization Strategy

- Should the S-3 impact differ from the one achieved by the past sectorial and regional policies for innovation?

Research Questions

1. **Is CIR effective**

   Average Treatment Effect

2. **How CIR effectiveness depends on the specific aspects on which the S-3 leverages** (e.g., different characteristics of the financed interventions)

   Heterogeneous Treatment Effect

3. **How CIR effectiveness depends on different selection mechanism** (e.g., different budget availability)

   Far from the threshold Effect

1. CIR effectiveness

Do treated firms benefit from the CIR?

impact measured with respect to the different macro categories of direct and indirect outcomes (What Works Centre for Local Economic Growth 2015)

Y1 Investments (tangible and intangible)

Y2 Total Production

Y3 Value Added

Y4 Employees

2. CIR Heterogeneous effectiveness

Does the effect on firms' outcomes depend on the characteristics of the treatment?

(Becker et al., 2013)

The treatment of a firm might be characterized by:

- **Z1** a partnership with Universities
- **Z2** a partnership with Universities from competitive regions
- **Z3** belonging to a particularly advanced set of sectors (ICT; Advanced materials; Health and biotechnologies; Aerospace and aeronautics)
- **Z4** a very large partnership (collaborative dimension)
- **Z5** being distributed in multiple projects

3. CIR effectiveness away from the assignment threshold

What might have happened with a different selection mechanism, for instance with a less selective threshold?

The impact for inframarginal firms (Angrist and Rokkanen, 2015)

- reproducing the counterfactual scenario far from the threshold
    - we identify an interval in which, conditioned to a specific vector of covariates, the outcome variables are independent of the running variable (Conditional Indipendence Assumption)
    - in the interval, we compare the extrapolations of the ATE to the fitted values for the outcome variables corresponding to the vector of the covariates away from the cutoff
    - the difference between the two is the CIR impact for infra-marginal firms, above and below the cutoff

RDD for evaluating the CIR Program

- A specific window of 2 months (february-april 2010) during which firms could present their projects and apply to the CIR Program
- More than 530 projects presented by more than 2,000 applicants: roughly 6 billion euros of resources requested compared to an available budget of 1 billion euros
- An independent evaluation (three steps) assigned a *score* to each project with the ranking published in may 2011
- Due to the limited budget, only the first 154 projects have been admitted (*score* $>=$ 104.4)
- **treatment group**, 240 obs: firms involved in admitted projects (*score* $>=$ 104.4)
- **control group**, 1840 obs: eligible and not eligible firms that did not get the treatment (*score* $<$ 104.4)

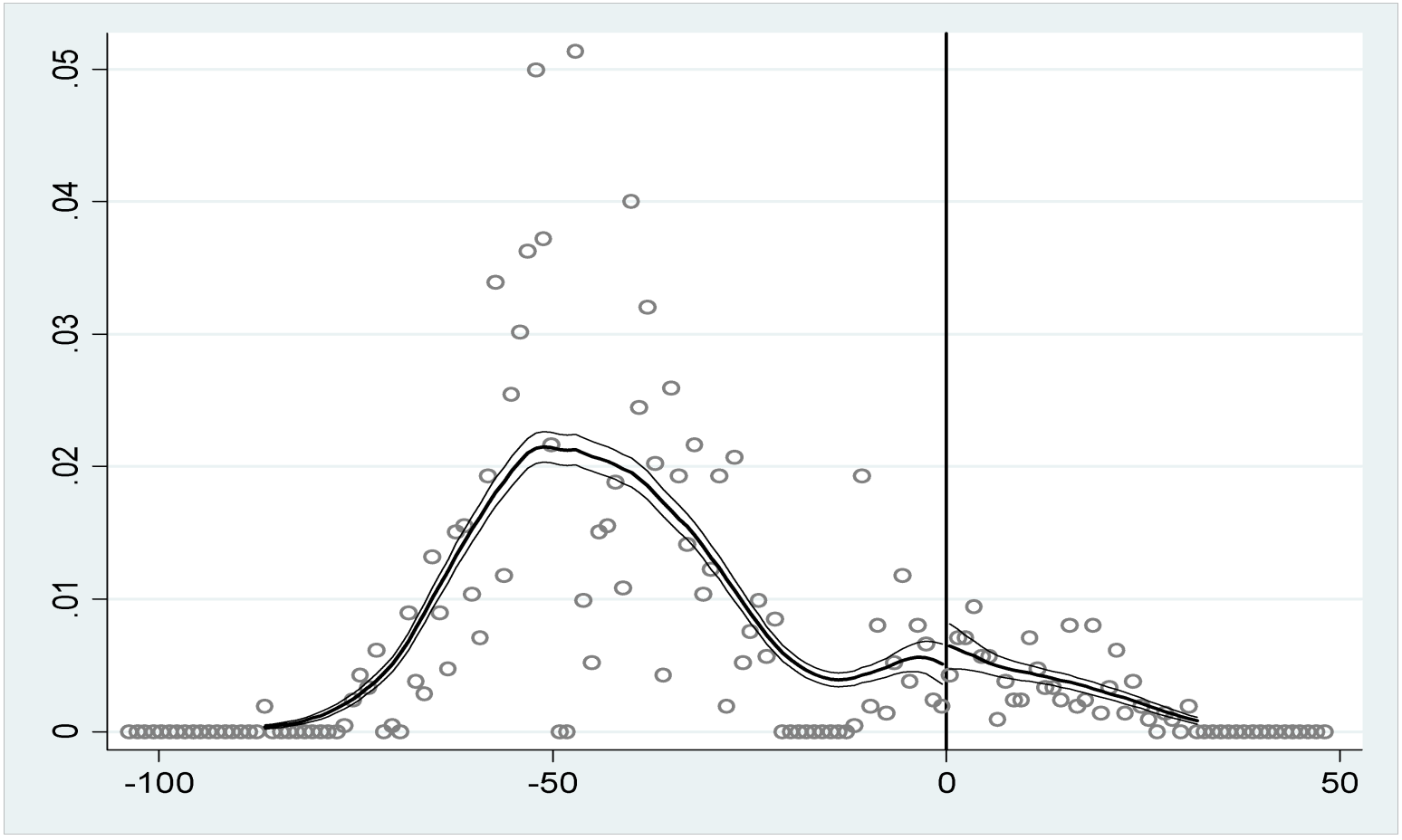
RDD for evaluating the CIR Program (cont.)

- The CIR did not allow firms to participate if they were applying for concurrent programs
- Projects were financed as soon as selected with an upfront transfer of up to 70 percent of the total funding assigned and they had to be concluded within 3 years (short term assessment)

- Randomization assumptions hold at the cutoff
  - observables smoothly distributed across treated and not treated observations (no significant relationship between CIR and Xs)
  - no manipulation of the *score* around the treshold (McCrary Test 2008):

RDD for evaluating the CIR Program (cont.)

Density of the forcing variable



RDD for evaluating the CIR Program (cont.)

Parametric models will balance trated and not-treated observations by using the polynomial of the *score* (from the first to the third order, can be different below and above the cutoff)

- **Average impact (ATE)**

$$\Delta_{Y\,i} = \alpha + f(score_i) + CIR_i[\beta_1 + f(score_i)] + \epsilon_i \tag{1}$$

- **Heterogeneous impact (H-ATE)**

$$\Delta_{Y\,i} = \alpha + f(score_i) + g(Z_i) + CIR_i[\beta_1 + g(Z_i) + f(score_i)] + \epsilon_i \tag{2}$$

Data and variables

Variables at firms' level:

Outcomes (in growth rate 2011-2014): Y1-Y4

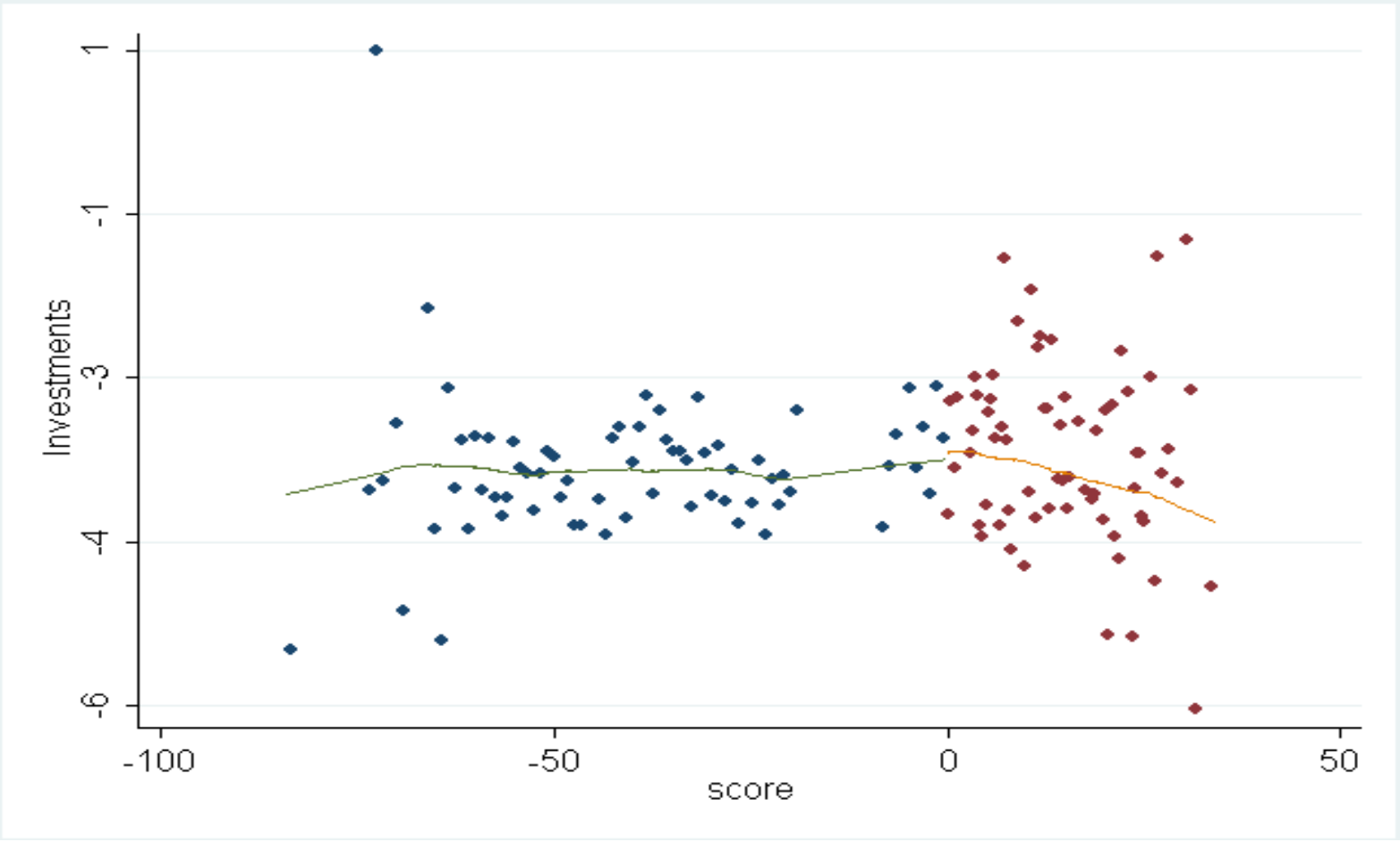
Observables: Tangible and Intangible investments; Sales; Consolidated debt; Employment; Capital; Total Balance sheet; Return on Assets; Return on Equity; Gross operative margin; Cash Flows; Labour cost; Service cost; etc

Sources:

- **Sirio**: official database of all applicant projects, with data on intended outcomes, time frame, location, costs to be covered, investment plan, involved firms, structure of the partnership
- **Cerved**: firms general characteristics (location, size, economic sector) , productivity, investments, sales, tangible and intangible capital, labour costs, and other proxy on of economic performance (assets, service costs etc), employment
- **OpenCoesione**: projects financial allocations, payments, subjects involved, contextualization within the cohesion policy framework

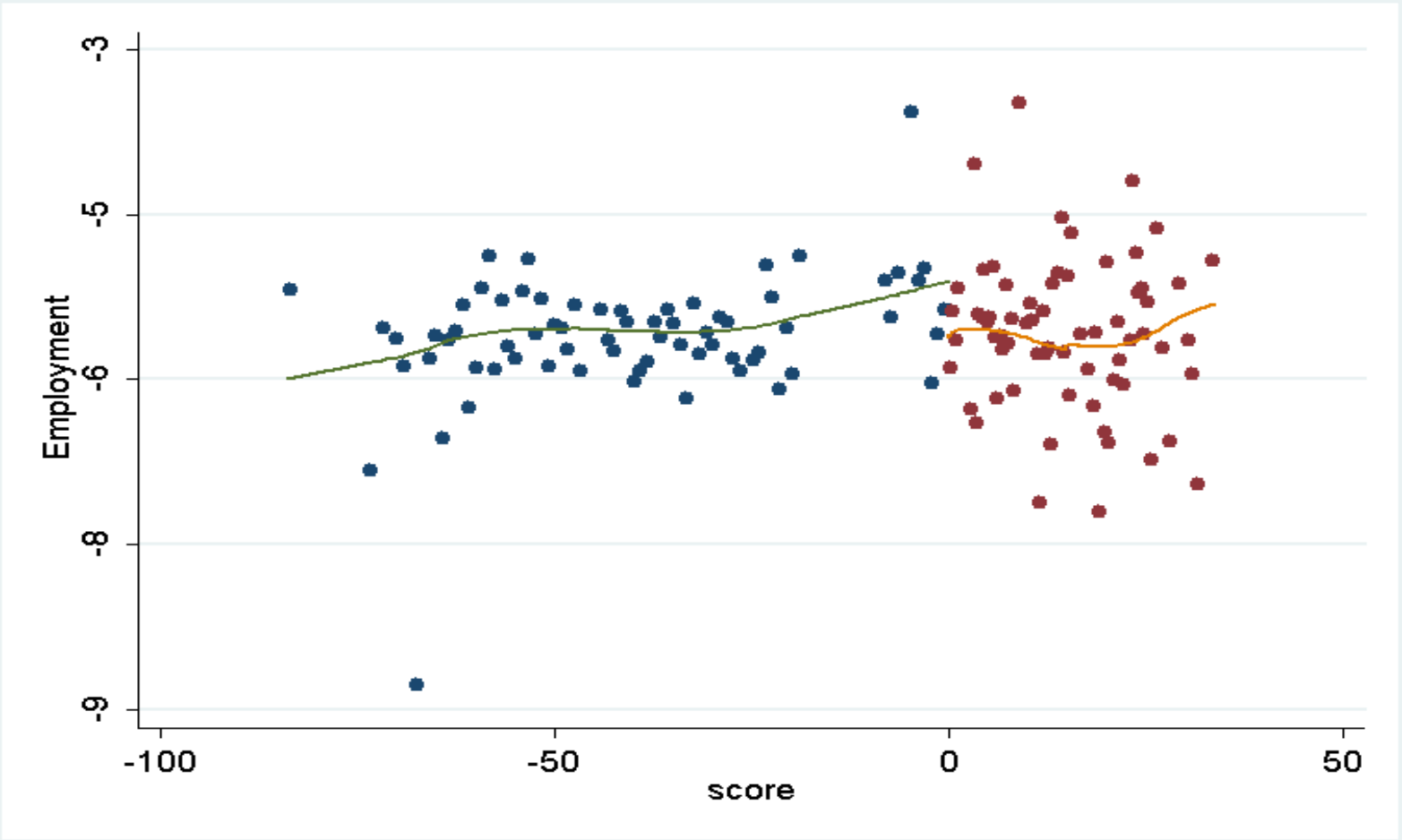
Preliminary graphical evidence

Y1 - Investments



Preliminary graphical evidence

Y4 - Employment



ATE Results

Do treated firms benefit from the CIR?

	investments	total production	value added	employment
CIR	-0.2092	0.0281	-0.2631	-0.3456*
	(0.2311)	(0.1500)	(0.1909)	(0.2092)
Polynomial degree	1-1	1-1	1-3	1-3
Akaike Information Criteria	6,513	5,545	5,407	5,598

Robust and clustered (project) standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

On average, NO. Even negative for employment

Balancing tests and robustness

- Balancing properties verified for almost all the observables with all the preferred specifications
- Placebo tests:

	Fake threshold (shift within control)	Pre-treatment (2008 -2010)
Investments	0.0894 (0.2115)	0.1199 (0.2637)
Tot. production	0.0827 (0.1617)	-0.1373 (0.1433)
Value added	0.3133 (0.3642)	-0.2208 (0.1578)
Employment	0.5746 (0.3513)	-0.3333* (0.1941)

H-ATE Results

Does the effect on firms' outcomes depend on the characteristics of the treatment?

	Investment	Tot. production	Value added	Employees
CIR	1.2968**	0.4239	0.5222	0.0002
CIR*Z1	-0.89820*	-0.3181	-0.4940*	-0.1027
CIR*Z2	-0.4604*	-0.2366	-0.1309	0.0076
CIR*Z3	-0.3091	-0.0153	-0.2093	-0.2822*
CIR*Z4	0.0988	-0.0328	-0.2751*	-0.2553
CIR*Z5	-0.8708*	0.0231	-0.4475*	-0.1246
Obs	1,720	1,862	1,772	1,784

H-ATE Results

Z1-Z2 Firms that developed their projects in collaboration with Universities (and even from competitive Universities) have been hampered in having their investments increased

- University-Industry linkages? Competitive skills shared with disadvantaged actors?

Z3 For very advanced projects, the CIR leads firms to reduce their employees

- is it a side/predicted effect?

Z4 The value added decreases for firms that develop the projects in large partnership (CIR collaborative dimension)

- there might be a correlation with a not very focused investment strategy

Z5 Investments and (again) value added decrease for firms developing more than one project

- allowing multi participation might played a part in making firms losing their focus on strategic investment

Far from the threshold Results (Angrist and Rokkanen)

Would the Program work for firms far the threshold?
what might have happened if firms with scores below the threshold would have gained access to the scheme and which is the relevance of public money spent for the firms that easily pass the financial threshold

- In an interval of 15 score point around the cutoff, conditioned to a specific vector of covariates, outcome variables are independent of the running variable (Conditional Indipendence Assumption)
- In this window (10 percent of the sample):
  - **below** the eligibility threshold the CIA-based extrapolations are constantly higher than the observed outcomes
  - **above** the eligibility threshold the effect remains undistinguishable from zero
- Lowering CIR eligibility criteria would have increased CIR effectiveness (if it had existed)

Preliminary conclusions

This paper sheds light on the impact that the smart specialization strategy of the EU Cohesion Policy can deliver in terms of firms performance by estimating the impact of a measure that, financed already during the 2007-2013 Cohesion Policy, presented some anticipatory aspects of the S-3

- The impact on the investment and also the indirect impacts on economic performance and employments are absent
- Some elements expected to be the strenghts of the S-3 might even have hampered the effectiveness of the subsidies
- A different budget availability would have not made any difference in terms of impact

What's next

- Additional **control groups**:
  - Firms eligible but not treated because of the limited resources (400 obs, $96 < \textit{score} < 104.4$)
- Robustness of the **Far from the threshold analysis**