Firm-Level Counterfactual Impact Evaluation of European Programs: Methodological Issues and Data Challenges

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From program intervention to desirable outcomes: what CIEs can estimate

- Firm-level programs can produce desirable socio-economic outcomes through the following (simplified) chain of causal links.

A) Eligible firms are informed on the existence of the program and find the program incentives worth applying for: program funds entirely allocated to assisted firms

B) Program incentives are capable of modifying in a desirable way the investment and/or hiring behavior of the assisted firms

C) Increases in investments and economic activity by assisted firms generate some socio-economic improvements for the areas in which the incentives are available
Outcomes concerning A) are not the focus of CIEs: even if all funds are allocated to the applicant firms, social benefits are generated only if the analysis can show that additional investments or R&D/innovation activities took place compared to the absence of the subsidies.

Most CIEs focus on firm-level outcomes B): the ultimate success of the policies are not tested but the analysis has usually stronger internal validity.

Focusing on geographically-aggregated outcomes C) tests the success of the policies in their ultimate goals: benefitting the community around the assisted firms (positive spills over do not undermine the validity of the results)....
…additional challenges for CIEs on geographically-aggregated outcomes

- .....but more confounding factors to be controlled for (the analysis is meaningful only if the size of program is large compared to the local economy)

- Moreover, the analysis has to deal with the presence of multiple sources of public aids (labour policy, infrastructure etc..) that can affect the geographically aggregated outcomes

- Sometimes a meso-level is used: outcomes aggregated by groups of firms (based on nuts2, sector or size). E.g. Bondonio and Greenbaum 2006, Pellegrini 2016
Short/medium-term impacts vs. long-term impacts

- Long-terms (LR) impacts in principle are desirable because they offer valuable information to refine the policy interventions…..

- ....however LR impacts pose additional challenges:
  
  ➢ increased difficulties in controlling for all the confounding factors
  
  ➢ treatment confounding issues: at the firm-level in the LR spill-overs may generate impacts (positive or negative) also on the non-assisted firms. This may lead to over- (or under-) estimating the true effects of the program…. 

  …..LR impacts best suited for geographically-aggregated or meso-level analyses
**Policy-relevant CIEs: Multiple treatment categories**

- CIEs can enhance the policy relevance of results by estimating multiple impacts for different treatment categories.

- Treatment categories based on different:
  - Economic intensities of the subsidies
  - Instrument of the support (soft loans, non-repayable grants)
  - Scope of the support (increasing investment activities, R&D, innovation)
  - Industrial sectors and or size of the assisted firms

- Each impact estimator CDD, PSM, RDD needs to be adjusted to multiple categorical treatments. Recent developments in CIE:
  - RDD: e.g. Becker et al. (2012); Pellegrini et al. (2016)
  - PSM: e.g. Lechner (2002); Bondonio and Greenbaum (2014)
  - GPS: e.g. Hirano and Imbens (2004); Becker et al. (2012)
Firm-level CIEs benefit from natural experiment conditions

• Natural experiments determine exogenous treatment exclusions in the form of:
  ➢ ranking of applicants with cut-off thresholds in the application scores
  ➢ (more rarely) geographic boundaries to set the eligibility status for the treatment

• Exploiting data from treated and rejected applicants is of great advantage because it ensures balancing crucial unobservables such as the firms’ position in their investment cycle (leading to same desire to invest)

• Cut-off thresholds in the eligibility scores (e.g. former Obj.1 areas) and in the application scores have been exploited (e.g. Law 488 in Italy: Pellegrini et al. 2014, Bondonio et al. 2016)
RDD for firm-level CIEs: some limitations

- Limitations of RDD applied to firm-level CIEs:
  - can be applied only to single-program evaluations
  - non-treated firms may be assisted with other unobserved programs
  - application scores are assigned to investment projects, not firms. Outcomes are firm-specific not investment-specific. With small samples, the firm-level characteristics of treatment and comparison group may be unbalanced by respect of important risk-factors.

In case of unbalance, it is recommended to extend the bandwidth across the threshold and complement RDD with a matching estimators that ensures that the treated applicants are comparable with the non-treated ones (e.g. POE/PRIME program in Portugal)
Hidden but important methodological issues:
A) Operationalizing the timing of the intervention

- Administrative databases on program incentives contain many dates:
  - dates on when the application was approved
  - dates on incentive payments (instalment 1, instalment 2, .....

- Which dates are to be used in measuring when the treatment occurs? It is a crucial choice:
  - If the programme intervention is wrongly placed earlier than the time in which the outcome of interest could be potentially affected, the outcomes would be erroneously considered as exposed to the treatment
  - If the programme intervention is wrongly placed later than the time in which the outcome of interest could be potentially affected, the outcomes would be erroneously considered as not-exposed to the treatment
The solution often requires additional investigation into the program procedures.

- For employment: the treated period should be placed when the subsidized investment becomes operational.

- For innovation and R&D expenditures: the treated period should be placed when the expenditures are recorded in the balance sheet.

... operationalizing the timing of the intervention
Hidden issues:

B) How to operationalize changes in Y

- When possible, CIEs are best implemented controlling for fixed effects. This means focusing on pre-post-intervention changes of Y.

\[
\frac{Y_{i,\text{post}} - Y_{i,\text{pre}}}{Y_{i,\text{pre}}} \quad \text{Ln}\left(\frac{Y_{i,\text{post}}}{Y_{i,\text{pre}}}\right)
\]

are often wrong choices, with heavy (overlooked) consequences on the impact estimates (results are entirely driven by single-establishment small firms).

- Often small firms (or start-ups) are recipients of generous assistance. How relevant is a change in Y should not be judged by comparison of previous levels of Y for the same firm. Much better to use absolute changes.

- For enhancing policy relevance: results need to be expressed in terms of public expenditure costs per unit of impact.
Hidden issues:
C) How much time lag should be allowed before expecting treatment impacts to occur

- Strong volatility of impact estimates based on the choice of the time lag between the completion of the program intervention and the measurement of the firm-level performance Y

- Long lags may look like a “safe choice” but they increase “treatment contamination” issues
Moving forward:
Three areas of improvements for having more effective CIEs in the EU

A. Enlarging access to micro-data for the purpose of conducting evaluations and enhancing the availability of linked administrative databases

B. Improving the way in which the methodological issues are conveyed from the academic scholars to the larger public of EU government officials, national/regional administrators, practitioners and consultants

C. Taking into account the data requirements for CIE when designing the policy interventions
A) Enlarging the access to micro-data and linked databases

- The availability of micro-data from administrative records or national statistical surveys is crucial…

- …most CIEs have still to rely on commercially available databases from balance sheets (BVD). Balance-sheet data pose limitations for conducting CIEs:
  - attrition bias and external validity issues (i.e. only corporate firms are included);
  - unreliable employment information etc.
…administrative data and CIEs

- On the use of Administrative data, two major areas of improvements exist:

I) The decisions on how to manage the databases should take into consideration also the requirements for conducting CIE.

    e.g.
    - rejected applicant information is purged from many program activity databases

II) Further improvements should be made to make micro-data accessible for conducting CIEs uniformly across the EU

    e.g.
    - Need for standardized procedures for granting access to the data (similar to US Census Bureau)
Linking different administrative databases is also crucial:

- E.g. Very little evidence is yet available on the impact of enterprise support on job quality. Only exceptions due to access to linked employer-employee data (e.g. POE/PRIME program in Portugal, Bondonio, Mamede, Fernandez 2015)

- Different waves of the EU Community Innovation Survey are not linkable longitudinally because of the lack of disclosure of the firm identifiers
B) Conveying to the public the methodological advances

- Methodological advancements are often not effectively conveyed to the larger public of actors involved in CIEs.

- Common misconceptions:
  
  ➢ When using Propensity Score Matching techniques (PSM), crucial confounding factors to be balanced between the treated and comparison group are excluded from the probit estimation for the sake of satisfying the balancing property.
The discussion on the trade off between balancing the covariates and efficiency in matching estimators (e.g. King et al. 2011, or the way data are coarsened for the sake of ensuring common support e.g. Iacus et al. 2011) often misses a crucial piece of the puzzle:

- with repeatable outcomes Y, the unbalance on some covariates can be assumed to be controlled as fixed effect. Whether or not fixed effect assumptions are reasonable is a decision that has to be knowledge driven

- what makes covariates to be balanced or not is also determined by the way they are defined and operationalized in the analysis. This decision has to be knowledge driven (not based on simple data availability)

E.g. geographic location
C) Taking into account data requirements for CIEs when designing the policy interventions

- Planning ahead the data needs for CIEs is crucial when the evaluation requires primary data collection
e.g. innovation outcomes, job satisfaction

- Often times administrative data are available only for the treated units (because a data collection system is established for program monitoring scopes)

- Data collection systems need to be started right at the beginning of the intervention in all units (treated and comparison group):
Because CIEs need data recorded also at pre-intervention times, collecting retrospective data at a post intervention time has serious limitations