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Evidence of Treatment Spillovers Within Markets

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Introduction

- **Is it efficient to increase the proportion** of individuals treated by ALMPs ?
- **Maybe not**, if policies have **negative indirect effects** on non treated people. How can we evaluate such effects ?
- Causal evaluation of public policies (and more broadly, of treatments) rely on **two main assumptions**:
  - **CIA**: conditional independence between treatment and outcomes;
  - **SUTVA**: no influence of an individual's treatment status on another individual's potential outcome.
- !!! Many policies generate interactions between individuals => **SUTVA may not hold**.

Externalities of ALMP (1)

- A growing evidence of **externalities of public policies**, and thus of SUTVA violations. Some rely on **structural calibrated models**
  - **Davidson and Woodbury (1993)**=> displacement effects of a re-employment bonus;
  - **Heckman, Lochner and Taber (1999)** => equilibrium effects of tuition subsidies;
  - **Lise, Seitz and Smith (2004)** => global impact of the *Self-Suffiency Program* in Canada.

Externalities of ALMP (2)

- Some recent papers attempt to **mesure externalities directly** through **randomized or natural experiments** :

  - **Duflo and Saez (2003)** evaluate the diffusion of information on a retirement savings program, with a two step experimental design;
  - **Crépon *et. al.* (2013)** measure the displacement effects of a reinforced placement assistance program, also with a two step experimental design;
  - **Gautier *et. al.* (2012)** show negative effects of an activation program on non-participants using a difference-in-difference model.

- !!! **Experiments are costly =>** is it possible to **measure treatments spillovers** (and hence to test the SUTVA) **in a non-experimental setting** ?

What we do in this paper

- **We extend the standard evaluation model**, allowing for individual outcomes to depend not only on the subject's treatment status but **also on the distribution of treatments in the population**.
- We define a range of treatment effects, and **show their identification under a pair of CIA**.
- Using data from the French unemployment agency, we study **the effect of the proportion of trained jobseekers within a given market** on the probability to leave unemployment.
- To overcome the issue of treatment allocation across markets, **we use detailed information on local labor demand,** together with the longitudinal dimension of our data.

The Model

- The economy consists of **M markets, denoted by $\boldsymbol{m}$**.
- An individual *i* belongs to only one market $m = m(i)$.
- We consider a **binary treatment $\boldsymbol{Z = 0, 1}$** and an outcome Y :

$$Y_i = Y\,(Z_i, Q_{m(i)}),$$

where $Q_{m(i)},$ is a function of $Z_j\,, j \in m(i)$.
- In our empirical application: Q_m is the **proportion of treated individuals in market $\boldsymbol{m}$.**

Outcomes and treatment effects

- We define $\boldsymbol{Y_i(z,q)}$ **as the potential outcome** for individual *i* that applies if $Z_i = z$ and $Q_{m(i)} = q$.
- The evaluation of the causal effect of q on the average treatment effect in the market is based on the **averages of these individual potential outcomes**:

$$Y_{z,q} = E_M \{E[Y_i(z,q)|M]\}, \quad \forall (z,q)$$

- The functions $Y_{z,q}$ directly lead to **average treatment effects**:

$$\delta_{q,q'}^{z,z'} = Y_{z,q} - Y_{z',q'}$$

- The effects of the treatment are then fully described by the set:

$$\{\delta_{q,q'}^{1,0}, \delta_{q,q'}^{0,0}, \delta_{q,q'}^{1,1}\}$$

Two identifying assumptions

- **At the individual level** we assume that we can observe a set X of individual characteristics, that allows for the following CIA:

$$Y_i(z,q) \perp Z_i \mid X_i, M_i = m, Q_m = q, \quad \forall z,q,m,i$$

- **At the market level** we assume that conditionally on a set of market characteristics W_m, the market potential outcomes are independent of the treatment status (here, the proportion of treated):

$$E\left[Y_i(z,q)|M_i = m\right] \perp Q_m \mid W_m, \quad \forall m,z,q$$

Estimation in two steps

- In our empirical application we make use of **matching methods**. !!! With matching, **interactions** between treatment and control groups **are most likely**.

- Step 1 (binary treatment): matching individual using the **weight estimator** of Hirano, Imbens and Ridder (2003).

- Step 2 (continuous treatment): matching markets using the **generalized propensity score** and the estimation procedure devised by Hirano and Imbens (2004).

Application to training policies: data

- **FNA (Fichier National des Assedic), which registers:**
  - **all individual unemployment spells** in France since 1990;
  - **all training spells** during unemployment;
  - a range of **individidual characteristics**, among which the jobseekers' occupation.
- **BMO (Enquête Besoins de Main d'Oeuvre):** survey which collects, from 2001 on, firms' job opening predictions at a very detailed level.
- We start in 2002 for two reasons:
  - **Unemployment insurance reform** in 2001 => changes in the rules of participation to training;
  - **match** between FNA and BMO.

Individual level

- We consider the unemployment inflows of T_0 = 2002 and T_0 = 2004.
  - Z_i = 1 {i enters a training program within d_Z months}.
  - Y_i = 1 {i leaves unemployment within d_Y months} .
- The individual controls X are:
  - age, 1{male}, 1{previous occupation = occupation of job searched}
  - duration of affiliation to the unemployment insurance system,
  - unemployment benefits and reference wage,
  - month when unemployment started.
- During [T_0 − 2, T_0] and [T_0 − 7, T_0 − 2]:
  - # unemployment spells,
  - time spent unemployed/in training,
  - % of spells with training.

Market level

- Markets are characterized by: **an occupation $\boldsymbol{o}$, a region $\boldsymbol{r}$, a year $\boldsymbol{t}$**.
- 308 markets. Smallest (resp. largest) market has 324 (resp. 24 262) individuals.
- Treatment rate $\boldsymbol{Q_m}$ **varies from 2% to 14%.**
- Market characteristics W_m :
  - θ_m = (# vacancies)/(# unemployed workers): **local labor market tightness**;
  - X_m : **mean of each individual characteristics** at the market level;
  - a **fixed unobserved region effect**.

Results: outcomes vs. *Q* (d_Z=6; d_Y=12)

Figure 1a: $\widehat{Y}_{1,q}$ *vs.* q

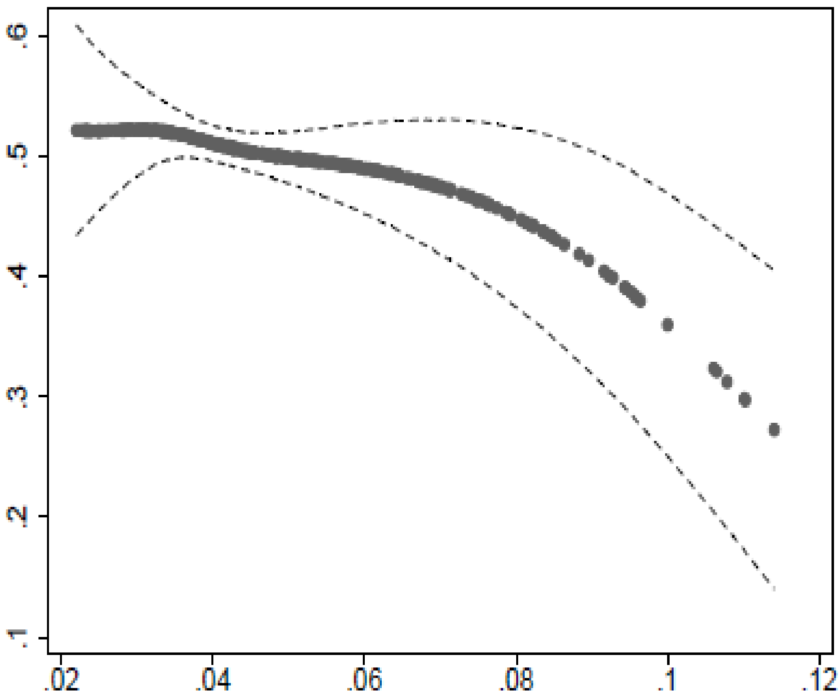
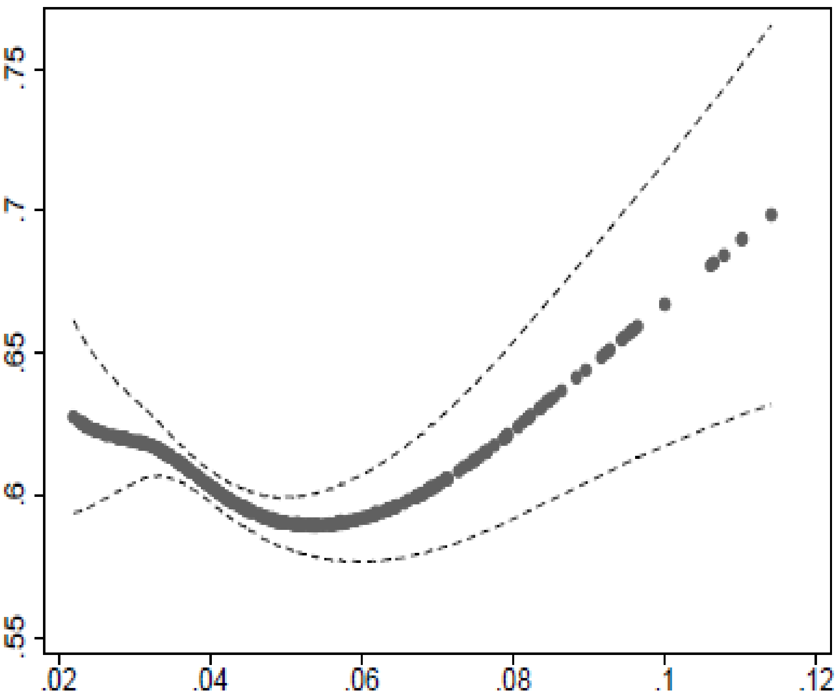
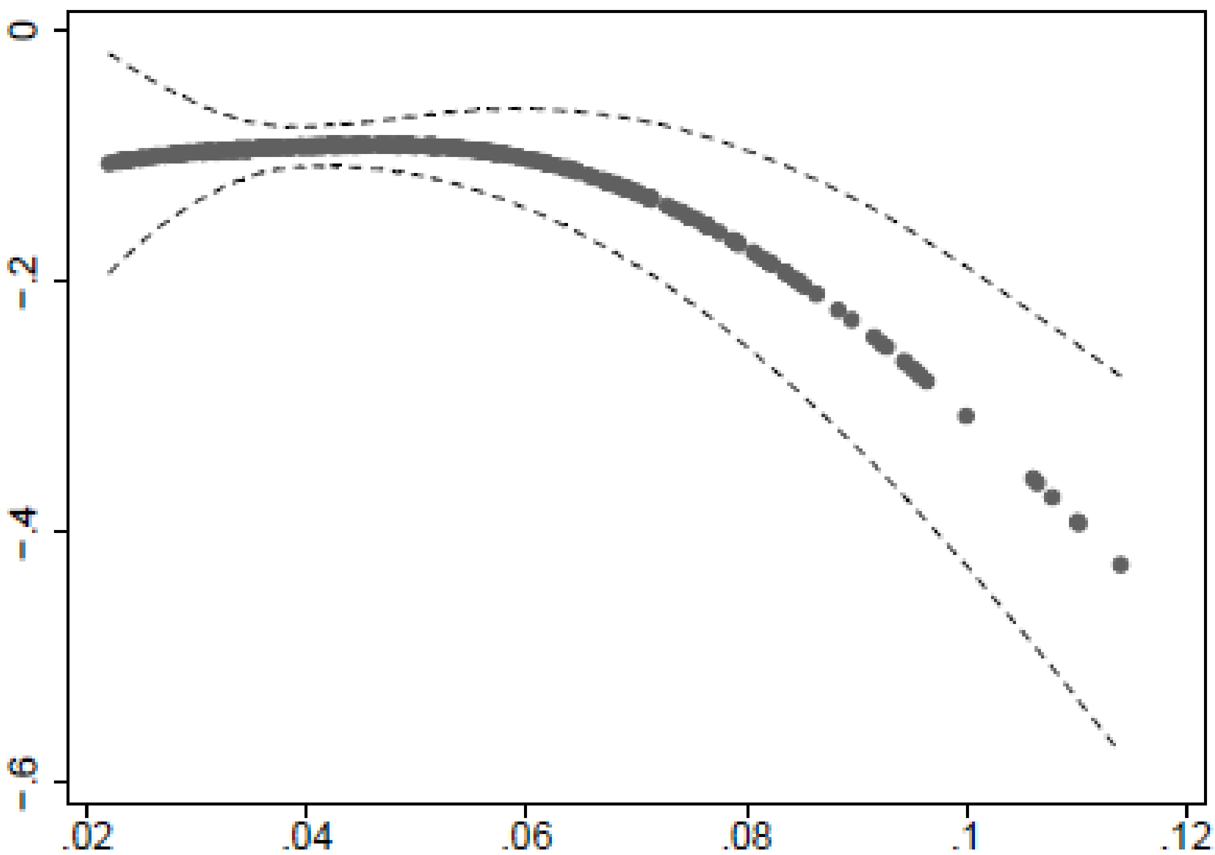


Figure 1b: $\widehat{Y}_{0,q}$ *vs.* q



Treatment effects vs. *q* (d_Z=6; d_Y=12)

Figure 2: $\widehat{\delta}^{1,0}_{q,q} = \widehat{Y}_{1,q} - \widehat{Y}_{0,q}$ *vs.* q



Sources of interactions and policy implications

- **Negative crowding-out** effect for both treated and non treated individuals ?
  $\Rightarrow$ **Marginally expanding** resources for training should be considered **with caution**.

- **Positive labor demand effect** for non-treated individuals ?
  $\Rightarrow$ Outcomes for $q > 0.14$ remain **undetermined**.
  $\Rightarrow$ What effect of a **change in the scale** of training programs ?

Conclusion

- We propose a two step method to **identify treatment externalities** in a non-experimental framework.
- We find **direct evidence of SUTVA violation** in the context of ALMP evaluation.
- Application to training policies show that **treatment effects are decreasing** with the proportion of treated individuals.
- A more structural investigation is needed to understand the **nature of the interactions** at work.