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# Toward the impact evaluation of innovation poles on member firms

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# Innovation poles

**Policy Rationale:** they constitute a typical instrument of the recent generation of innovation policies addressing so-called systemic failures (e.g. Woolthuis et al. 2005)

Other labels / similar infrastructures: technological districts, innovation clusters, ST parks

Policies often develop in two steps:

1. Support the creation of the (material or immaterial) infrastructure – a network of universities, service providers, tech transfer centres, firms
2. Provide incentives to firms for buying services provided by the pole

Possible services

- networking opportunities aimed at matching knowledge demand and supply (intermediation)
- technology check-up services with identification of the firms' technological needs
- other specialized services and consultancy
- help in finding opportunities for innovation financing, ...

# Previous literature

What do we know about the results of these previous policy instruments?

A few number of studies have evaluated innovation poles, Science & Technology Parks and the like:

- ❖ Many of them have focused on the first part of the policies (e.g., the creation of the infrastructure) (Phillimore, 1999; Bakouros et al, 2002; Cheba, 2013; Rowe, 2014);
- ❖ Only some of those that focus on the second step have adopted a counterfactual approach (e.g., Vásquez-Urriago et al, 2014). Among these we find two recent Italian studies:

❑ Liberati et al. (2014) on Science & Technology Parks existing in 2011 (14 ST Parks), matching combined with parametric DID approach

Outcomes: sales, v. added, investments, profits, etc in 2011; patents 2009-2011

❑ Bertamino et al. (2014) on Technological Districts 2003-2011 (29 TD), matching combined with parametric DID approach

Outcomes: sales, v. added, investments, profits, etc within 2 years after joining; patents within 5 years after joining

Both studies find evidence of better firms self-selecting into these innovation policy tools but... find only weak evidence of positive causal effect of joining on economic performance and innovation outcomes

# Opening the black box

The previous two studies compare the outcomes of joining vs non joining, i.e. they do not pay attention to whether what could potentially occur after joining has actually occurred in terms of service receipt by firms from technology providers, consultancies, joint R&D projects

The novelty of our approach is that it tries to shed light on whether at least some of the services and utilities these bodies are supposed to provide are effective

Effective with regard to what?

Their possible contribution can be reasonably and comprehensively appraised only in the medium or long term

Since we are dealing with a quite recent policy experience, we will not focus on “hard” outcomes such as sales, v. added, patents which may be viewed as mid-term outcomes that can arise after the completion of new innovation processes

We will instead place more emphasis on softer elements regarding the dimensions of organizational learning, innovation propensity and capabilities of member firms, which may be viewed as prerequisites for innovation to take place, with SMEs in particular

These are desired outcomes of the policy!

# Types of services under the lens

**Technological check-up:** provided by a technology-transfer organization as the IP, it should really help firms to define their need of technological assistance and choose the most proper services/consultancies. If so, **the receipt of an innovation-support service should have a higher impact if accompanied by previous technological check-up**

**Quality of services:** innovation-support services in the IP should be supplied by knowledgeable agents, including universities, that show higher quality than ordinary service providers available in the local business service market. If so, **the receipt of a service from an IP supplier should have a higher impact than if a similar service is provided by an “ordinary” non-IP provider**

**Non customized services:** even without receiving check-up or specialized services from the IP, member firms might benefit from ‘just being there’, since they have the opportunity to receive information (e.g. technological demonstrations, seminars, ...) that is reserved for the ‘club’ members. If so, **the fact of being part in a IP could per se be cause of positive impacts with respect to non-membership**

# The policy under analysis – I step

**2010 – I step:** Tuscany Region identifies a set of 12 technology areas in which it promotes the creation of 12 innovation poles

*groups of universities/research centres, service providers, and firms organized in a temporary association or consortium (the management of the pole)*

Poles have the following basic goals:

- operate as specialized intermediaries in the field of research and innovation (tech check-up)
- provide innovative services
- encourage networking among members of the pole

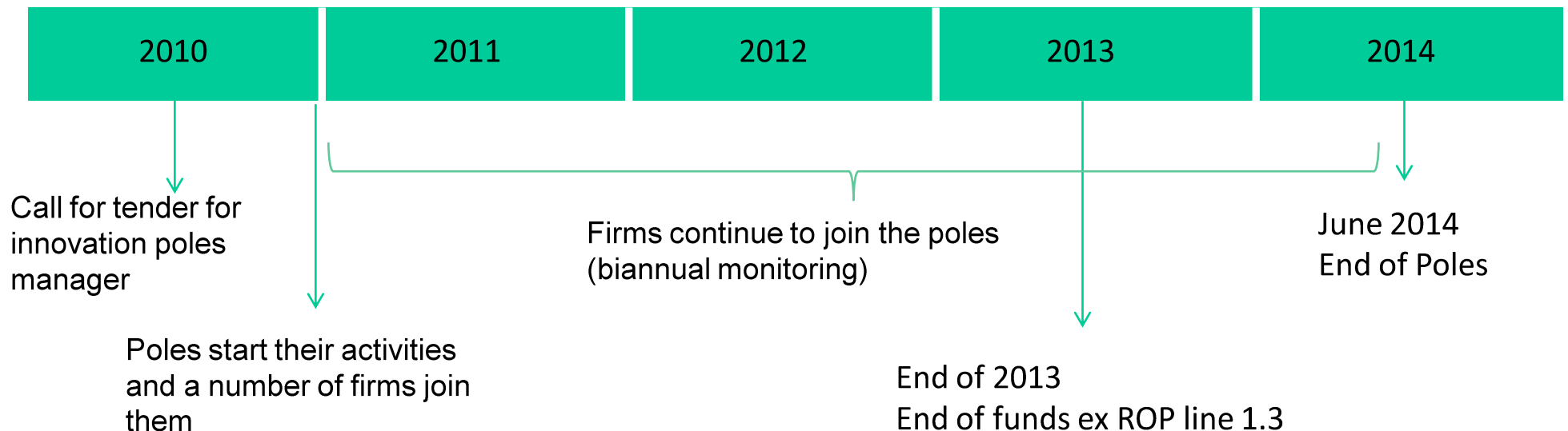
Funds (ERDF funds) are granted to the management board to organize such activities in tranches, only after ascertaining the achievement of performance indicators:

- A minimum number of firms must join the pole (in absolute numbers and in pct with respect to the firms that are included in the management board). Affiliation to the pole is for free;
- The pole must deliver a minimum number of services to firms
- The pole must reach a minimum amount of turnover

# The policy – II step

**2011 – II step:** Two interventions are aimed at supporting the activity of the Poles as innovation service providers:

- ❑ The Poles are automatically added to the list of innovative service providers accredited by the region. Since 2008, the region provides incentives to companies that buy innovative services from accredited providers through (ROP line 1.3 - Aid to SMEs for the acquisition of qualified services)
- ❑ Firms that join the Poles can receive a grant equal to 80% of costs incurred for the acquisition of innovative services ex ROP line 1.3 (the default is in the range 20%-60%, depending on the type of service and the type of applicant)



# Descriptive statistics

There are 3,157 member firms of at least one IP, so we have multiple memberships

| 1 IP  | 2 IPs | 3 IPs | 4 IPs |
|-------|-------|-------|-------|
| 2,599 | 408   | 136   | 14    |

Total: 3,157

For sake of simplicity, we focus on single-membership firms

| <i>IP name</i> | <i>Active in...</i>                  | <i>Members</i> | <i>With aided service %</i> |
|----------------|--------------------------------------|----------------|-----------------------------|
| OPTOSCANA      | Optoelectronics                      | 38             | 2.6%                        |
| INNOPAPER      | Paper industry                       | 100            | 6.0%                        |
| OTIR 2020      | Fashion industry                     | 401            | 16.2%                       |
| VITA           | Life sciences                        | 85             | 14.1%                       |
| PIETRE         | Stone industry                       | 98             | 1.0%                        |
| PENTA          | Nautics                              | 242            | 4.1%                        |
| POLIS          | Sustainable city & Cultural heritage | 408            | 11.3%                       |
| NANOXM         | Nanotech                             | 56             | 7.1%                        |
| CENTO          | Furniture                            | 238            | 5.0%                        |
| PIERRE         | Renewable energy                     | 230            | 7.8%                        |
| POLO12         | Mechanics and transports             | 264            | 12.1%                       |
| POLITER        | ICT, Robotics                        | 439            | 12.8%                       |
| Total          |                                      | 2,599          | 10.1%                       |



# Issues of comparability

Note that:

- ❑ the decision to join an IP is the result of a choice, with those that join being potentially different from the rest not only in terms of observable characteristics
- ❑ the same holds true for the receipt of services

Therefore, it may make sense to involve in the analysis only those firms whose behavior reveals innovation intentions, e.g. firms that chose to become members of IP or, at least, firms that we know to have received specialized services/consultancies

In order to address these potentially serious issues, we restrict the analysis to firms that are either members of IP or that received specialized services

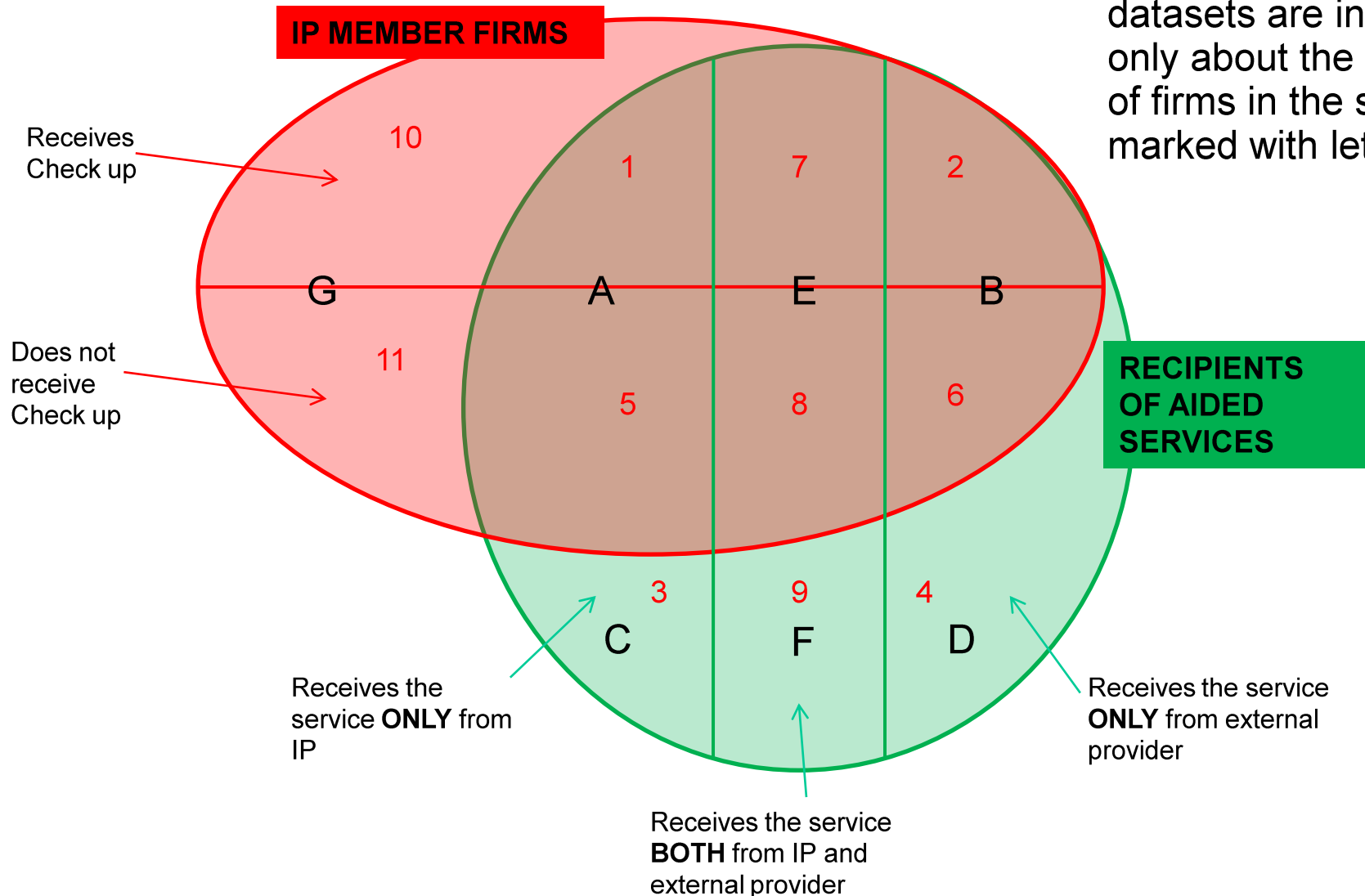
From administrative datasets...

- ❑ we know who is member of IP
- ❑ we do not know the universe of firms receiving services but only the subset of these receiving public aids for buying these services
- ❑ we do not know whether a member firm receives technological check up prior to service receipt (if any)

# Possible strata of analysis (1)

In spite of these simplifications, the situation is still far from simple !

Note that administrative datasets are informative only about the distribution of firms in the strata marked with letters...



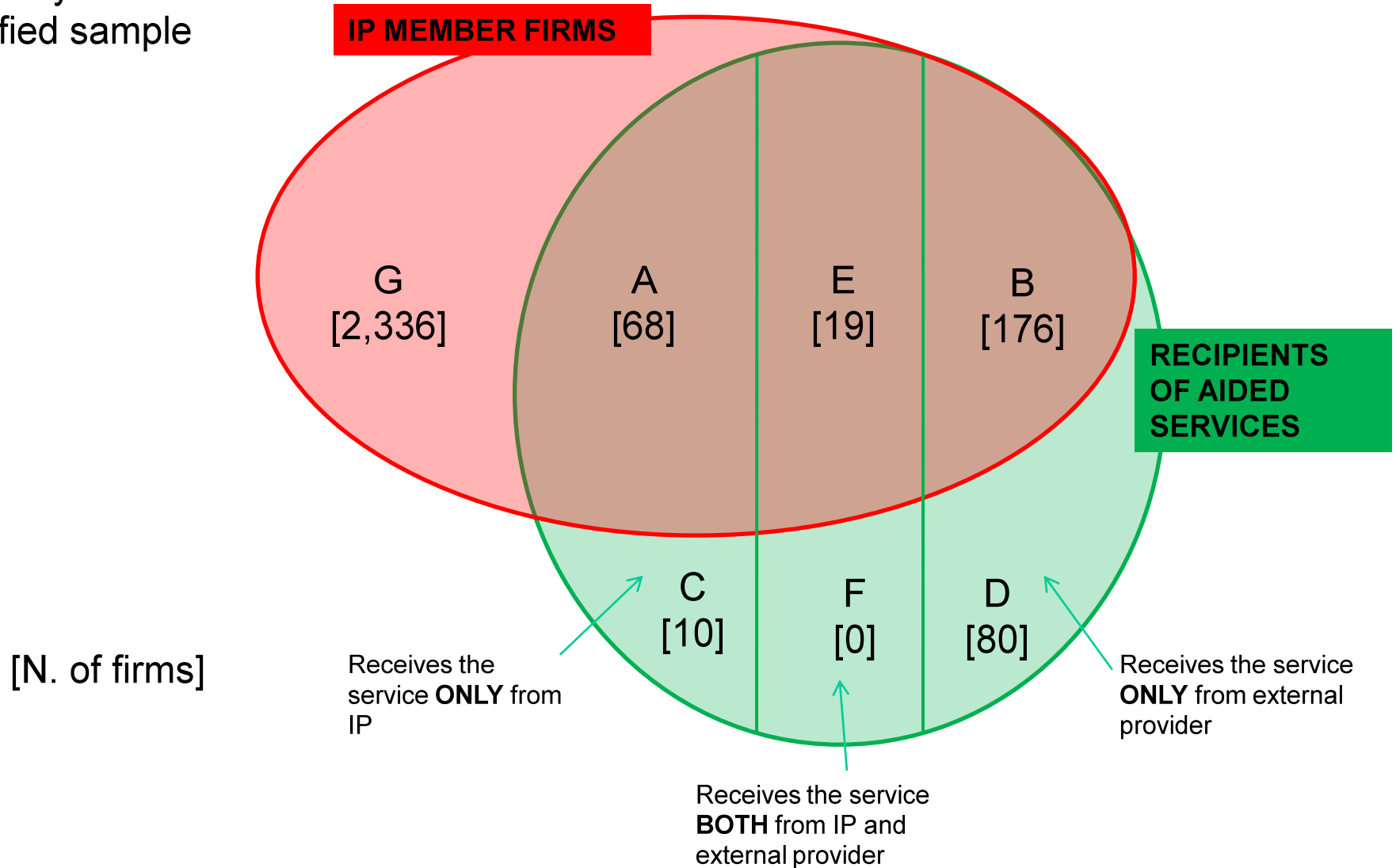
# Possible strata of analysis (2)

...while the distribution of firms in the strata marked with numbers can only be known at the price of surveying firms about whether they received check up

|    | IP member | receives CHECK-UP | receives SERVICE | receives SERVICE from IP | receives SERVICE from external provider |
|----|-----------|-------------------|------------------|--------------------------|-----------------------------------------|
| 1  | Yes       | Yes               | Yes              | Yes                      | No                                      |
| 2  | Yes       | Yes               | Yes              | No                       | Yes                                     |
| 3  | No        | No                | Yes              | Yes                      | No                                      |
| 4  | No        | No                | Yes              | No                       | Yes                                     |
| 5  | Yes       | No                | Yes              | Yes                      | No                                      |
| 6  | Yes       | No                | Yes              | No                       | Yes                                     |
| 7  | Yes       | Yes               | Yes              | Yes                      | Yes                                     |
| 8  | Yes       | No                | Yes              | Yes                      | Yes                                     |
| 9  | No        | No                | Yes              | Yes                      | Yes                                     |
| 10 | Yes       | Yes               | No               | No                       | No                                      |
| 11 | Yes       | No                | No               | No                       | No                                      |

# Actual sampling strata

The survey is based on a stratified sample



# Outcomes of interest

In the survey, we collect information unavailable in administrative or balance-sheet datasets related to organizational learning, innovation propensity and capabilities of firms, which may be viewed as prerequisites for innovation to take place. E.g.:

- increased R&D investment / Sales
- increased R&D employees
- application for intellectual property rights
- introduction of new-to-the-firm products
- introduction of significant changes in production technologies
- introduction of significant changes in marketing strategies
- increased collaborations with university partners
- increased awareness of own technological needs
- increased awareness of own needs for human capital
- increased know-how in writing formal and comprehensive R&D projects
- ...

# Estimands

## Average Treatment Effects on the Treated

$$ATT = E[Y_i(1) | X, T=1] - E[Y_i(0) | X, T=1]$$

observed
counterfactual

### Effect of receiving Check-up

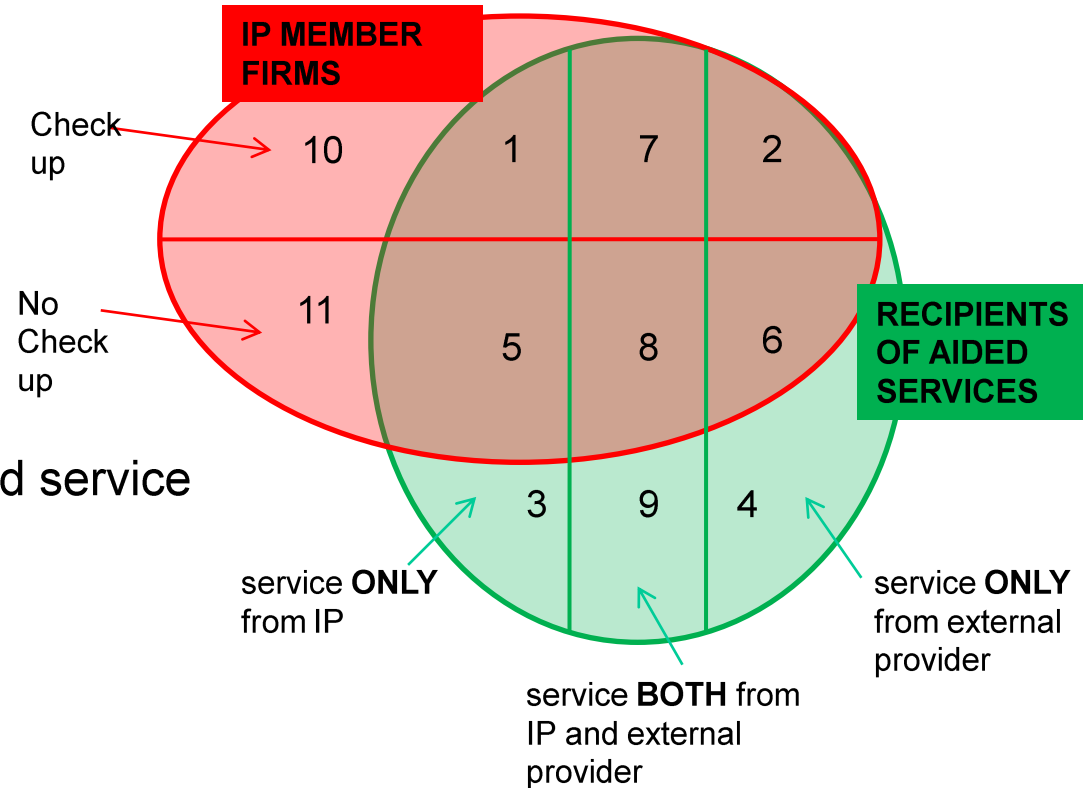
[1+7+2] – [5+8+6] for members with an aided service  
 [1+7+2+10] – [5+8+6+11] for all members

### Effect of receiving service from IP

[3] – [4] for non members  
 [5] – [6] for members with no check-up  
 [1] – [2] for members with check-up  
 [1+5] – [2+6] for all members

### Effect of just 'being in there'

[5] – [3] for those being serviced by IP suppliers  
 [6] – [4] for those being serviced by others  
 [6+5] – [4+3] for those being serviced by anyone



gross informational (dis)advantage due to "club information" and externalities

# The strategy we wish to adopt

Being in an observational setting, effects cannot be identified simply by computing differences in means

The identification of counterfactuals requires to address the underlying selection issues by means of an appropriate strategy

In observational settings, any strategy requires assumptions (e.g. exogeneity of an instrument, selection on observables, parallel trends, ...)

Relying on a set of relevant pretreatment firm characteristics and on stratification variables, we believe that a strategy based on a **selection on observables** assumption can be credible

Therefore, our preferred approach is a propensity-score matching ...

- ❑ exploiting the powerful “covariate-balancing propensity score” by Imai & Ratkovic (2014)
- ❑ involving only the most appropriate strata in the comparisons
- ❑ performing sensitivity analyses as in Ichino et al. (2008)

Motivated by recent works that **relax the typical non-interference assumption** (Hong & Raudenbush, 2006; Cerqua & Pellegrini, 2014; Arpino & Mattei, 2015), while estimating causal effects we will account for the fact that IP are, by construction, environments that favor networking and interaction and therefore the **circulation of spillovers among members**



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To be completed with results  
in the near future

Comments and suggestions are welcome  
already at this stage!