R&D collaboration policies: are they really able to promote networking?

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Extended abstract

The last twenty years have witnessed the diffusion of innovation policies encouraging interactions between organisations with different knowledge and competencies (Mowery, 1994; Metcalfe and Georghiou, 1998; Autio et al., 2008). Although promoting R&D is the primary objective of such interventions, which provide funds for the implementation of collaborative R&D projects, the secondary one is clearly that of stimulating networking also beyond the project receiving support. By encouraging the diffusion of knowledge through networks, these policies aim to address network failures that can occur whenever the lack of linkages between agents leads to an insufficient development of complementarities, to obstacles in learning processes and in the creation of new ideas, as happens when agents are trapped in relational and knowledge lock-ins (Carlsson and Jacobsson, 1997; Malerba, 1997; Nooteboom, 2000; Klein Woolthuis et al., 2005; Hekkert and Negro, 2008). Many of these interventions have targeted small and medium-sized firms (SMEs), which, despite having greater need for sourcing external knowledge than other firms, have less knowledge and skills to invest in the search, screening and identification of partners to collaborate with (Davenport et al., 1998b; Bougrain and Haudeville, 2002; Narula, 2004).

The problem of how to analyse and evaluate such policies has entered the agenda of both researchers and policymakers. Given their specific aim to encourage networking, in addition to the typical objectives of programme evaluation, which include the analysis of the effects on R&D spending or on the innovative output produced by the funded organisations (David et al., 2000; Georghiou and Roessner, 2000), it is important to investigate whether, and to what extent, these interventions have taught participating firms how to collaborate with other agents and introduce some persistent change in their networking behaviour (Davenport et al., 1998a; Luukkonen, 2000; Fier et al., 2006; Autio et al., 2008; Clarysse et al., 2009; Afcha Chávez, 2010; Wanzenböck et al., 2013; Knockaert et al., 2014). A number of contributions have tried to do this by analyzing various aspects of network additionality. However, a key issue remains unexplored, which is related to the following question: do we really need R&D collaboration policies to stimulate networking?

This question comes from the fact that the literature has shown that even relatively simple policy schemes such as R&D incentives to individual companies can stimulate R&D collaborations (Miotti and Sachwald, 2003; Busom and Ribas, 2008). Therefore, one might wonder if this specific instrument, which is indeed more complex to manage, is really needed to boost collaboration. Our paper explores this issue and takes a step forward in the 'comparative' evaluation of the effects of alternative policies, which – at least in the case of enterprise and innovation policy - is a largely neglected issue.

In order to accomplish this goal we need to figure out a logic cause-effect chain that can guide us in the comparative empirical analysis of the networking effects. We believe that, thanks to their peculiar features, R&D collaboration policies can be more effective than R&D subsidies to individual firms to stimulate networking. This expectation rests on two main mechanisms that should be triggered by R&D collaboration policies: a) the development of organisational learning by experience (Cyert and March, 1963), absorptive capacity (Cohen and Levinthal, 1998, 1990), and interaction with external organisations (Huber, 1991; Levinson and Asahi, 1996; Kogut, 2000) – which are aptly called into question by Clarysse et al (2009) in the explanation of behavioural additionality – and b) the cumulative effect of learning (Kim and Kogut 1996; Van den Bosch et al. 1999) and networking (Gulati, 1995; Powell et al., 1996; Walker et al., 1997; Chung et al., 2000). As learning (to collaborate) takes time, we focus on the non-simultaneous network effects of these policies (Roper and Hewitt-Dundas, 2014).

We apply this framework to the comparative analysis and evaluation of two different innovation policy instruments, implemented by the same policymaker, in the same area, in the same period to support small businesses: a subsidy for R&D collaboration and a typical R&D subsidy to individual firms.

While previous evidence on network additionality has been mainly descriptive (exceptions include Fier et al., 2006; Antonioli et al., 2014; Chapman and Hewitt-Dundas, 2016), we use a propensity score matching approach (Rosenbaum and Rubin, 1983) to make causal inference using a set of original data that we have collected through an ad hoc survey. The survey was aimed not only at interviewing firms participating in both programmes, but also at interviewing a set of very similar firms that did not participate in any programme during the same time period. This choice is very reasonable when it is impossible to approach the whole population of eligible firms with the survey. This reservoir of potential control firms was identified through matched sampling techniques. In particular, we exploit the generalisation of propensity-score matching methods to settings with heterogeneous programs (multiple treatments, Lechner 2002a, 2002b) to reconstruct, separately for each programme, the counterfactual outcomes of firms in a no-policy scenario (absolute effects), as well as under the alternative policy instrument (comparative, or differential effects), and to estimate treatment effects in each situation by means of nearest neighbour matching techniques. The following Table 1 reports the absolute effects of the two programmes, while Table 2 report the comparative effects of the two different “active” treatments (namely: the R&D grant to individual firms and the R&D grant to collaboration). The two tables consider the same quantities of interest (average treatment on the treated, average treatment on the untreated and the average treatment effect). However, the estimation of some of these quantities is not always meaningful, namely when the counterfactual scenario exploits the information on untreated firms collected through matched sampling.

Table 1: Absolute effects: Treatment vs. no treatment

	T = I	***T = C***
ATT = E(Y(1) – Y(0) | X, T=1) *Contrast between:* *- observed outcome of firms receiving T* *- outcome that these firms would achieve with no treatment at all*	Average effect of the I subsidy on I-type firms 3% university -0.4% other firms -0.3% R&D inputs	Average effect of the C subsidy on C-type firms 28%*** university 10% other firms 26%** R&D inputs
ATU = E(Y(1) – Y(0) | X, T=0) *Contrast between:* *- observed outcome of untreated firms* *- outcome that these firms would achieve after receiving T*	Average effect of the I subsidy on untreated-type firms. Not meaningful after matched sampling	Average effect of the C subsidy on untreated-type firms. Not meaningful after matched sampling
ATE = E(Y(1) – Y(0) | X) *is a weighted average of the ATT and the ATU. Contrast between:* *- Outcome that all firms would achieve after T* *- Outcome that all firms would achieve with no T at all*	Average effect of the I subsidy. Not meaningful after matched sampling	Average effect of the C subsidy. Not meaningful after matched sampling

Note to table: Statistical significance: $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$

Table 2: Comparative effects of alternative treatments T and C

	T = I	T = C
ATT = E(Y(1) – Y(0) | X, T=1) Contrast between: - observed outcome of firms receiving T - outcome that these firms would achieve after alternative treatment	Average effect of the I subsidy on I-type firms -16% university -35% ** other firms 25% R&D inputs	Average effect of the C subsidy on C-type firms 18%*** universities 2% other firms 16% R&D inputs
ATU = E(Y(1) – Y(0) | X, T=0) Contrast between: - observed outcome of firms taking the alternative treatment - outcome that these firms would achieve after receiving T	Average effect of the I subsidy on C-type firms -18%*** universities -2% other firms -16% R&D inputs	Average effect of the C subsidy on I-type firms 16% universities 35% ** other firms -25% R&D inputs
ATE = E(Y(1) – Y(0) | X) is a weighted average of the ATT and the ATU. Contrast between: - Outcome that all firms would achieve after T - Outcome that all firms would achieve after alternative treatment	Average effect of the I subsidy -14% university -13% other firms -12% R&D inputs	Average effect of the C subsidy 14% university 13% other firms 12% R&D inputs

Note to table: Statistical significance: $^{*}p< 0.10$, $^{**}p< 0.05$, $^{***}p< 0.01$

The comparison between the network additionality generated by the R&D collaboration policy and the R&D subsidy to individual firms shows that the former type of policy is more effective in stimulate networking than individual incentives to R&D. However, firms participating in R&D collaboration policies often have a prior propensity to collaboration. If more stand-alone firms would participate in these policies, they could significantly increase inter-firm partnerships.

In conclusion, we find that the pro-networking rationale of R&D collaboration policies is confirmed.

Key words: Behavioural additionality, networking additionality, innovation policy, policy evaluation, innovation networks.

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