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Internal structures and external connectedness: towards a typology of French clusters

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Aims and scope

For last years, governments from many countries have built cluster development policies aimed at catalyzing the competitiveness and innovativeness of their industries. The knowledge-centred theory of clusters argues that clusters perform well since they stimulate knowledge creation and combination capabilities (Ferrary, 2011). The intensity of collaborations among diverse actors (firms, research institutions, etc.) hence becomes a key explanatory variable of clusters' success (Porter 1998; Tallmann et al., 2004; Bathelt 2005).

Two alternative although complementary, sources of knowledge creation and combination have been highlighted: clusters may learn either internally (by stimulating knowledge interactions among their members) or externally by looking outside their borders to find new knowledge (Maskell et al., 2006; Moodysson, 2008). In this latter respect, an important stream of literature has discussed the importance of accessing external sources of knowledge, of increasing the external connectedness through the development of so-called "knowledge pipelines" (Bathelt et al. 2004, Owen-Smith and Powell, 2004) to catalyse clusters' performances. By offering the opportunity to tap into external pools of knowledge, those pipelines allow clusters to be fuelled with new knowledge, thus enhancing their innovativeness and resilience. However, this literature, by resting either on theoretical discussions or on case studies, has poorly addressed the important issue of the impact of cluster characteristics on pipeline construction. More precisely, one would easily expect that different clusters might be characterised by different pipelines practices (numerous vs. few pipelines, pipelines in the sectoral vicinity vs. at sectoral distance).

This paper aims at characterising those pipelines practices for different clusters and then to isolate their explanatory factors and, among them, to test for the influence of the internal structure of clusters. All in all, the main analytical issue underlying this paper is the following: do internal characteristics of clusters vary (among them), and do they have any influence on the characteristics of clusters' external relationships? In other words are some clusters trapped whereas others are well-endowed for internal learning, or is it possible to counterbalance structural internal weaknesses and escape the trap through an active external networking activity? Besides an enquiry into the network of inter-cluster R&D cooperations, we inspect clusters' cooperation practices as depending on three main characteristics pertaining to:

- Their levels of internal complexity accounting for the coordination needs among firms of the cluster (Arikan and Schilling 2011)
- The dominant ownership structure of their belonging firms accounting for the balance between independent firms and subsidiaries of national companies or of MNC (Markusen 1996, Giuliani 2011)
- The cluster's absorptive capacity accounting for clusters' ability to effectively combine resources with external partners (Giuliani 2007)
- A cluster's dominant knowledge base as different types of knowledge base (analytic, synthetic, symbolic) have different consequences on the needs and characteristics of a cluster's relational behaviour (Moodysson, 2008; Plum and Hassink, 2011).

Data and method

We address this question for the specific case of the French *Pôles de Compétitivité* policy. French *Pôles de Compétitivité* are 71 state-supported clusters spread all over the French territory and specialized in different industries (eg. aerospace, automotive, agricultural and agro-food, finance, retailing, biotechs, nanotechs, greentechs...) They are jointly sponsored by the French State and by French *Regional Councils*. The chosen scale of action for the policy is basically at the cluster level. One of the main targets of this policy is to catalyse the innovativeness of firms belonging to *Pôles de Compétitivité*. This is done notably by financing R&D projects by contributing to finance R&D projects at the involving firms (from and outside each *Pôles de Compétitivité*) and research labs. We undertake a quantitative analysis on data characterizing each of the 71 *Pôles de Compétitivité* (firm demography and industrial distribution of firms, employment characteristics, dominant knowledge base, financing activities) out of their scoreboards (available on the official *Pôles de compétitivité* website www.competitivite.gouv.fr). We suppose those data to proxy each determinant of the internal characteristics of clusters (internal complexity, ownership structure, absorptive capacity, dominant knowledge base) as well as on R&D collaborative projects (name of the project and involved *Pôles*) for the years 2006-2012.

We then apply a three-steps methodology for identifying specific cooperation (ie. Pipelining) practices involving different *Pôles* and to link their internal characteristics with their cooperation practices. First, thanks to data analysis techniques we try and highlight patterns in the ways *Pôles* are structured (clusters sharing similar types of actors, similar qualification levels, similar geographical spread of their activity, etc.). Applying network analysis methods on collaborative R&D projects, we then investigate their cooperation practices with other *Pôles*. In a final step, we confront internal characteristics and the cooperation practices of French *Pôles de compétitivité* to analyse their potential links (do specific internal structures call for specific cooperation practices?).

Main results

Our data analysis combined to a network analysis on French *Pôles de compétitivité* allows us to highlight several results concerning clusters' cooperation practices and to link them with internal characteristics. First, even though clusters tend to favour cooperation with a given partnering cluster, they try to diversify as much as

possible their cooperation with different clusters. They thus try to strike a balance between deepened, more enduring cooperations with a one or a couple of other clusters and the search for novelty variety by initiating cooperations with new partnering clusters. Our results also suggest a significant variety in the cooperation practices among French clusters. Some of them do not play any significant role in the global network, whereas others are associated with high levels of centrality. This suggests that not all clusters implement (or are capable of implementing) similar cooperation practices. This is coherent with our first argument that clusters may not be equally endowed with the same networking capabilities.

Investigating further the factors underlying clusters' cooperation practices and trying to bind them with internal characteristics, we confronted the results obtained out of our network analysis based on R&D collaborative projects. Our first results show that French *Pôles de compétitivité* indeed differ according to their internal characteristics, the most discriminating factors being linked to the complexity level of clusters and their ownership structure while absorptive capacity and the nature of knowledge bases appear to be less discriminating. Considering both Pôles' internal characteristics and cooperation practices, the internal factors determining most of their cooperation practices lie in their levels of internal complexity and their absorptive capacities. Our analysis shows that the dominant ownership structure in a Pôle and the nature of its dominant knowledge base have less influence.