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# Does a clustered location matter for high-technology companies' performance? The case of biotechnology in the Netherlands

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## Abstract

Young entrepreneurial companies in biotechnology tend to cluster in space, nearby research universities and research centers. This pattern is often ascribed to the availability of external economies, mainly local knowledge spillovers that help to reduce the uncertainty from a disruptive technology faced by these companies. Given a shortage of empirical research on cluster advantages and performance of clustered companies, we present results of a comparative analysis of clustered and non-clustered companies in biotechnology and Bionanotechnology in the Netherlands. It appears that, among other influences, a clustered location has no significant influence on innovation and speed of growth. However, a location in the largest cluster (Leiden) does contribute to a better performance in terms of innovativeness compared with all other locations. The kind of external economies involved seems to vary according to the stage in the knowledge value chain and the segment in biotechnology industry. Knowledge spillovers tend to be local for companies involved in new drugs and diagnostics research only in the first stage of the knowledge chain and for service companies regardless of the stage in the knowledge chain. © 2006 Elsevier Inc. All rights reserved.

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## 1. Clusters in dispute

No other concept in regional economics and policy seems so often used and yet so poorly understood on the basis of systematic research than the cluster concept. This particularly holds true for one of the

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proposed underlying benefits of a clustered location, i.e. local knowledge spillovers and local learning processes. Advantages of agglomeration or clustering have been argued theoretically and empirically, starting with Marshall in the late 1880s in an economic tradition and “reinvented” by authors of the new industrial district since the late 1980s (see, for example, [1]). Advantages of agglomeration are rooted in three sets of economies: specialized inputs from various intermediate and subsidiary industries, a pool of skilled labor; and a dedicated infrastructure and other collective resources. In particular approaches (“learning regions”), a strong attention has been given to knowledge spillovers and tacit knowledge flows as a result of spatial proximity and networking. In this line of thinking the assumption is that companies benefit from a clustered location through meeting colleagues repeatedly and in person allowing for the exchange of tacit information [2–4].

Clustering is not simply the co-location of a number of biotechnology or nanotechnology companies but it includes the ideas of regional competitive advantage, political drivers, educational activities, synergies between industry, government and academia, entrepreneurial activity, and interaction between large firms and small and medium-sized firms. Concepts of economic clusters emphasizing entrepreneurial efforts have been postulated by many authors. There are at least four popular approaches to economic development through clustering, each articulating different critical mechanisms and requirements for success. They include the entrepreneurial small firm (or Birch) model, drawing on ideas of Schumpeter [5–7], in which emphasis is put on R&D activity, entrepreneurship and on advocating a “bottom up” approach in policies for the enhancement of small business development. The latter is supported by the empirical evidence that the vast majority of net new jobs is generated not by existing companies but new ones. The role of small companies is also emphasized in the industrial district literature, mainly concerning traditional (artisanal) production but providing a clear model for networked high-technology production linked with flexible specialization [8,9]. In this view, independently small companies in collaborative networks share the costs of developing new technologies and responding flexibly to new user demands, in a dense network of institutions and companies. This allows small companies to compete effectively in or aside from channels normally controlled by larger firms. Analysis of such clusters draws heavily on social capital theory [10] that views economic development as partly determined by cultural characteristics of a local community, particularly by supportive civic traditions.

A second cluster approach – the Triple Helix model – centers on the relationships between universities, industry and governments as actors providing fertile seedbeds for knowledge utilization by industry [11]. A first step in such relationships usually involves joint projects to enhance a local cluster or technopole. In such arrangements, the initial lack of fit between the Triple Helix partners urges them to partially take on the role and view of the other partners. Thus, one of the clearest changes perceived in recent times is a blurring of the edges between the functions of all three actors involved. For example, universities have become more entrepreneurial and companies have started knowledge production and education in their own campuses [12]. In this situation, the development of incubators is one of the effective means to mediate the network among university, government and industry, and to contribute to regional-economic growth [13].

A third approach is found in the concepts advocated by Porter [14]. A cluster can be defined as a geographically proximate group of interconnected companies and associated institutions in a particular area, linked by communalities and complementarities, providing various economies. Following these concepts, the growth of regional clusters of excellence occurs when quality factors inputs (such as from universities, national laboratories, etc. in a particular application) are combined with demanding regional customers, competing (similar) firms and high-standard supplying and servicing companies; the latter

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