CLUSTERING EFFECTS*

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Abstract

Clusters are considered as an interfirm network joining resources and knowledge for gaining some profits. The distinct feature of clusters is generating some positive effects that provide certain comparative advantages for clusters. The present paper attempts to contribute to the literatures on interfirm networks and geographical agglomeration by investigating the effects of clusters on regional economic development. The study explores and examines some crucial factors influencing clustering and provides an overview on four positive effect determined – agglomeration effect, learning effect, innovation effect and synergic effect. The paper suggests analytical framework for apprehending the phenomena of clustering and lays a theoretical foundation for further investigation in this field.

Key words: clusters, interfirm relationships, networks, agglomeration effect

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Introduction

In recent years there has been growing interest in the concept of "clustering" both in economics and other social disciplines. Clustering policy is thought to be an effective economic instrument for improving local competitiveness and boosting innovative activity, making it a crucial factor in sustainable economic development.

The term "cluster" first appeared in the 1980s. At that time it was seen largely as a set of firms, not only localised within the same geographical area, but also additionally incorporated in a network with the purpose of gaining shared benefits by utilising complementary resources and competences (Mattson, 1987). Michael Porter, who studied correlations between clusters and local competitiveness, defined the former as "geographic concentrations of interconnected companies and institutions in a particular field. Clusters encompass an array of linked industries and other entities important to competition"[1]. In other

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[1] Michael Porter, Cluster and the New Economics of Competitions, Harvard Business Review, Nov. – Dec. 1998

words, a cluster can be defined as an interfirm network that pools material, financial, social and other resources with the purpose of gaining specific benefits. A cluster is characterised by positive emergent effects that provide comparative advantages for the entire structure. The present paper attempts to analyse clusters in terms of these effects and to determine concomitant economic gains.

Since Alfred Marshall's introduction of the concept in 1920, many economists have argued that the geographical agglomeration – or clustering – of enterprises can be a source of improved firm performance. The core idea is that the spatial proximity of a firm to its suppliers, customers and rivals produces such advantages as access to informational spillovers, skilled labour, reduced transaction costs, etc. A number of empirical studies (Glaeser et al., 1992, Henderson et al., 1995, Henderson, 1997, Combes, 2000, Blien et al., 2006) have shown agglomeration to be a reason for employment growth in the USA and some European states. Other researchers (De Lucio et al., 2002) have pointed out additional positive productive effects gained through agglomeration.

A specific type of benefit accruing from agglomeration relates to knowledge spillovers, interpreted as ideas and findings borrowed by firm i from firm j (Griliches, 1991).Geographical (spatial) proximity helps firms to keep abreast of new technologies as well as the latest marketing and management strategies. Such externalities positively affect the technological capabilities of firms. Moreover, agglomeration fosters trust between clustering firms, which is of particular importance for those countries where formal institutions fail to provide sustainable economic development. Relationships based on trust are known to favour successful cooperation and partnership between clustering firms.

In addition to information spillovers and trust, there are other agglomeration mechanisms capable of reducing the costs of operating a firm. For instance, agglomeration can decrease labour costs due to the fact that a larger labour market simplifies the sourcing of skilled labour (Glaeser, 1992). A functioning market for second hand capital is advantageous in terms of lowering the costs of fixed capital. Proximity to suppliers and consumers and mutual infrastructure facilitates a reduction in transport and transaction costs.

Agglomeration produces such clustering features as urbanisation and specialisation. Urbanisation refers to the "sheer number of and variety of division of labour within a region", i.e. industrial density and diversity. The diversity of industries within a location stimulates the augmentation of knowledge, which provides a breeding ground for innovation and growth.

Since industries develop primarily in large cities, urban localities involve some positive externalities in terms of idea and knowledge exchange between firms, which eventually facilitate the development of infrastructure and a geographically concentrated market. Therefore, urbanisation provides possibilities for agglomeration effects to be positively realised.

Specialisation refers to the extent to which a particular industry constitutes the bulk of the total economic activity in a region.[2] Specialisation leads to knowledge spillovers, which expand the production process and stimulate business interaction, as well as facilitating the mobility of skilled labour. These factors can strengthen innovative and effective growth of clustering firms in comparison with their rivals in non-urbanised and unspecialised areas.

Therefore, the agglomeration effect formed by geographical proximity facilitates access to labour and capital markets, technologies, informational and knowledge spillovers due to lower transaction and transport costs, as well as establishing trust relationships within a network of clustering firms.

Another effect promoting clusterisation and supporting the competitive advantages of a cluster is the learning effect. This is achieved through knowledge spillovers and knowledge accumulation, which facilitate innovative activities in a cluster. It was found that innovations are produced more effectively through "learning-by-doing" and "learning-by-using", or during the course of solving some actual problems that occur in the production process (Asheim, 1992). Innovations in clusters develop as a result of trustful cooperation between specialised firms and informal interactions between employees, employers and entrepreneurs. That is why informal non-scientific and interactive knowledge is given such importance. Moreover, a great part of knowledge is tacit, limited by human and social context.

However, in particular intensive knowledge industries, e.g. in biotechnology or pharmaceutical industry, it is scientific knowledge and R&D that govern the development of firms (Cooke, 2002). In terms of its definition, researchers treat scientific knowledge differently. On the one hand, MacKinnon, Lundvall, Johnson and Maskell consider it as a codified type of knowledge. This knowledge is globally available and explicit; therefore, it can be easily transferred to another person or entity by such means as verbalising, etc. On the other hand, it is broadly recognised that new scientific knowledge is complex and non-

[2] Glaeser E.L., Kallal H.D., Scheinkman J.A., Shleifer A. 1992. Growth in Cities. The Journal of Political Economy 100(6):pp. 1126-1152.

codified, i.e. tacit and specified in its own terms (Acs et al, 2002). Specified knowledge, being of particular value for innovative processes, is locally embedded; this stimulates firms to cluster with the expectation of gaining such benefits as access to rare or unique information resources. Scientific knowledge is, therefore, "available only through access to the right persons, often few in numbers, who are working in a given problem area".[3]

In recent years, the attention of researchers has been devoted to an issue of how knowledge is localised geographically. Some empirical studies proved a positive interaction between geographical proximity and the spillovers of tacit, complex knowledge. For instance, Jaffe, Trajtenberg and Henderson compared the spatial patterns of citation (proxy for knowledge spillovers) and corporate patents with occasionally chosen patents for some Universities in the USA. Eventually, it was empirically proven that knowledge spillovers are localised strictly at a regional (state) level.

In other words, the learning effect facilitates both scientific and non-scientific knowledge accumulation and spillovers, as well as generation of innovative knowledge due to geographical proximity and trustful interaction between clustering firms.

Localised knowledge spillovers encourage innovative activities. A cluster provides investment inflows and knowledge inputs, which form a technological infrastructure capable of supporting innovative activities (Feldman, 1994). Such investment can originate from rivals, related industries, suppliers, consumers, universities, research and public institutions. Thus, innovative activities tend to be geographically concentrated alongside a place-specific infrastructure for benefiting from knowledge and technical spillovers (Tassey, 1991). That is to say, the innovative effect is generated by innovative performance and knowledge spillovers within a spatial proximity.

The innovative effect can be analysed in terms of the concept of technological regimes developed by Nelson and Winter (Nelson, Winter, 1992) and upgraded by Malerbo and Orsenigo. A combination of four factors, which affect the rate of innovative activity in clusters, is supposed to describe the technological environment faced by a firm. These factors are worth examining in greater detail.

The first factor is an opportunity condition displaying firms' innovation capability under the conditions of sufficient investment. The second factor is an appropriability condition, which reflects a firm's ability to protect innovations from simulation in the

[3] Leamer E. E. and Storper, M. (2001) The Economic Geography of the Internet Age, Journal of International Business Studies, 32, pp.641-665

anticipation of increased profits later. The degree of cumulativeness is the third factor indicating the probability of producing new innovations, provided a number of innovations have already been produced previously. The fourth factor is a knowledge base characterising the type of knowledge underlying a firm's performance.

Since technological regimes are spatially dimensioned, they possess some basic features affecting the geographical localisation and distribution of innovations. If technological capabilities of a firm determine the extent of its innovations, the spatial localisation of innovators is influenced by where and how these capabilities are able to be realised. This realisation is determined by a knowledge base concerned with the activity of a single firm. The knowledge base determines how effectively technologies and information are allocated among clustering firms. Due to the tacit and uncodified nature of knowledge, it seems reasonable to expect innovations to be geographically concentrated.

Thus, the innovative effect based on geographical proximity and accumulated knowledge potential facilitates the production of new innovative products.

One of the basic functions of a cluster is to provide human and social capital, as well as financial resources and equipment in order to support firms contributing to the overall cluster performance. Apart from human resources, firms require moral support, which is realised through social capital. Indeed, it is interactions that provide idea spillovers among clustering firms.

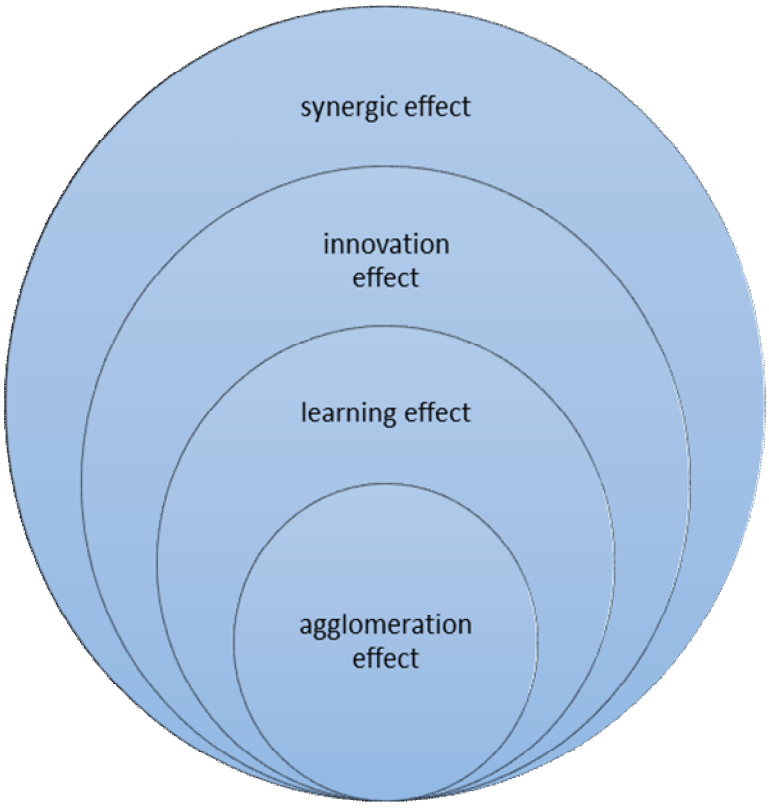
The concept of social capital was developed by a French sociologist Pierre Bourdieu, who defined social capital as a set of resources aimed at maintaining a durable network of relations, more or less institutionalised, with "interconnections" and "interexchanges". When trying to assess the advantages of cluster coordination, it is important to consider the social capital aspect. Social capital is formed as a result of social interactions that grant access to cluster resources. Its quality is determined by the quality of resources. Potential social capital possessed by actors can be realised only through interactions between them. In other words, social capital arises as a natural response to the need of simplifying shared interactions between actors.

Interactions between actors in clusters enhance and consolidate the relationships between them by establishing trust and constituting norms and rules accepted by all. Given abundant information (particularly tacit knowledge), such interactions can provide information transfer within actors in a cluster and facilitate the generation of shared knowledge by gaining access to interpretation of information and learning.

Thus, a function of social capital is to support cluster development. This function is primarily realised through collective assets such as shared norms, values, views, all of which stimulate accessibility and exchange. These, in turn, facilitate mobilisation and involvement in common projects aimed at the generation of innovative products. Consequently, social interactions in clusters based on trust and shared ideas favour innovation activities.

Here, it is reasonable to point out the synergic effect, i.e. a multiple effect emerged due to integration of geographic proximity, knowledge transfer and innovative activity, as well as the contribution of social capital. This effect is certain to promote effectiveness of interaction within clustering firms. It should be noted that the fundamental determinant underlying the synergic effect is social capital. All the above named effects, viz. the agglomeration, learning, innovation and synergic effects, are schematically presented in Figure 1.

Fig. 1: Interconnection of Clustering Effects



Source: by authors

Conclusion

In conclusion, all clustering effects complement one another by forming an indivisible social and economic entity within a cluster. The agglomeration effect based on spatial proximity of firms provides tacit, complex knowledge spillovers consequently giving rise to the learning effect. The learning effect formed by accumulated scientific knowledge resources and trustful relationships among actors induces the innovation effect. All these effects engender the synergic effect, which, being grounded on social capital, strengthens the competitiveness of a cluster.

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