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MGE-PEPF

Master's Thesis

University of Tampere

Clusters as a tool for local development: what attitude to expect from governments.

2007/2008

Contents

Chapter I: Introduction

Even if the second part of the 20th century saw the development and hegemony of globalization, nowadays, the logic of search for quality, in addition with the traditional need for quantitative savings, is generating a new vitality for the regional and local economies. Not only in term of economic activities but also in the works of academics, whether they are geographers or economics (see for example Krugman 1995). But this new wave of interest for economic of location should not make forget that some economists previously wrote about the territory, the "local". For instance, the IENA school was presenting the "urban hierarchy of central places" which was basically an homogeneous organization of the territory in several central places, thanks to the action of an optimizing invisible hand coordinating the utility of the firm (maximization of its profit and minimization of costs) with the territory, in term of transportation's cost. This was a structuralist scheme, the size the variety of activities of a central place depending on its place in the network of central places, this explaining the existence of small and poor cities. This stressed the success of agglomeration centers, compared with periphery, even if this was just a relative domination, since each periphery can be considered as the local center of a smaller and poorer (in activities) periphery, in a decreasing logic. We could have considered the logic of agglomeration as the aim of firm to locate far from the competitors but close to its customers, as the invisible hand would be acting in optimizing location at the whole territorial level. But the Hotelling's paradox reveals us that sometimes firms locate close to each others, even if that means potential lost in customers. The main explanation would be that firm, doing so, could benefit from what have been called agglomeration effects (such as mutual emulation, proximity with firms on the same industrial chain, or related to it), or the Marshall's atmosphere of Industrial districts. That is, certain cities, territory are most likely to be successful than others.

Nevertheless, this optic has been undermined by Colin Clark and its Stages of historical scheme, showing that certain regions/country do not develop at the same rhythm, would not take off

at the same moment, reason of differences in development. This vision was also shared by Rostow, with its stages of development and Vernon and its products' cycle. So the late of some territory would not be structural but rather historical, due to differences in initial endowments, internal structures...situation the would lead to an homogenization on the long run, once the History is over. Some places would be under developed since they are at the bottom of the international organization of economy, some theoreticians developing the idea of domination of centers (or leading countries/regions) over peripheries. This topic is still discussed.

But there is a theory that gave back to the territory/region is full important in the development process: the endogenous regional development. Indeed, the success and growth of regions would be due to their internal dynamism, where strategies such as development of Marshallians Districts, ancestors of clusters, would take their full place. Thus the industrial organization, crucial to territorial development switched from a rigid and massive fordist production to a new regime based on a flexible specialization, where the notion of territoriality is central since it favors the special atmosphere (with a skilled and professional pool of workers and decentralization in innovation processes and coordination between firms in the area). Thus all the conditions would be in place to accompany the ultimate form of industrial development, the cluster.

A lot of agents or factors interfere in the process of decision making, in the constitution and in the management of a cluster. For instance, we can list at least for categories of actors. Central government who impulse national policies of economical development and by doing so can act with local governances by funding them or by decentralization process. Local governances can provide a range of services, facilities...Then come the private actors, firms which are directly concerned by the clusters and have the possibility to choose their location according to their strategies and individuals, mainly considered as tax payers, who can decide whether or not they accept such a policy. And finally we can include the competitors, acting in a context of local/national/international competition.

Clusters are not an entirely new economic phenomenon. In England, the famous economist Alfred Marshall identified the importance of the textiles cluster around Manchester and the

metalworking cluster of Sheffield back in the 19th century. But there is now a rapidly growing interest by governments in this phenomenon, which has not been sufficiently recognized in recent years. Local governances are also involved in this process. Clusters are local networks of firms in related industries. They are found throughout the world, in affluent regions and in poor ones, in OECD members and in non-Members. They are not just local concentrations of industry, but places where there are real interactions between local firms and between firms and institutions. There is mutual support and coordination, which is generally summed up in the ideas of 'social capital' and 'trust'. In clusters, the transaction costs of dealing with suppliers and collaborators are low because trust is high. Even where firms have not worked together before they have information on each other and informal ties that reinforce trust. In an increasingly complex and rapidly-moving economy the cooperation that is encouraged by clusters is critical. Clusters enhance the economic performance of the enterprises within them. In Italy it has been shown that being located in a cluster increases the profitability of firms on average by between 2 and 4 per cent. This is because clusters create agglomeration economies. Firms clustered together in the same industry gain from specialized labor pools, business services and finance, provided by public actors. And ideas and information flow more easily within clusters, stimulating innovation. Clusters are also important socially, because they are places of cooperation and networking. In clusters, firms often cooperate with each other, for example in selling and transporting output. They also cooperate with a wide range of other local players such as universities, trade associations, chambers of commerce and local public administrations. Together they can create a healthy competitive environment that benefits everyone.

Cluster analysis is very powerful because it provides a framework for integrating all the main economic development policy instruments available to all levels governments. In developing a cluster various policy instruments need to be used together, for example policies for direct investment, skills development, start-ups, finance and exports. What is needed and how they should be combined depends on the cluster. What is important is that policy-makers analyze the specific needs of their area and how they can develop a global strategy to respond.

As well as supporting cluster initiatives where they can, governments must increase the decentralization of their economic development policies to local and regional levels. Clusters demonstrate that every territory is different in its industries and structures. It is therefore no longer possible to deliver a simple top-down policy. Every territory must design its own initiatives, tailored to its own needs.

When we are talking about clusters, it is important to consider the notion of proximity in terms of local development modes, traditionally of three kinds, in which public actors got an important role to play: the mode based on agglomeration: agglomeration is based on spatial proximity. So if a firm establishes herself in a place with strong agglomeration, is going to benefit from an external economy of agglomeration (facilities, services in firms, zone of employment,etc...). The mode based on specialization: it is about the mode of local development for which a territory concentrates an important party of its activities on an area. It concerns the notions of industrial regions in the sense of Marshal or else Local Public Services, according to the French terminology. The mode based on specification: specification is the least frequent case, it aims at avoiding the problem which can procreate specialization, imprisonment in a trajectory. It is about the capacity of a territory to expand outside a domain of specialization. It is institutional nearness, and notably the effects of networks or else the quality of coordination of the private and public actors which favor this situation.

The traditional analysis is based on a dynamic conception of the territory, as a result of the combination of the three dimensions of the proximity: the spatial dimension, the organizational dimension and the institutional dimension. All of them act simultaneously, in a logic of self-reinforcement. If this three dimensions are combined, there is a potential territory defined as place of coordination of the actors and activities. So that, the territory becomes a reality and one needs a factor to trigger off, in this case of a problem met by an actor whom he can solve by soliciting an other nearby geographical actor, detaining assets which he presumes supplementary to share the same norms and the same values.

In order to be successful, such a policy should respect some prerequisites because it takes place in a context of competition and also because in this process are involved a multiplicity of actors, possibly in competition, without a common culture. If the triptych "firms/research/training" is not respected (the role of local governances), if the interactions between actors is not eased, then the whole process can fail. (I want to define the good way to manage it).

Governance so is very important since it can be defined as the way all the local public and private partners define and implement territorial strategies and manage the competitiveness of the territory. What is important so is the organization of structures and their services, to assume the installation of a true sharing out of roles between actors, a responsibility of its members as well as the fixing of objectives with monitoring and promotion of achievements, and all the actors have to be involved in. To be efficient and lasting, this governance must be lived as a true added value for all the partners of pole, as a community of interest and destiny. If it seems important that industrialist manage the cluster, local collectivities have to facilitate the development of a "business friendly" environment, efficient and the less costly possible, and also accompany, federate and support the actors. Moreover, the project is a lasting one, so it is important than authorities involved create conditions suitable for this objective, in order to avoid bad behaviors from firms such as taking the fundings given by authorities and others externalities and then relocating elsewhere.

It belongs to local authorities to support the process and to be sure that all the factors of success are presents: full involvement and interest-sharing of the industrialist, good governance and diversification of the type of firms involved (not only leader firms but also small and medium sized firms) in order to reinforce the attractiveness of a territory.

So in order to highlight the main characteristics of a cluster policy, the thesis will be organized as follows. In the first part, we will envisage deeper the cluster theory, mainly around Michael Porter's works. In the second part we will study the role of the government, as a central player in the cluster process, using public economic models. In the last part, a classic tool for local decision makers to identify cluster, the Location Quotient, will be applied to Rennes, in order to show the industrial specialization of the area.

Chapter 2: The cluster theory

Since the late eighties, early nineties, clusters have emerged has a raising source of interest on the politic, economist and academic sphere. Thus, works such those of Michael Porter and The Institute for Strategy and competitiveness on elaborating a "U.S. Cluster mapping project" and others "Cluster Profiles", often providing examples of actions and experimentations in innovation and economic development. The point was, and still is, to use successful clusters as example for enhancing local externalities linked to knowledges concentration and special local environment and develop then competitiveness. Putting apart the common craze for this concept, the notion of cluster does not create the unanimity, as well in term of definition, appreciation or efficiency, among academics or local development specialists.

Thus, cluster has a wide meaning, as a generic term, gathering severals theoretical approaches or declinations, coming from the size and amount of actors and their connections, the intensity of networking, location's aspects, direction given to local governances strategies and so on, as evidenced by the diversity of clusters strategies set up worldwide such as Italian industrial districts, German networks of competence, French poles of competitiveness, Finnish national cluster programs... But obviously, when talking about such strategies, the Silicon Valley example first come to minds. Indeed, with a worldwide unique innovative capacity based on four institutes for science with heavy financial resources, with adaptive strategies ("green" technologies...) and a large number of engineers and venture capitalists, the Silicon Valley is seen as the successful cluster to imitate, often used by academics for empirical or theoretical works. For instance, works of Raphaël Suire underline the ambiguity of the label Silicon. In addition of the Silicon Valley, some well known examples of clusters are Bangalore, India for information technologies and outsourcing, Hollywood, United States gathering firms linked with the film industry, Rotterdam, for logistics and so on.

II.1 What is a cluster?

II.1.1 Origins of the concept.

The geographical concentration of firms within industrial clusters primarily can be explained by the external economies of agglomeration they received. The explanation of the phenomenon is quite old in the academic sphere, as Alfred Marshall had already identified in 1890 in his Principles of Economics, the benefits of concentration of economic activities within the "Industrial Districts":"Generally, the aggregation of many small workshops, as the creation of some large factories can achieve the benefits of large-scale production". "It is then possible to cut the production process into several segments, each of which can be achieve with maximum savings in a small institution forming a district composed of a substantial number of similar small specialized institutions to achieve a particular stage of the production process".

The concept of industrial district has been re-actualized about a century later, by Beccatini in 1979, particularly underlining, in the case of industrial organization of northern Italy, that a district relies both on informal elements (historical presence in the region, informal relations, collaboration between firms...) and formal elements (funding modes, governance...). Beccatini thus defines Districts as a "socio-territorial entity characterized by an active presence of a community of people and of a population of firms into a given geographical and historical area". Then, an Industrial District is a territorialized productive system and especially a social system.

The Industrial District can be defines as a way of organizing production, based on a close labor division between several small specialized firms. They constitute a link between all the economic aspects that occur inside a given sector and the local community characterized by a homogeneous system of values and thoughts.
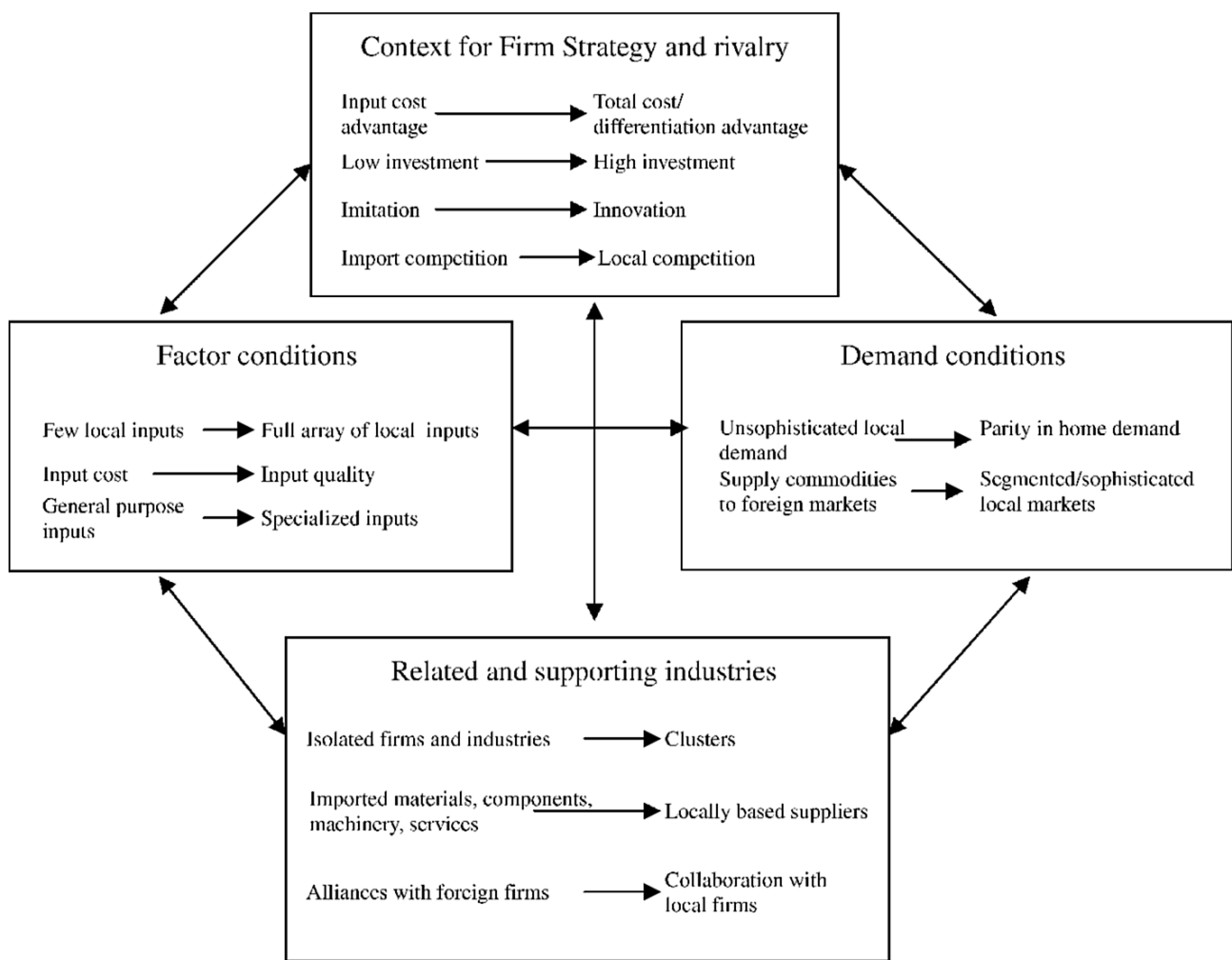
II.1.2 Reactualization of firms' agglomeration by Michael Porter

In 1990, in "The Competitive Advantage of Nations", Micheal Porter has popularized the study and description of firms' agglomeration and the concept of cluster, defining it as "a geographic concentration of interconnected companies, specialized suppliers, services providers, firms in related industries and associated institutions (for example, universities, standards agencies and trade associations) in particular fields that compete but also cooperate."

The geographical scope of clusters varies according to local contexts: cluster can be urban, metropolitan and rural, at the level of a city, or national or regional, and depends also on the segments on which the members firms are in competition and strategies they employ. Thus, cluster are part of a broader theoretical framework to understand the driving forces of economic competitiveness at the regional and national scales. Cluster, thank to the proximity it allows, develop an inner competitive advantage because it develops and intensifies the interactions between four complementary factors constituting the regional competitive advantage, synthesized in the famous "Porter's Diamond". It offers a model that can help understand the competitive advantage of a nation or a region as well, by shaping the extent to which it is likely to achieve advantage on a global scale.

Porter has introduced this model on "The competitive Advantage of Nations" after doing researches on ten countries on the world top on trade. The book was the first theory on competitiveness based on the causes of productivity with which the economies compete, instead of only comparing endowment on traditional comparative advantages such as pool of labor.

Context for Firm Strategy and rivalry

Input cost advantage ──────► Total cost/ differentiation advantage

Low investment ──────► High investment

Imitation ──────► Innovation

Import competition ──────► Local competition

Factor conditions

Few local inputs ──────► Full array of local inputs

Input cost ──────► Input quality

General purpose inputs ──────► Specialized inputs

Demand conditions

Unsophisticated local demand ──────► Parity in home demand

Supply commodities to foreign markets ──────► Segmented/sophisticated local markets

Related and supporting industries

Isolated firms and industries ──────► Clusters

Imported materials, components, machinery, services ──────► Locally based suppliers

Alliances with foreign firms ──────► Collaboration with local firms

Source: Porter (2000)

Traditionally, the economic theory mentions the following factors for comparative advantage for countries or regions: land, location, natural resources, labor and local population size. Porter says that the stability of the industrial growth has hardly ever been built on basic and inherited factors mentioned above. He introduced the notion of clusters, that arise in particular locations. They are developing in areas of concentrated resources and competences, and reach a critical mass, giving it a key position in an economic sector, with a sustainable and decisive comparative advantage, compared to others locations. For Porter, clusters can influence competition in three ways: they can increase the productivity of an enterprise, they can drive innovation in the industry and they can stimulate new businesses in the industry. On "the Competitive Advantage of Nations", he emphasizes four interlinked advanced factors and activities in and between companies

12

in a clusters, that can be influenced by a "pro-active" policy from governances.

The four edges of the diamond represent the influential forces. The "factor conditions" or resources which include production factors used by companies in the cluster: labor forces and notably scientific and technical ones used in cluster's activities; capital, for the different stages of firms' funding; infrastructure such as equipment, administration, information, research centers...; natural resources. They also include factors like quality of research on universities, deregulation on labor markets...that is to say, qualitative factors as well as quantitative. These factors provide initial advantages which are going to be the basis of the development strategy. Each country or region has its own and particular set of conditions, hence each of them will develop industries for which the set of factors is optimal. In opposition with the common wisdom that considers these factors are inherited, they are rather created for Porter. Political initiatives, changes in social and cultural sphere or technological progress can change these set of factors and so the competitiveness. Specialized factors of production, or key factors, are skilled labor, capital and infrastructure and do generate sustained competitive advantages. They require heavy investment and are more difficult to duplicate.

Then the political, legislative and economic environment, known as the "context for firm, strategy and rivalry", which must be a stable and healthy environment, encouraging investment, innovation and competition. In a globalized economy, competition, especially direct one, incite firms to work for increase productivity and innovation, and thus to cluster in order to benefit from networking advantages. It is about "a local context that encourages appropriate forms of investment and sustained upgrading", in a context of "vigorous competition among locally-based rivals". This also refers to the conditions in a country or region that determine how companies are organized, managed, and that determine the characteristics of domestic competition. Here, cultural aspects play an important role since factors like management structures, working norms and values or also interactions between firms, are shaped differently from a country or a region to another, providing advantages or disadvantages for local industries. Porter argues that domestic rivalry and the search for competitive advantage within a nation (or any other given territory) can help provide

organizations with bases for achieving and reinforcing such advantages.

The third edge gather the "demand conditions", that is to say a local market of quality and large enough to fit with the local production (this condition implies the present of well-aware and exigent consumers, whose presence allows the companies to anticipate the demand and lead them to more innovations and quality) and then allowing firms to increase their competitiveness. It can be for instance an "unusual local demand in specialized segments that can be served globally". Home demand conditions influence the shaping of particular local factor conditions. They have impact on the pace and direction of innovation and products development. According to Porter, home demand is determined by three major characteristics: customers needs and wants, their scope and growth rate, and the mechanisms that transmit local preferences to global market. A country or a region can achieve advantages in a market or a segment if home demand is able to anticipate the direction taken by the global demand.

The last edge is about the "related and supporting industries" where spatial proximity of upstream and downstream industries facilitates the exchange of information and eases a continuous exchange of ideas and innovation. Industries can take advantages from the presence of capable and locally-based suppliers and the presence of competitive related industries. The presence of a successful and competitive industry on a given territory is an interesting advantage since it can lead to advantages in others supporting or related industries. Having competitive supplying industries allows to reinforce innovation and the hope to internationalize its own industries at later stages in the value chain. Alongside suppliers, Porter also insists on the importance of related industries since they can use and coordinate particular activities in the value chain and because they are concerned with complementary products. In this domain, a typical example can be found in the shoe and leather industry in Italy.

In addition of these four elements, two external factors, called chance and government, are added to the model. Government tries to nourish and enhance the cluster's environment, while the chance criterion can be seen as a sum of unexpected events (natural catastrophe abroad modifying demand conditions, discovery of raw materials on the territory or accidental discovery of a

14

technology, a process...) or preconditions that provide territory advantages in the competition.

The interactions between the four elements can be more intense when the firms of a given sectors are geographically concentrated. Thus the systemic nature of the diamond and the necessary intensification of interactions between these four interconnected factors lead to the concentration of competing firms and to the development of the industrial cluster, the spatial reproduction of the competitive diamond.

The proximity and close ties, whether they are vertical (for instance customers-suppliers relationship) or horizontal (complementary products and services, similarity of resources and technologies used in the production process...), involve social relationship that benefit the companies involved. Thus, as Porter said in "On Competition", cluster can be understood as "a form of network that occurs within a geographic location, in which the proximity of firms and institutions ensures certain forms of commonality and increases the frequency and impact of interactions". Thus a cluster is a in-network organization of a given territory stressing the ties existing between the different actors involved.

II.1.3 A constantly evolving concept

As said in the introduction of this part, the notion of cluster has emerged as a central issue for all that concern local development. Particularly, the interest of academics for the subject has contributed to the deepening of the concept.

Rosenfeld (2002) for instance defines clusters as a "critical mass of companies, sufficient to attract services, resources and suppliers, with systemic relations based on complementaries and similarities, on a limited geography area".

The recent boom of Information and Communication Technologies (I.C.T.) lead authors such as Cook (2003) to consider clusters as" a geographical concentration of technological actors united by economic value chains, operating in an environment with support infrastructures, sharing

a common strategy and aimed at attacking a same market". Nevertheless, this kind of definition designed for I.C.T. also applies to other forms of clusters.

The United Nations Industrial Development Organization (UNIDO) defines clusters as "a sectoral and geographical concentration that produce and sell a range of related or complementary products and thus face common challenges and opportunities". UNIDO insists on the necessity not to confuse clusters with networks, that are "a group of firms that cooperate on a joint development project complementing each other and specializing in order to overcome common problems, achieve collective efficiency and penetrate markets beyond their individual reach". Networks can be horizontal (when they are formed of SMEs) or vertical (when large companies are involved). According to UNIDO, networks can develop within or out of a cluster, while clusters can lead to the development of networks inside. Also, a network can eventually evolve as a cluster, as it develops business development services providers, enterprise associations and involvement of public institutions.

Another way to think about clusters is considering this process in terms of production chains. According to the OECD, production chains are "a network of labor and production processes whose end results on a finished commodity". They can also be described as a value-added chains as it emphasizes the fact that each stage of the production process adds value to the sequence. A definition of clusters in this context would be the presence in a given territory of linkages including backward and forward production ties, alliances among enterprises of different sizes, that is to say, a connection of formal and informal networks that leads to a situation where the activity of one affects the cost and effectiveness of others. Collaboration in a cluster is thus a positive sum game.

After Porter, most of the experts define it as a geographical agglomeration of similar, related or complemented businesses, with active channels for actions, transactions, dialogs and any others usual activities connected with the production process, that share specialized infrastructure, labor markets and services, and that are faced by common threats and opportunities. The insistence they made on spatial proximity is, in a way, a gate connecting Porter's works with the concept of

Industrial District developed by Beccatini, stressing the importance of the territory.

As the term cluster has been used more and more frequently, sometimes with very different meanings, studying it as an issue for economics imply to know what we are talking about, that is to say imply to be able to give a clear and comprehensive view of what the term really stands for. Indeed, in the theory, it refers both to national groups of industries closely related but scattered at the level of a country and without a major concentration (a vision close to the original one of Porter's industrial clusters, focused on the role of networks) , but it also means a group of very localized firms closely linked together on a small territory, from a localized urban/metropolitan area to the scale of a neighborhood.

To resume the current state of the theory, it can be said that the term cluster has three meanings. The first one, economic, emphasize the sectoral aspect and describe the cluster as a group of companies connected by clients-suppliers relations or by technologies, employment areas, customers or commons distribution networks. The second, relational, is based on networking actors. Geographic proximity is very variable, the main influential proximity being relational, reducing the importance for firms of getting closer. The third meaning, more territorial, sees first in the cluster a pole with a critical mass of actors due to a quite big concentration of companies, research and training organisms such as universities, whom activity is in a particular sector, based on the presence of venture-capital, on Authorities of all level, and aiming to the international top, excellency. In this case, the territorial anchorage is strong or very strong.

From the current state of the theory, it appears then that it is nearly impossible to find or even consider a unique and relevant definition, taking all the aspects of a cluster, knowing that the use of this concept is both confuse and creating confusion. Indeed, cluster can have a wide variety of shape and each case present a unique dimension, in terms of geographical area, nature of relations inside, types of players, awareness of belonging to the cluster, technological development and reached level of innovation, position in the life cycle of the cluster...Furthermore, it is at this point necessary to stress the fact that the term has been used for organizing local development, analyze empirically regions as well as for allowing theoretical development on employment,

productivity and growth, because from the considered meaning, the actions taken and the direction given to these actions by governances can vary. Later we will understand better the role of government in the process, so it is important to be aware that the word have been used for different purposes by many authors, among them economists, geographers and politicians, aimed at different audiences. That why the sense we will accept on the thesis is the traditional one of Porter, to ensure this concept is still adapted to the current state of the economy.

II.2 What are the benefits expected from clusters?

Before going deeper in analyzing rationales for clustering, it is advisable to take a look to sources of regional competitiveness. Porter considers productivity as the main source of region competitiveness, stressing the fact that productivity is the result of the uses of region's endowment in capital, human forces, natural resources and industry-friendly characteristics (institutions, tax system...). Productivity depends both on the value of products and services such as uniqueness and quality, but also on the efficiency with which they are produced (that is to say the ability to achieve an optimal level of production at a minimal cost). Thus, what matters for a region is the way its industries compete on a market, not the industry in which regions compete. Consequently, productivity in a region is a consequence of why firms, locals or foreigns, choose to locate, and above all, what they choose to do in this location, no matters if the firm is a subcontractor or if the mother-firm is located elsewhere. Thus, regions compete in offering a suitable environment to develop a competitive set of activities, that is to say the most productive possible. To do so, regions rely on a network of private and public actors, different but interlinked, such as their roles in the economy. The best way for achieving this strategy is to foster the local innovative capacity, role attributed to clustering process.

II.2.1 The geographically closer firms are, the more competitive they would be.

II.2.1.1 The reasons for success.

In his notable work, Marshall has conceptualized the sources of competitiveness of a local system of small and medium-sized firms, stressing three reasons why agglomerated firms would be more competitive and productive. First of all, the fact that enterprises are concentrated allow them access to a pool of competent job. Indeed, sectoral geographic concentration attract and develop competences among the member firms. Thus it exists an active pool of a qualified manpower, responding to the need of firms and able to adapt to their needs, getting this way a particular and localized (so, rare) working knowledge, close to the Human Capital theory develop by Gary S. Becker, creating so a comparative advantage.

The second sources examined is the increasing specialization of suppliers. The agglomeration of firms tends to create a market where customers requirements and quantity of products demanded are stronger. This situation push companies to specialize more at one stage of the production chain, and to coordinate their activities with those of the others firms. They are cooperating to reduce transaction costs that may occur within the process, including, according to Dahlman, research and information costs (all the market researches), negotiation and decision costs (sale and purchase contracts...) and costs of monitoring and enforcing (quality control of the service, verification of delivery...). This aspect of cooperation between firms can take the form of local systems of price, when purchasing raw materials...

Thirdly, the geographic proximity facilitates knowledge spillovers, made of tacit informations and expertise of skilled employees. Knowledge is disseminated within the cluster because proximity multiply relations between the actors. The mobility of workers inside the same firm and between firms allows the diffusion of tacit knowledges, but less frequently of the codified knowledge. This can be seen as the result of experience gained by learning practices that the worker

forward to his new company, thereby promoting diffusion of information within the cluster. This is also the case of formal or informal meeting that workers on the cluster can have together (exchanging tips about the best way to do a process, the appreciation of markets orientations, is also a way to promote vitals knowledge spillovers).

Another characteristic that makes clusters efficient is the role played by a central player, the entrepreneur. Schumpeter in 1934 stressed the fundamental role of this actor in the economic activity: by taking risks and traducing ideas into new products, he is a key player in the economic development process. Therefore, the places knowing a firms agglomeration process can be viewed as a pool of entrepreneur, installing themselves into a specific local environment, developing then an activity friendly area, providing then all the aspects that make agglomeration attractive for others firms (the process is self-reinforcing, once it exists on the area connected activities, networking...). The creation of firms (mainly small units, spin-offs...) but such entrepreneur, should spontaneously lead to, or at least ease, the creation of clusters, when the aim is geographic concentration of competing and innovating firms, presenting close organization and characteristics.

For its part, Krugman in 1991 shows that small accidental events (or chance) can generate a cumulative process in which the presence of businesses and skilled workers encourages even more businesses and workers to locate here. Clusters are often the consequence of a sequel of events leading to their more or less sudden apparition. But once they are established, they tend to reinforce at this location. For Krugman, the initial presence of a large amount of natural resources on a given location is not enough to explain the agglomeration process. If firms are agglomerating, it is because they find their own interests in doing so. That is to say, they are finding in proximity something that increases their production and efficiency. They are benefiting from agglomeration economics, or gains in achieving the production process produced by the geographical proximity. Four economics forces are at the basis of this phenomenon: increasing returns, transportation costs, market size and differentiation of produced goods. The choice to locate in a region rather than in another is due to the arbitration between these forces. In general, firms tend to locate where demand is important. But also, demand is important where firms are located. In the same way, consumers

preference for the variety attracts highly differentiated firms, which in turn attract consumers seeking variety. This cumulative process could lead to a dual situation with two kind of equilibrium: a symmetrical equilibrium with equal repartition of industrial activities between territories, and a "center-periphery" equilibrium, where the differentiated sector located in a single region. Agglomeration is even more likely that, ceteris paribus, transportation costs are low, economies of scale are important and that goods produced by firms in the location are more differentiated. From an initial shock, an endogenous process of agglomeration can develop.

II.2.1.2 Economies of scale and increasing returns

Marshall, who was one of the first economics to write about firms agglomeration develops the concept of externals economies from observing industrial districts. Economies of scale are the cost advantages that a firm obtains by extending its size. For instance, it could be the case as a firm doubles its size, the costs of its output less than doubles, since it allows lower prices for inputs. Individual firms can experience economies of scale internally through growth of input-output ratios, increased division of labor and eventually vertical integration. The potential of internal economies of scale provides an explanation about how firms might increase or concentrate production at one facility rather than produce at several smaller factories in different locations. These gains in efficiency, associated with large firms and internal economies of scale are also a available for smaller firms. Indeed, they mainly take benefit from external economies of scale when they decide to locate in an area geographically marked by firms agglomeration. For instance, firms internalize externalities when they purchase inputs from others firms members. From simple buyers-suppliers relationship, cluster allows the fully expression of strong externalities that arise from co-location decisions. Information spillovers is an example of these advantages.

Increasing returns are a part of returns of scale theory that refers to a technical property of production changes that examines changes in output subsequent to a proportional change in inputs. If outputs increase by more than the proportion of inputs increase, the economic situation that result

is qualified increasing returns of scale. Kaldor emphasizes that firms may be able to experience continue increasing returns of scale, provide they are located in a convenient environment. Indeed, the more a firm produces, the more experience it gets by learning by doing, increasing thus its productivity and efficiency. Besides, the gains obtained can be generalized to the whole value chain of the firm. Economies of scale and improvement of technologies gained from experience's knowledges lead to a gain in productivity. According to Kaldor, technology knowledge is acquired by experience which is a function of cumulative volume of gross investment. Such technological progress is internal to the firm, or endogenous, and it results in a self-propelling spiral of growth, enhanced productivity, and increasing returns. At the core of Kaldor's theory of increasing returns is the view that the dynamic relationship between productivity changes and output changes involving economies of large-scale production and technical progress is the key to the growth of capitalist economies, and that the relationship is self-propelling and therefore endogenous. As clusters can be made of national or multinational firms, the local become a concentration, with globalization, of increasing returns and all the factors that lead to a better productivity and worldwide competitiveness. According to Kaldor, the self-propelling relationship is endogenous within the firms, that means that belonging to a cluster is a competitive advantage for a firm.

II.2.1.3 The concept of externalities.

Following the works of Marshall, the academics have underlined the action of two types of externalities.

First of all, location externalities or gains linked to the proximity of companies of the same industrial branch. These externalities include: profits from the presence of a pool of competent employees, specialized subcontractors and complementary suppliers, and from the economies on transaction costs; economies of scale that the presence of similar companies can create by cooperation, knowledge spillovers (either informal, or through backward and forward ties such as subcontracting or cooperation agreements) or, social capital that is created in the community; the

presence of infrastructures and amenities such as services adapted to the industry. As these clustered firms face similar problematics and use quite the same production process (use of similar technologies, skills...), they are more likely to observe others firms and take knowledges from them, in a learning by imitating process. Thus, knowledge accumulated by one firm tends to serve to the member firms without real compensation.

The second type is urbanization externalities, that is to say, gains external to the branch of activities, internal to the local economy. They come from the proximity with firms from different branches and are very common in metropolitan areas that provide a density of varied actors and easily accessible. Those external economies include the presence of a diverse labor market, a range of services to industries, knowledge spillovers, economies of scale and investment in infrastructure, especially in I.C.T. Diversity of industry mix and proximity generates benefits for everyone in the region and allows generalization and global learning of industrial practices from an industry to another. Urbanization economies due to density generate savings for firms, that are very crucial for clusters. For instance, firms can benefit from the presence of institutions (such as universities, research centers, incubators, chambers of commerce), associations (group of employers, agencies, professional association...), accessibility to companies services (lawyers, consultants, financiers...), which tailored services adapted to their needs The pooling of resources available to players is a constituent advantage of urbanization economies, explaining agglomeration processes.

II.2.1.4 The competitive dynamic of clusters

Porter underlines the close links between competitiveness of enterprises and their membership in a cluster. Membership enable firms to benefit from a local environment of competing firms, specialized resources and institutions promoting knowledge spillovers and that stimulate their competitiveness. The cluster is thus considered as a self-reinforcing from inside system which produces the wealth in an endogenous way. The four elements of the competitive diamond within a same cluster would have a triple benefit by increasing productivity as well as

innovation and entrepreneurship.

Indeed, the productivity of firms increase through access to a local labor market adapted to the needs of the cluster, the accumulation of knowledges and the transfer of information within the cluster, the complementaries between the actors or the effects of scale such as the costs of promoting the cluster. Firms are better and faster in understanding the expectations of the market and are push to be more innovative to meet the needs of partners enterprises and consumers.

Besides, the innovating capacity of enterprises is facilitated in a cluster because companies received the information given by the consumers about their needs or habits, and then can better find new technologies to satisfy them. They can implement innovative solution quickly with a limited cost and risk. In this process, companies are involved in a paradoxical game of cooperation and competition with the other member firms, forging alliances or entering a fierce competition, considering a segment of the market. This relationship would help to stimulate their efforts of productivity and innovation.

Finally, the creation of new businesses is greatly facilitated within clusters. Good ideas can develop, move and be implemented more easily than elsewhere, thanks to the concentration of partners, talent and capital locally available. The cluster also plays a magnetic role for foreign entrepreneurs which are maximizing their chances of success by locating in the cluster, taking benefit of all its advantages. Large companies in the cluster are also a good environment for developing small ones, especially subsidiaries of the large firms, in order to develop a project, exploit an idea, that would have more difficulty to be implemented within the parent company.

II.2.1.5 Daily life in a cluster: finding a balance between cooperation and competition.

An additional approach of how a cluster functions is based on the analysis of cooperation and competition inside it. In order to ensure good relations between cluster's actors with different

expectations and objectives, firms are using mechanisms and actions of cooperation, such as compensation (for instance, rewarding mutually beneficial behaviors) and exclusion (to punish opportunistic behaviors). Mutually beneficial cooperation is favored by trust and social "embededdness" (term developed by Polanyi, meaning of insertion in the local social environment). Cooperation within a cluster can take several forms, from vertical, with clients or suppliers, to horizontal, in the relation with member firms, but multilateral as well, when the cooperation involves institutions in addition with firms, notably in business services (lobbying, consulting, training, funding, certification of quality through elaboration of cluster's certificate in addition of the simple label of belonging to it...). Nevertheless, as clusters involved actors with different rationales, the cooperation is not always evolving in a positive way (situation where all the actors are acting for the cluster's "welfare"), but it can be the results of collusive tactics. The true is that, in strategy of firms involved in a cluster, the border between cooperation and fierce competition is never clearly delimited. Besides, companies are likely to relocate from the cluster to exclude others members from benefiting from the production advantages they have acquired.

The relation between cooperation and competition can be considered also through the approach of the management of innovation technology that occurs in a cluster. The issues of how an innovation is implemented by a single firm within the cluster, how appropriable are the advantages gained by first movers, how technological advantages in a domain are transferred to the whole value chain (and to the whole cluster), how is the accessibility to resources that a firm does not have (especially when a new fashion standard comes from customers new needs), and so on, could be applied to a cluster's organization daily reality, either they are the results of contracts or integration. The proximity in a cluster, which allows others firms on the vicinity to benefit from an advanced innovative firm, also incite firms to take advantage back, finding a way to appropriate and use technological innovations longer than the first mover, by ameliorating it technologically, and thus reinforcing from inside the innovating process and its transmission. Leaders in a cluster will be seeking for innovating products or processes faster than others members, who will benefit the spillovers. That why a cluster allows the existence of several larges companies within it. Indeed,

25

imitation is a big part of clusters reality.

Concomitantly, members will look for benefiting from others positive aspects to belong to a cluster, from any technological development achieved. This goes from their reputation, their commercial positioning toward potential buyers from outside the cluster, the selection of distribution's channels for new production using the new technology, an easier access to financial institutions...that is to say all the commons points a small firm in a cluster will share with its bigger "colleagues". Inversely, small firms are also sharing the consequences of risks taken by innovative firms (for instance, the training of employees for adapting their skills to new technology, is likely to have a high cost, since it will be adapted only to the needs of the innovative firm, since small quantities cost more). If large companies are more likely to fix the technological standards, small firms can influence the setting of certain products standards related with final consumers tastes, because they are supposed to adapt more easily to changes in demand's characteristics (their small size allows a better adaptability) ,and that will have strong impact on clusters' organization, especially, in order to limit the cost of adaptation, firms can be tend to choice a permanent strategic supplier, in order to keep the long term benefit of a technology longer, saving capitals from adaptation.

Thus, a cluster is a milieu in balance between cooperation and competition, including innovative firms followed by imitating small counterparts, based on networks and internal spillovers, that can also influence directions taken to suppliers and purchasers strategies of the clusters, through norms, patents and others contractual relations. In definitive, a cluster concentrate in a given geographic area all the characteristics of normal economic activities, in a more protected and exclusive environment.

II.2.1.6 Sociological drivers of agglomeration

It is also important to consider social relations operating inside economical operations. The

relationship between economical actors, in a particular geographical context, plays a key role in the economic exchanges. The analysis of clusters and others industrial districts stresses the notions of territory and milieu. Belonging to a community, sharing common values, a similar culture and the intensity of networking determine certain economic behaviors such as the ability to take some risks, knowledge sharing and others types of cooperation. The existence of a mutual trust and of a industrial atmosphere innovation. Those features are particularly present in the industrial districts, considered as a productive system inside an environment incorporating rules, industrial know-hows and a social and relational capital (knowledge that an agent has of others agents and of the milieu).

Consequently, one of the most important value in a cluster is the existence of synergies that are created through the networks and the personal relations between the actors. They constitute an intangible and specific asset to the cluster, and, as unique, is nontransferable in a whole (a reason why it is a mistake to try to imitate a successful model of cluster elsewhere). From this common culture or history, it emerges an individual propensity to cooperate, to get closer and develop a mutual trust between the partners. This background is shared by all the members. This aspect of the social life in clusters is made possible by the connection, on a daily basis, between the economical sphere and a range of institutions and social and political norms and unwritten rules that create and reinforce the local community. The correct functioning and the effectiveness of a cluster is thus ensured by this mutual confidence.

The cluster, as a system of economic and social relations, thus contribute to the formation of a social and relational capital in a given geographic area. This capital ease the collective action of private actors but also contribute to the reduction of the uncertainty and the development of collective learning process, which are based on the existence of codes, common languages, attitudes of trust and mutual cooperation, and are the result of labor mobility in technical and scientific cooperation, inter-firms as well as in research centers.

When making a comparison between "Silicon Valley" and "Road 128", two famous cluster place, Saxenian shows that cultural differences in terms of openness and tolerance are on the basis of success. The intensity of interactions may, for instance, allow a better flow of knowledge

27

spillovers between companies through their employees. In addition, a condition of success for a cluster reside on its ability to maintain internal social coherence by acculturation processes, that is to say by shaping a new and own identity (sense of belonging, creation and acceptance of local rules and norms, active structures to interact and negotiate, such as the breakfast in Rennes Atalante...), as well as its ability to integrate innovation by capturing and disseminating it. This process involves all the actors within the cluster, especially intermediate bodies such as local public associations, cooperatives, trade unions, chambers of commerce...that allow a social regulation of the system, defining standards in all the domains corresponding to a normal activity for a cluster (in the technical domain, the establishment of facilities for meetings, conferences and debates...).

II.3 Critics and limits made to cluster theory.

II.3.1 An ambiguous and easily interpretable concept.

The lack of theoretical precision of the concept, notably about the definitions of actors and geographical boundaries, is a problem and makes it difficult to compare and evaluate the economic performance of global clusters. Indeed, how is it possible (and does it make sense?) to make a comparison between certain American clusters with high-technology firms agglomerated in wide areas and industrial districts in Italy, described by Beccatini, which organization is based on a network of small and medium firms, engaged in low-technology activities (shoes, textile..), in more limited area? Where is the relationship between both types of cluster? This is a fundamental question, especially knowing that some local development authorities could try to learn from one example and then reproduce it elsewhere, in a totally different context. In this domain, maybe more than elsewhere in economics, comparison does not makes sense. Thus, the elastic character of the concept, whether about the geographical scope of the cluster or about the nature of the relationship between the actors, makes it complicated and laborious to start statistical works, when delimiting territorial units for instance.

Between the diverse definitions and analysis given by academics, and the multiplicity of uses it allows to authorities, the concept lost its meaning, considering all its variety of uses, interpretations and cases where it has been applied. We then reach a point where academics are, if not critic, at least cautious when using and defining it, and politicians are inclined to use it as explication for every industrial or development policy, as it sounds to them to be more understandable than others economics theories, more convincing.

Some points in the theory remain without clear responses. For instance, if we consider the geographical boundaries of clusters. Is there a minimum geographical threshold for knowledge spillovers to occur, to develop interactions? What geographic concentration, spatial density has to be achieved in order to favor networking processes? There is also the point about industrial limits. At which level of economic specialization an industrial concentration becomes a cluster? Who are exactly the actors (institutions, research and formation centers, authorities...) and what are the activities that can be associated to the description of the cluster? How to determine the critical mass that make a cluster successful (the cluster effect would fully operate if an adequate number of actors and related industries are present)?

Another important issue is about the industrial links operating within a cluster. How to qualify and quantify them? Indeed, for a good implementation of a cluster policy, it is important to know what is, if any, the optimal intensity of links, networking forces, that will favor the crucial knowledge spillovers. Thus it would be interesting to know how the firms organized themselves, both in intern and in their relations with others cluster's members. Said in another way, the point here is to know how firms managers manage to combine practical cooperation and competition through projects common to the members firms, avoiding that collaboration put at risk their competitive advantages. This is particularly true for SMEs (bigger enterprises, whether national or international have diversified value chains) whose activities is based on a single (or few) industrial branches, increasing the impact of the competition. It is then important to organize cooperation's rules inside the cluster, to optimize advantages linked with networking. This part not only rely on firms themselves, but also on the others actors (research, training, institutions). How do these

players have to organize regarding to the cluster? Consequently, implementing a successful cluster strategy is to answer the question how to reconcile the unity of objectives such as the performance of a cluster and its impact on the development of a territory, with the multiplicity of actors having different rationales, needs, objectives, time horizons, whose impact on the cluster could be difficult relations between actors (for instance, about innovation, companies are in a vision of short-term benefits while research centers are more in a long-term logic).

Others issues on clusters remain unanswered. For instance, as strategies type clusters have become a popular model of local industrial development, the trap for analyses would be to give an approach exclusively based or focused on the cluster itself, as an isolated milieu, isolating it from the regional productive system of which they are an integral part. It could lead to a mis estimation of the relations between the various clusters, their interdependency and the way they are organized on the territory, and to divide the economy into independent fragments, while most clusters overlap each others, which raises again the problem of cluster boundaries.

On the other hand, the mere concentration of activities do not necessary means it exist a cluster, it is not a sufficient criterion. The risk is to be tempted to see clusters everywhere, in any situations. This could be dangerous, giving local decision-makers false interpretation guides on how to build an efficient industrial policy. Furthermore, the current typology on cluster is listing clusters according criteria such as size, level of development of the cluster (critical mass, position in the cycle of life...), local environment, industrial potential for having a cluster (presence of vertical or horizontal link, characteristics of the value-chain)...that are many and various, tending to a situation where all the enterprises could virtually be incorporated in clusters and every agglomeration of firms be described as a cluster.

In addition, R. Martin and P. Sunley (2003), suggest that the competitive strategies of firms belonging to a cluster tend to converge through imitation and observation, and therefore to be less innovating than the theory claims. This is explained since each cluster company defines is scope of actions according to the norm in its cluster, rather than having a industrial-wide vision. The consequence would be a restricted collective vision, reducing thus the potential for innovation and

the ability to react to the environment. Martin shows that an idealized vision of cluster, assumed beneficial for companies and territories, may actually reduce the adaptability of firms by making them inert and inflexible, compared to non-agglomerated firms. This could lead to the decline of clusters that would have stuck themselves in a certain way of thinking and acting. Creativity and openness are positives way to react to the environment.

In addition to this part, it can be say that the success of a cluster is often specific to the cultural and social local networks, characteristic of legal and political systems and the strength of social networks mapping the territory. It is above all a matter of context, thus the risk is to overestimate the reproducibility of a successful cluster or to make a misuse of empirical evidences by generalizing them, in order to develop a cluster on a territory. It is extremely difficult to reproduce in different places the conditions that lead to the success of some glorified models such as Silicon Valley.

II.3.2 Should we "declusterized" or do economic gains justify clusters policies?

Martin and Sunley have made a critic of the cluster concept. In an article, "Deconstructing clusters: chaotic concept or policy panacea?", they underlined its industrial and geographical limits, lack of theoretical precision, practical adaptability to concrete cases. They said Porter's works lack of empirical evidences, using non academic definitions of his model and "claiming vague casualties and linkages". According to them, Porter has hidden the works of geographers economists who preceded him, while developing a intelligent marketing for his concept. The paradox between the low academic content of the theory, its popularity and the clemency it found among the academics, would be the result of Porter's efficiency to promote his concept. It became like a brand. The current state of studies, according to them, does not go far enough in analyzing whether clusters improve innovation and performance or not, and with which intensity. Besides, they highlight the fact that

cartographies can be approximate because no one knows what variable to choose to identify them. Many regions have to hire consultants to analyze clusters, recognize and promote regional priorities. As the authors point out, clusters often just are on the eyes of those who want to see them, or created them. They based this strong critic on the fact that where Porter identified 60 clusters in the United States in 2001, the 0ECD detected nearly 380 for the same period. And this because the number of cluster differs according the data, definitions and methods of definition used. After that, how can this concept stay credible?

One the other hand, the concentration of activities cannot be conceived without taking attention on the associated congestion effects which are causes of many economical disadvantages for companies (negative externalities): rising land and real estate prices, as in the Silicon Valley, that can be an entrance barrier for firms as well as for consumers (they even can exit the local market), as well as traffic congestion in case of inadequate infrastructures, that can generate delays and stress affecting the productivity of firms as seen in London.

So it is legitimate to raise some doubts about the economic gains coming from cluster strategies. A report from the CEPREMAP (Center for Economic Research and its Applications) tries to quantify the productivity gains of companies belonging to a cluster, using French data. To increase productivity of firms by 5%, the level of specialization in an activity of a given area should be double. Therefore, it exists a real gain to clustering, confirming both the theoretical benefits described above and giving a justification to clusters policies. However, such an income remains modest for the changes it requires in economic geography. The CEPREMAD concludes, saying that "there is therefore no economic miracle to expect from such a policy. The estimated yield of clusters in terms of productivity is very similar to other studies on other countries". From this evaluation, the authors ask questions to cluster policies, especially the French "Poles de Compétitivité", underlining dangers they could face, such as the risk of an uniform cluster policy that could undermine the national advantage of having diverse sectors, since some are less sensitive to concentration gains, taking advantage of dispersion, or the impact of information asymmetries on the decision process.

II.4 How to make a successful cluster?

II.4.1 From emergence to stability: be able to combine two kinds of externalities.

The aim of aware local decision makers is to implement a competitiveness cluster, that is to say, to concentrate in a same location the talent incorporated within public and private research units, teaching facilities and the expertise of companies, in order to establish working relationships which develop a cooperative environment and promote partnership within innovative projects, as described previously. Researchers and enterprises are mobilized within a private/public partnership, to work on new projects, resulting in technological advances, economic efficiency and job creation in the local pool, the whole should enable those actors involved to attain leading position in their fields. Thus it is important to gather four elements to make a successful cluster. A cluster should be based on a common development strategy, with a strong partnership between the various actors, an international visibility in order to maximize benefits of concentration of a large amount of highly marketable technologies. To reach this aim, structure is very important, since it results in optimization of interconnected relations between the members, mainly of this type:

Research Centers

Training Organizations   Enterprises
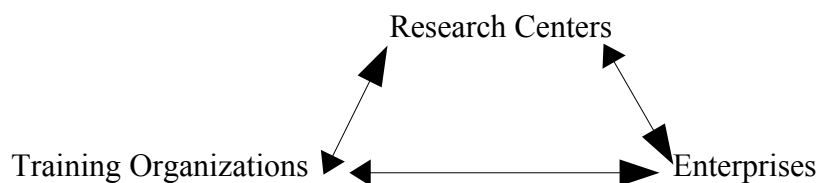
Once these structure is organized, cluster can enhance the advantages offered by a competitiveness cluster, that is to say, working partnership and a shared vision with relevant networks, a source of economic appeal. Indeed, an organization gathering the best player in their fields, small or large, allows players to access a pool of talent, such as leading actors using innovative and competitive technology, competent researchers, qualified staff, public financial support driving innovative research and development and participation to innovating projects, under

the best conditions. Due to their international vocation, clusters enable the investment of companies to benefit from this unique technological environment, the creation of international level research teams, and also the development of technological partnership within and outside the cluster, with foreign firms and clusters.

So decision makers, through the cluster strategy are trying to find a solution to the triple problem of innovation, competitiveness and attractiveness of territories. But what revealed to be successful in a place could not lead to success elsewhere. Indeed, behind geographical clustering it exists realities that are different. That is to say, it is relevant to take a serious look to the conditions of stability and performance. It seems hazardous to try to replicate what has worked (Silicon Valley...), since social, organizational and institutional factors are an important constituting part of territories.

R. Suire (2006) gave a detailed description of cluster formation and the way they function, through the analysis of externalities in actions in the process. He clearly distinguishes two different mechanisms in the collective dynamic of location, according we are talking about informational externalities and observational learning, or network externalities and interactive learning. According to the type of externalities taken into consideration, the strategies of localization do not depend on the same motivations.

Creation of a cluster can firstly rely on informational cascades models. Then decision is based on informational externalities, that is to say the benefit actors can take from observation of others actors. Actions of the others enter into the decision process. This is what has been called "penguin effect", identified by Farell and Saloner. Players facing incertitude about the results of their actions based their individual belief on comparison of collective belief, itself being made from past actions. As hungry penguins looking for food in a rich in fish water, but full of predators, firms will act by mimicry, locating in cascade, following the decision of a leader. From a certain threshold of adoption of the location, the territory gets a label (or a collective image) that would have an impact on the positive image of firms. Then the only relevant strategy for a firm, with a high risk aversion (here, the location's cost), is to align with localization choices of leader

companies, especially if they have a significant credit. The creation of a positive image will ease the activities of firms belonging to the created community, such as access to venture capitalist...

Networks externalities and learning from interactions can also be the basis of cluster formation. The benefits that players can find in interaction with others can result in network externalities, when a player's satisfaction of its adhesion to an economic network is positively correlated to the number of adopter of this network. Here, the degree of networking of agents would lead to an increase of the satisfaction of consumers, a drop of the marginal cost or the improvement of the technological capacity of enterprises. In oder to obtain this externalities, the firm's localization strategy is not isolated but rather depends on those of others firms. "The process of individual decision making follows therefore a process of learning by interactions, namely a process by which an agent will build its decision on the basis of its own intrinsic preferences and needs of coordination with others agents". In this situation, even if most of member firms are competing, specificity of clusters, especially those belonging to high technological industries, is to lead to a certain standardization and to production of related goods, that is to say, to an increasing cooperation, as the process progresses, reinforcing the action of network externalities and thus the attractiveness of a territory and anchorage of firm agglomeration.

Authorities have to ensure a good combination of both types of externalities by finding a compromise between anchorage and growth speed, in order to avoid relocation in cascade. Indeed, whether we are facing one or the other externality, the characteristic of clusters will be different. If informational externalities and mimicry are prevailing, then localization in cascade is a weakness since agglomeration speed lead to a situation where located firms can more easily choose to move away to another territory as the leader firms are modifying their location's choice. Conversely, network externalities ensures anchorage and stability of the cluster, even if it requires time to do so. Thus for Suire, "a cluster will be more likely to rapidly grow that it rely on a mechanism of informational mimicry (penguin effect) to generate a cumulative dynamic, but a cluster will be more stable if it combines high proportion of network effects compared to penguin effects".
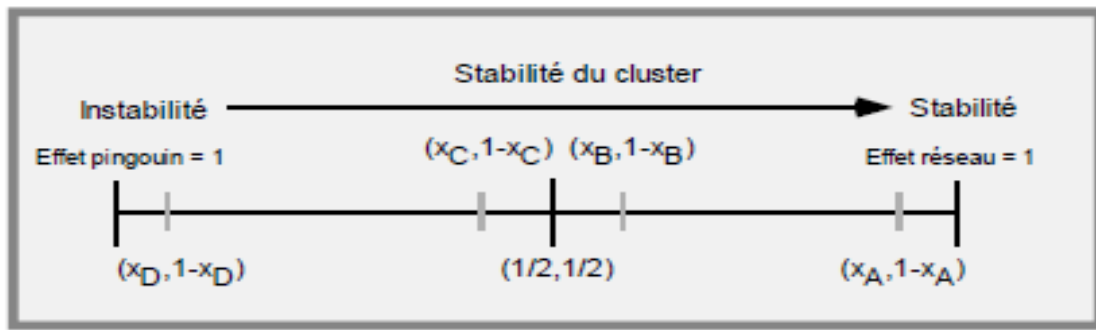
The effects of the distribution of behavior on the stability of cluster. Source: R. Suire (2006)

The nearer of the point where penguin effect=1 is the cursor, the bigger is the instability, with low interactions, since firms only located here to act similarly to localization's choice of leaders, but productive interdependencies are not established. When the cursor gets closer of the middle, anchorages are still not ensured but network effects begin to appear with a critical mass of agglomerated firms. Stability is ensured when the cursor gets closer of the point where network effect=1, thank to interdependencies between firms. Suire to conclude that " the issue of local developer or regional decision-maker is to know how the cursor moves from left to right so that the cluster is gaining stability and performance".

As we already said, when network externalities exceed pecuniary and informational externalities, anchorage and stability are guaranteed, that is to say that knowledge spillovers reinforce the effects of speed agglomeration. Thus what is important here are the effects of three combined proximity: geographical, organizational and relational that are the justification of clusters performance. Local decision makers have to manage cautiously relational proximity since this is on this proximity that depends knowledge spillovers and all the others process responsible for the success of clusters. As Marshall was stressing, it is therefore important to develop and enhance an atmosphere that will help to an optimal activity for firms members. Besides, factors such as lack of cooperation between firms, congestion, increase of land's price, changing conditions of local market...can tend companies to leave the cluster. Therefore, an adequate policy consists on making available benefits from localization such as interdependencies and complementaries between firms

compared to the disadvantages associated with the pressure of a limited space and high transportation time. The degree and aspects of integration, interaction and proximity is thus responsible for performance differences.

II.4.2 The birth, evolution and decline of clusters.

It can takes decades to a fully functional cluster, the startup, incubation and operations of clusters can therefore take several years since the players have to learn how to work together. By using the diamond, it can be identified the reasons or roots of cluster's formation. Locating in a place can be due to the historical circumstances, that local authorities have to identify, protect and enhance, in order to keep available these particular resources and comparative advantages for firms, inciting them to locate on this territory. One prominent motivation for the formation of industry is the availability of pools of factors, such as specialized skills, universities and institutions industry friendly, appropriate infrastructure (that can be implemented by local authorities in a development project). Local demand conditions and particularities, prior existence of related or connected industries or presence on a territory of highly innovative firms that stimulate the growth of many others, are also seed for formation of new clusters. Chance events are often important in the birth of clusters, although it should be relativized by locational antecedents such as prior presence in the area of specialized universities or institutions (the presence of medical institutions in the Minneapolis area played an important part in the decision of pacemaker pioneer Medtronic to locate there, as Porter shows). As it as been said in the description of the diamond, chance can also be important because it influence directly or indirectly the four sources of locational competitive advantage by creating, for instance, advantageous factors or demand conditions. But chance alone cannot explain the agglomeration process, since it need important advantages already established.

Different methods can be used to identify a cluster, whether they are based on quantitative or qualitative methods. Quantitatively, location quotients can be use, as they indicate the spatial

concentration of firms by industry or activities. But quantitativeness cannot fully identify cluster, since it exists qualitative conditions explaining the emergence of clustering process. Namely, they are the recognition of local opportunities by authorities, involvement of local forces such as entrepreneurs, skilled labor, researchers, local markets and so on, presence of leader companies in their domains and of a strong entrepreneurial spirit, possibility to access to diversified funding sources and information networks, presence of training and research institutions, international minded development strategy inscribed on the long run (since it requires severals years to establish a successful cluster)...

Cluster development is more predictable than their birth that present many causes, as seen above. Indeed, once the process has started on good rails, it is like a chain reaction associating all the effects provided by the different factors. It can depends, for instance, on the capacity of all the players to respond, and on how they respond, to the needs of cluster. In this process, three particular factors play an important role: intensity of competition and rivalry, drivers of improvements, ability to establish mechanisms bringing cluster participants together and an environment friendly to the creation of new businesses and institutions (cluster creation is a self reinforcing process, since a critical mass of firm have been reached). Cluster development, in addition to its normal reinforcement, can be accentuated by attracting new companies or foreign direct investment under the form of investments in subsidiaries. In parallel, a developing cluster also attracts talents, that could be creative peoples as R. Florida (2002) stressed, bringing new ideas and way of proceeding, that reinforce the cluster. This relocation of skilled labor sends signals to entrepreneurs wanting to seize this opportunity. As Porter says, "a cluster's success stories help attract the best talents". But cluster players can as well play directly a role in this process, by requesting outsiders to join in the cluster. Even if the process is mainly self reinforcing, it needs to be monitored by some local authorities. Monitoring can be implemented by through report on innovation within the cluster, on networking,on the ability of the cluster to win new markets, or to compare the evolution of the cluster compared to others. Having an updated strategy, such as a cluster development program, and regularly applicate it to the cluster, is a efficient way to evaluate the process. Implementing its

strategy can be done via securing substantial governmental support, identifying a leader firm able to advertise the cluster by association of both names, organizing diversified activities around a group of leader firms as drivers of the cluster before sharing the responsibilities among the members.

Nevertheless, even if most successful clusters can last for decades, the ability of clusters to remain competitive in a constantly evolving environment, is not assured. As the diamond is able to explain the strengths of clusters, it can also serves to identify the causes of cluster's decline, whether they are derived from the location itself or exogenous, that is to say coming from the evolutions in the external environment. Internal sources of decline may be rigidities diminishing productivity and innovation , inflexibility of the structures, collusive ententes inside the cluster, barriers undermining the vital rivalry, inability to upgrade and change...Such causes of decline are likely to occur where governments are intervening in competition. External threats to success can be a modification in used technologies or characteristics of local demand that becomes different from the global one. As Porter says, "the ultimate test of the health or decline of a cluster is its rate of innovation", that is to say that authorities have to do their best to ensure that cluster's members ensure a high level of investment dedicated to innovation. This requires support measures such as intervention policy, toward individual firms or toward the regional innovation system, reaching thus in the end the cluster. Measures in this domain can be proactive (increasing interaction and learning within the cluster) or reactive (by reallocating resources...). Measures can also target governance by providing support to whoever organize exchange activities among players and create partnership, try to boost interactions among players. In order to increase learning, measures can also tend to support individual and collective learning through easing research and development, support for research through a partnership with an university and an enterprise, organizing conferences and others meeting to ease the transmission and use of knowledge and technology.

To conclude with this part, we can quote M. Porter, giving a finale definition of what is a cluster. "A cluster is a system of interconnected firms and institutions the whole of which is greater than the sum of the parts. Clusters play an important role in competition, and these raise important

implications for companies, governments, universities and others institutions in an economy."

"Clusters represent a new and complementary way of understanding an economy, organizing economic development and setting public policy. Understanding the state of clusters in a location provides important insights into the productive potential of its economy and the constrains of its future development".

Chapter 3: the government, a central player in a multi-player game.

III.1 A quick overview of government's role in the economy.

As it has been suggested in the end of the previous chapter, government, considered here as well as the central government or local and regional authorities, play an important role, since it can be at the origin of the cluster strategy and development or at least, it can initiate a series of support measures. In the economics' tradition, government is a central role player in the economy. In an ideal market economy, State, and his agent, the government, does not have to intervene since forces such as the Smith's "Invisible Hand" are acting to optimize the economical interactions between all the players. Nevertheless, the real economy is quite different from what has been idealized. Thus, it has been given described five traditional reasons for State to intervene in order to correct economic imbalances (improve economic efficiency, income distribution, promote growth and economic stability and also equity and conduct the international economic policy). In some cases, it also can provide specific public sector outputs. Thus, when talking about public intervention into the economy, it can concerns as well local or national level of governance. Giving local authorities the competence (or part of it, in association with the central government) in term of industrial

development, in the creation and promotion of a cluster for instance, reveals that they are the most appropriate for delivery of public goods, such as cluster can be qualified of. Indeed, decentralization has been described as a way to facilitate matching of public sector's actions with local preferences (in the case of cluster, this could be the financing of internal infrastructures such as broad band networks, nursery...but also developing a locally specific cluster) and it is also referenced as subsidiarity, that is to say that power should be exercised at the lowest governmental level possible. We are here considering economic decentralization, that is to say the relocation of economic decisions. Decentralization would increase efficiency. Indeed, local government represents subnational communities and act, for instance, in the field of local economic development, being totally concentrated on the local welfare optimization, since local levels of governance would be less captured by producer's interests (Bailey). Besides, local governance is preferable to central governance since it avoids uniformity at the national level, that do not take into account local differences and preferences, and then leading to a loss of consumers' surplus. Thus, under the Oates' theorem on decentralization, decentralized decisions are Pareto efficient because they remove the dead weight loss in consumers surplus. Homogeneity being a principle in location theory (people live which those who have the same preferences), local governance have to make sure (and also ensure its continuity) that the preferences vary little within the community.

In this condition, local authorities are free to play their role in the economy, especially the resource allocation, that have been argued to be primarily the concern of local governments (notably by Musgrave). Implementing an industrial development policy and setting its conditions and limits is a way to ensure that use of land is effectively distributed. For that task, land prices impact on the decision's function of firms to locate, and thus, local governance have to make their territory attractive, using for instance tax incentives, provide they are not overlapping central government's role, whether in a centralized constraint model (central government sets out a range of limits within which local authorities can act with full autonomy) or a bargaining model (autonomy is established by the constitution).

As markets failed to achieve allocative efficiency, being non perfectly competitive or by

41

having market prices that do not reflect all costs and benefits, authorities have to intervene. On this topic, it can be noted that implementing a cluster strategy allows to create a competition friendly climate into the concerned territory (the local authority in charge of the cluster has got all the means to avoid collusive behaviors, and also to increase spillovers and interaction that, in the end, through technological improvement of production's processes, will lead to an increased competence and competition). In parallel, the mutual dependency between firm's location and local demand characteristics (including where it locate itself, awareness of customers...) lead firms to tend to make their prices reflecting the costs and benefits (an innovation could tend to a decreasing production's cost, then firms wanting to keep their position on the market, in an open economy without monopoly, will reflect on the price their new production's function).

III.2 The role of government in cluster

Having highlighted the different forms and level of government and suggested that they could play a range of economic role allows to fix governments' policy toward cluster in its context (to know whether we are considering the national cluster policy, part of the national industrial policy, or rather, the local development strategy based around clusters). First, by achieving a stable macroeconomic and politic environment, it provides attractive environment for companies, based, for instance, on healthy public finances (meaning more fundings available for tax incentives, supportive measures toward firms..) and others macroeconomic fundamentals such as low level of inflation, level of interest rates...Governments also play a role in improving microeconomic capacities of an economy. By doing so, through institutions, they ensure the availability and quality of inputs beneficial to clusters, notably those identified into the Porter's diamond (human, capital and natural resources, infrastructures, economical information...). Thirdly, it also has to establish rules and incentives that set up the aspects and limits (if any) to competition, such anti-trust measures, a tax system and patent laws that encourage investment, an efficient industrial law

system, etc...that is to say all measures that do not prevent innovation. Having an industrial policy, and particularly one of development and upgrading of clusters is also on of the mission of governments. This can be part of a long-term economic program that mobilize governments, institutions, businesses and citizens (as possible workers or entrepreneurs) to upgrade the industrial environment (from general business to local clusters). In others words, authorities have to have a vision to avoid inaction or unnecessary and inefficient actions.

III.2.1 Government's policy at the cluster level

For Porter, all clusters offer opportunities to improve productivity and support raising wages. That the reason why the government should consider all of them seriously, because they contribute to the national level of productivity but also because every cluster is suppose to have an emulation impact on others, even those in traditional activities or with less added-value. Upgrading a cluster should thus be a priority for authorities. Besides, as new clusters emerge better from already established or emerging ones, government should focus on reinforcing and build on them instead of creating entirely new clusters. As Porter says, "businesses involving advanced technology do not succeed on vacuum but where there is already a base of less sophisticated activities on this field", that is to say, where local advantages exist. In the process, authorities should avoid trying to imitate what have succeeded, but try to research specific competitive advantages in order to get specialized, building on all sources of uniqueness, making them potential strengths. Better, they should do their best to attract investment and companies (foreign or local), supported by a range of measures such as investment on training, infrastructure, that is to say all that can improve the business environment.

After having identified the existence of a cluster (or a potential for cluster development), authorities should be able to implement strategies to upgrade them. Thus they are involved in removing obstacles or constraints that limit cluster's productivity and innovation. In order to fight

this sources of inefficiency, governments can initiate measures toward human resources, infrastructures and also try to accentuate the network effects by regulating interactions and cooperation. In this process, all the players have to be involved in a full cooperation, since some actions of the government can be source of new constraints. According to Porter, "ideally, all government policies that inflicts cost on firms without conferring any compensating, long term competitive value should be minimized or eliminated". It can be need to change institutions or policies that affect cluster development.

Better than an industrial policy considered in its national level, or a policy toward a single company or sector, a policy focused on cluster allows to highlight the externalities, ties, spillovers, and all the different actors that are important for competition. As in a cluster are gathered in a same location members, suppliers, related industries, services providers, to name a few, a governmental policy should take in consideration the fact that these players are all facing the same type of problems, when implementing its policy. An aware local government will thus know all the domains in which it has to act, in order to highlight the uniqueness of its territory and thus regulating and investing in public (or quasi-public) goods that will impact on the industrial environment, having finally an higher return than with policy in favor of individual firms or industries, all things being equal, provide it is able to identify the actions to implement, and use the adequate means. An authority, able to understand and interpret the competitive diamond, will set up policy creating (maximizing the local factors) wealth and participate to local/national welfare, by increases in competitiveness.

To summarize, a government should act as a "catalyst and challenger",that is to say it has to encourage or force companies to raise their level of inspiration, innovating, and move to higher level of competitiveness. It must encourage companies to raise their performance, stimulate early demand for advanced products, it must focus on specialized factors (identification, creation, development and upgrading), and to stimulate local rivalry to increase competition (too much cooperation can decrease intensity of competition).

Besides these "industrials" aspects, a government can improve the functioning of a cluster

by stimulating two general aspects of cluster daily life, relational proximity and creativity. Indeed, a territory will gain in efficiency and productivity when collective capacity to innovation is stimulated by networks effects, since they increase the productive interactions between firms. In a well organized cluster, networking, cooperation and interaction are pushed to a so high level that it acquires competitive advantage due to knowledge and innovation spillovers within the cluster's boundaries. But to maximize these spillovers effects, it is important, since modalities of knowledge spillovers depend on size and knowledges basis of member companies, to improve the quality of this factors. Governments can act by focusing their approach on creativity and on its providers, the talents. Indeed they became a central issue on the development of cluster and all the policies that go with. Richard Florida (2002 and 2005) identified and described these creative class, stressing all its characteristics, aspects and social networks to which they belong, making of it on the basis of the territorial performance and of the collective capacity to innovate. He stresses on the crucial necessity for a government to do involved all its means to attract these class, since when the labor market is flexible, they are those who choose where to locate in accordance with their preferences, bringing with them their knowledges, ideas, way of proceeding, and then, by capillary, once in their new firms, they feed the knowledge basis that is already shared by the members of cluster, enforcing the territorial embedding of innovation (we talk about regional innovation system) but also the social embedding, since they become integrated local citizens, playing fully their new role (they, as the others players, have to be heard, since they can leave the territory if they are not heard, voting with their own foot). Thus it is primordial for a government to create a local environment friendly to this category of collaborators. Openness of minds, organization of artistic and cultural events, presence of an integrated gay community are aspects that play in their location decision and on which government have opportunities to seize.

All this lead to the development and enforcement of a relational proximity and its competent management by local authorities, enforcing the impact and efficiency of numerous relational externalities, should lead to a continuous rise of the exit cost of innovators and participants to innovating networks, since a multilateral dependency appears and reinforces. Local decision makers

should do their best to favor the development and the maintenance of direct social relations, in multiple optic: favor the creation and diffusion of knowledges; create lasting relationships, even when the talents are leaving the territory (since we consider that cooperation within a cluster can be made from outside the cluster, between insiders and outsiders) in order to access knowledges non available and accessible locally, but also to maintain the attractiveness of the territory toward talents participating to the network.

III.2.2 Government's influence on Porter's diamond

As it has been already described, government have the capacity to influence on a cluster by acting on factors whose presence is revealed by the porter's diamond. For instance, when considering the edge "Context for firm strategy and rivalry", authorities can act by eliminating barriers to local competition, by organizing a relevant network of institutions and department that surround the proper functioning of cluster, leading and organizing an advertising campaign in order to concentrate all the efforts to promote a territory and attract companies and investment, including coming from abroad, that is to say all measures that promote the industrial development strategy on a territorial basis. The aim being to associate a positive and dynamic image to this given territory, making it the place to be in, where to develop an activity (a policy orientated toward attracting leaders is a way to reach this goal, provide networks effects become more influent than informational externalities, avoiding relocating of these leaders firms once the effects of a generous policy, let say an offered tax reduction if the firm locate here, are over).

As far as "Demand conditions" are concerned, government can set up regulations inciting innovation, like the obligation for firm to fill a certain standard level of innovation in order to satisfy better local customers and to improve the production process by reducing regulatory uncertainty, stimulate technological upgrading and early adoption of new uses. This can be achieve

by contracting with outside the cluster services providers that are testing and certificate new products and that can also be in charge of advertising and marketing campaigns. Having a high level standards, in addition with specialization, is a strong signal sent to the markets and to customers, in a global competition environment, and clusters can hope to seize for a while a part of the demand, keeping in minds that comparative advantages of the kind have to be feed by constant research and development effort. But another way for government to promote cluster's products is to become a buyer. Indeed, by doing so, a positive image will be attributed to the cluster, since it proves cluster's capacity to be competitive knowing the legal complexity of public market or public/private partnerships. Besides, this should not be achieved in opposition with the development of a real and without limits competition that is suppose to feed the development process.

Implementing a policy toward "Related and supporting industries" could take the form of organizing forums, conferences and others formal or informal places where information could be exchanged through reinforcement of proximity, bringing together cluster participants. But these places could also be the opportunity to develop strategic efforts to attract suppliers and services providers based outside the cluster. This also can be achieve by establishing free trade zones, orientated to the cluster needs, industrial parks or suppliers parks.

The last edge of the diamond, "Factors conditions" can be stimulated by creating specialized education and training programs, setting educational policies encouraging public universities and schools to respond to local clusters needs, establishing local university research efforts in technologies related to the cluster, supporting cluster specific information gathering and compilation and also by enhancing specialized transportation, communication and others infrastructures.

Of course, the shape of policies implemented should not be the same at the different stages of cluster's life. Indeed, throughout their life's cycle, clusters mature and develop, thus the appropriate priorities for the government change, since sources of competitive advantage on which they rely, change. Indeed, early priorities involve improving infrastructures and eliminating diamond disadvantages, while later role are more about removing constraints to innovation and

upgrading.

Nevertheless, clusters are inscribed in the overall economy, since a national economy can be viewed as a set of cluster, a set of locals territories with opportunities to develop. Then the local and the national level are self-reinforcing, complementary. Indeed, clusters are a way to advertise competitiveness of an economy, since they are involved in a wide range of globalized economic activities that make the promotion of national/regional economy. They do so by exporting goods, attracting foreign direct investment, by taking their advantageous position from national policies in science and technologies and from the national regulation system for the industry. Furthermore, a cluster orientation in government also provides a mechanism through witch authorities can become better informed about the practical costs and benefits of policies they implement and better motivated to make them more cost effective, by learning from competition and cooperation of severals players and then finding solutions to deficiencies.

III.2.3 Expansion and theoretical limits of government's action

The central role of the government is that of organizing participants, do the best to balance the ratio advantages/disadvantages and catalyze public and private action. By this way, dialogue between businesses, government and institutions such as universities are more concrete and efficient, making planning and actions more possible. In order to fully implement this actions, players must share a number of common. Government should thus ensure that it exists a shared understanding of competitiveness and of its sources, that is to say how to implement crucial innovations that will feed the productivity. From this dialogue the benefit would be a removal of obstacles and a better understanding of necessity to upgrade. Thus fixing goals and the plan to implement them in the beginning of the cluster strategy informs firms about how they have to react in this environment, which increase stability, since it deters participants to search for the status quo or to orient cluster according to their own interests. Cluster programming and management is thus a

collective game where cooperation and wide involvement of all the participants should overcome individual interests, government being the guarantor of the system, within appropriate boundaries.

So that the system functions properly, it should be under a private sector leadership. Indeed, if we take a look to the different models of local/national government, it appears some characteristics that go against a system ruled by public actors. A government can take several forms. It may be a "despotic benevolent", a very paternalist actor, that corresponds to a situation where authorities know best than others players which actions to implement to reach an objective and are more keen to intervene on their own to correct potential market failure, as they consider this is the one best way to maximize the economic welfare of the given territory. In this case, the risk is that the voice of others players is not heard, leading to a loss in their utility surplus/function, and then to a suboptimal economic situation.

The model of government could as well be a "fiscal exchange" model, where the government provides services (here the cluster and all the structures and amenities that directly fall within is domain of action, for instance anti congestion measures, broad band networks...) solely in accordance with voters/players' willingness to pay corresponding taxes. We are here facing two main problems, the first one being the willingness of players to fairly reveal their preferences, and thus to determine the amount to which they are disposed to pay to obtain this service/good. The second one is the consequence of the first, since it can result in under provision of public goods/services, thus the cluster will not produce its beneficial effects to its maximum level.

The worst situation would be the "leviathan model", because it corresponds to a situation where despotic self serving bureaucrats and politicians maximize their own welfares, rather than those of cluster's actors and by capillary, those of local/national customers and related industries. As it has been shown previously, government should be guarantor of cluster's stability and cooperation processes, that is to say, it should be at the entire disposition of players to make their individual interests compatible with global interest of cluster (and thus of the given territory and its components). Or, when politicians and the government, viewed as a pool of politicians and bureaucrats act for themselves before satisfying global welfare, the resulting situations is a dead

49

weight loss in global welfare, and thus in efficiency of the cluster process. Indeed, if we consider cluster as the expression of a local mobilization of factors (human as well) toward a common goal, local "leviathan" government is self serving in the decision making process, that is to say that when implementing cluster strategy, it seeks to limit others stakeholders representation, in order to adopt the definition of service (here cluster organization) that promote its owns interests. Even if the raising of spendings toward the cluster ordered by local government (due to the fact that it is maximizing its utility through budget maximization, because it is improving is public image and career opportunities) could be seem as a positive result for the cluster development (since more money is available for, lets say, upgrading Porter's diamond), it is all but the case since it cannot achieve the needs of cluster's players and their interests would be undermined, as those of the whole cluster.

It seems that the theoretical model of local government that should fix best to a government involved in a cluster is the "fiscal transfer" model where the provision of public sector services (here cluster) is used to pursue social policy objectives. Try to develop a territory using the method of cluster, in order to achieve social objectives such as higher wages level, better education and access to skilled job, development of a pool of activities and employment in a context marked by a given level of unemployment (even matching the criterion of non accelerating inflation rate of unemployment) is a way to pursue a social policy. In this model, stakeholders (the partners in the cluster) include particular groups of users, tax payers and their political representative constituting a majority, adopt policies which adapt the financing, quantity and quality of public services in their favor. With this model, the specifics needs of a clusters would be satisfied, as the expression of local welfare. In this model, all the actors are included in the decision making process, within a truly democratic organization and real partnership.

The particular aspect of the decisions and ability that is needed to implement a cluster policy asked about the power relationships within local authorities (in this context we consider authorities as leading boards of clusters composed of politicians and representative of firms, sharing some characteristics and behaviors). Indeed, the nature of the taken decision and its results would not

have the same characteristics whether we are facing three different situations. On the "formal model" power relationships are determined by the institutional framework, where local politicians make policy and bureaucrats implement it. Under the "technocratic model", power reside in officers (bureaucrats) due to their specialized knowledges and abilities, in opposition with the amateurship of the councilors (politicians). Here bureaucrats are the dominant force of the political system due to their monopoly in competences and informations. The fact that well aware politicians are in charge could be an attracting solution for leading cluster management. But the fact is that this could lead to asymmetries of information since they can be cut from the basis and the cluster. Besides, it goes against the central in cluster principle pf cooperation in decision making. There is also the "joint elite model", a compromise of the previous two models, were power is share between a small number of officers and councilors. The result is that some ideas could not be develop since they are not coming from this small elite (a cluster should rely on the full involvement of all actors, no matters of their size and place in the organizational framework of the cluster). None of these models are enough to explain the reality of the power distribution within a cluster. Elements of the three could be relevant. So, it exists a more relevant model, the fiscal exchange, because local government is a service delivery instrument, providing services to the proper functioning of clusters, in response to clusters members and their willingness to contribute. All those in power or with a role in the cluster should be involved.

That is why, for Porter, successful cluster initiatives are structured around a private sector leadership, where "active government participation in a private led effort, rather than an initiative controlled by government, will have a better chance of success". Indeed, it is more easy for firms to identify weaknesses and opportunities to which they are confronted on a daily basis. And this is the guarantee that the initiative would be free of any partisan orientation, independent of politicians' agenda.

III.2.4 A summary of typical measures to implement

In accordance with the competitive diamond, some factors have to be integrated in a successful cluster initiative. Some particular measures correspond to each factor, and allow to upgrade them and preserve competitive advantages.

As it has been said previously, innovation and technological capacities are key factors to success. It is thus of the utmost importance to initiate actions in this direction. Local decision maker can try to rise the research and development capacity of the territory, that is to say, private or public research institutes in the field of cluster, including internal to the firms research centers, and also individual expert, all of them being available on the territory at any time to bring to the cluster their research processes and technicals. The action to be implemented could be for instance a rise of governmental credits attributed to research projects and also an increase in private effort in fields of research, via creation of technopolis, internal research institute gathering all the research capacities via networking and mobility of searchers. The corollary of this set of measures would be to act on the field of innovation and learning by imitation processes, that is to say, make available to the others members, through dispersion within the cluster boundaries of all the new technologies and processes developed by cluster's companies. The government could for instance install a patent and copyright policy, set up objectives in investment in new technologies or organize round-tables discussion involving all the players, about the direction to give to the production (launch of new products, organization of the value chain within the cluster...). In order to give a substantial push to this objective of high level of innovation and mutual sharing of it, it is important to have, on the territory, the presence of market leaders and innovators, because they will act like magnets and attract potential new location decisions, reinforcing the technological assets of the location, and will act like advertisers of cluster's productions outside its geographical limits.

Also playing on the edge of local factors conditions are the workforce skills and its availability. What is important here is the degree to which it is tailored to the cluster's needs

(technical skills, general knowledge of the industry, entrepreneurial skills...) and the quantity already and immediately available. What can be done in this domain, upstream, is creation of tailored academics programs with an adequate number of graduated students, most of the cohort having to be hired by the cluster. The challenge here is to create a connection between universities and others teaching institutes and the cluster, in order to teach a competent and efficient local manpower, responding to the cluster's context. What can be done here is to attract qualified and experienced instructors, develop the openness to technological and organizational change and creativity via training and internships (and the internal mobility within the cluster) in order to update skills, one of the most important thing being the hiring of interns or students in the cluster, in order to avoid lost of investment returns in educational efforts.

When implementing a cluster strategy, a government also has to consider economical problematic, inherent to cluster functioning. For instance, a cluster policy has to deal with the crucial issue of proximity with suppliers. indeed, proximity reduces transaction costs and maximizes crucial interactions. It is of the first importance to optimize relationship with suppliers, by doing an analysis of supply chains in connection with the inputs and outputs incorporated in the process, that is to say to know if the provision is optimal. Increase in the rivalry between potential suppliers can be an approach to maximize supply chains' functioning, by opposing actual suppliers to potential ones. A survey of all the economic interactions inside and outside the cluster is needed to understand its organization and optimize it. To do so, it is also crucial for local decision makers to identify the range of specialized services inside the clusters. Indeed, they constitute a sum of institutions and professionals with a good knowledge of the cluster, such as technology centers, businesses centers, incubators, assistance, consultants, lawyers and so on. Besides, cluster governing board has to be aware of capital availability to implementation of projects of the cluster and of member companies, that is to say the net of local banks who know how a cluster functions and know the players and their need, access to various types of capital to accompany all the life stages of a firm (startup capital, working capital, venture capital...). Local decision makers can decide to ease the loaning for cluster's activities or associate bankers to decision making process, as

it has been seen in the case of the Silicon Valley.

Another important domain where decision making can lead to a competitive advantage is all the decision that concern networking and interactions, that is to say, all the relations that foster efficiency and competitiveness of the cluster. It is important to develop interactions and cooperation between members on training, production, joint venture, problem solving, reflexion groups, marketing, management, competence's upgrading groups..., all of those having to be repeated on a frequent basis. Having a high level and quality of social capital is thus important since it emphasizes the nature and quality of cluster's implantation on the given territory, by involving it in a local logic of cooperation and community building, through the associations of workers or entrepreneurs, membership and level of activity being clues of vitality of these ties. But vitality of networking in a cluster can also be stressed by the existence of external connections experienced in joint venture, contracts, alliances, communication with experts or others players belonging to others clusters, by having a good knowledge of what is done elsewhere, in the same industry (international visits can be organized, for instance).

But a cluster could not be successful without two more elements. First of all, an entrepreneurial climate must be well developed, that is to say that the cluster is, as businesses friendly environment, propitious to creation of new firms and acts as an incubator for them, and contribute to the self-reinforcement of agglomeration effects. The result is a continuous creation of firms by workers or entrepreneurs already established within the cluster (even if outsiders can join in the process), keen to take risks in a safe environment (presence of a range of players, private or public as well, readability of economic perspectives, supervising of the activity...) within the cluster, on new or complementary and competitive products. One of the means of local government to highlight these positive aspect of cluster is to insist on the visibility of indicators such as number of new startups generated by the cluster and number of firms that came from outside to join in. the second important element is a shared vision and leadership. Indeed, to be successful, as cluster should be considered as a system, where firms are planing its direction for the future, sharing common and cumulative goals, leader firms taking the responsibility on their own, since their

bigger size, dominant position on a sector or innovative capacity allow them to take responsibility for collective competitiveness. Thus, a possible action could be a collective plan, based on a collectively determined and accepted cluster name as a label.

III.3 Clusters as an issue for public economics: the government acting as a stabilizer.

Industrial clusters are an established tool to enhance the dynamism of a territory, and as such, they represent also a subsystem of relations between players, possibly having differences in inherent interests and objectives and on the way they act and behave. Through the collaboration process they intensify, clusters are responsible for the creation and development of economic effects, such as lower transaction costs (as trust increases, number of transactions growths, and prices decrease, the global effect being measurable via consumers and suppliers surplus) and more efficient public decision about infrastructure, education, competitive fundamentals of the territory, that lead to more qualitative endowments on basics factors such as skills, technology, infrastructures and thus, of entrepreneurial climate. Nevertheless, collaboration has a cost, in term of opportunity costs (time spent to build relationships and networks), which are lower where firms are agglomerated and cohabit in a given location, that clusters provides. Besides, the effects of the first effort of collaboration are continuing all over the time, and at decreasing cost. As we have seen in the previous chapter, clusters are originating a range of externalities, appearing at it early stages, and collaboration are one of them, presenting all the aspects of an externality, and more precisely of a public goods externality since no members of the cluster can be excluded from the benefits of lower transaction costs (this is also true for others public goods generated by the cluster, like networks, public infrastructures, educated manpower...). But also, considering that collaboration has the characteristics of network externalities stresses an important issue. Indeed, which states collaboration and networking said sharing the benefits while internalizing its costs. But, if

entrepreneurs investors act like selfish players, we would face the "ownership externality", that leads to an under investment in building cooperation since they cant own the whole benefits. Besides, as they are selfish, and as the good provided are of public aspects (non rivalry and non excludability), that means that free-riders (from inside or outside the cluster) could possibly benefit without contributing, thus contributors, which cannot capture all the benefits for themselves (that is to say for the members of cluster), will invest less than the optimal level for the community, or will turn their investment on goods that only benefit to the members (taking the characteristics of a club-good, with partial rivalry and excludability). Thus it is important to appeal to a "stabilizer" player, able to balance the aims of the players and combine cooperation and cooperation, that is the role in the cluster organization we will attribute to the government, through additional public fundings, even if it is also at the basis of the creation of the based on clusters development policy.

As we said that government could be the stabilizer of this system, and since we previously stressed the advantages of having decentralized levels of governance, we will consider from now local governance has being the main actors of cluster strategies. Besides, even if the following sections will be based under public goods' characteristics, it is important to note that cluster policies are producing as well "quasi public goods", like capacity building or the cluster area in itself, since it is provided both by firms and by the public/quasi public sector. Samuelson in 1954 made crucial distinction between public goods and private goods produced and consumed in a given economy. Between these two categories, there exists goods that share characteristics of private and public goods. This is the case of quasi public or impure public goods. Traditional criteria of goods' classification are excludability/non excludability and rivalry and non rivalry, to which have been added criteria of divisibility/non divisibility and optional/non optional. Let's only consider the first two.

A good or service is qualified of excludable when it is possible to prevent its use, consumption and benefit by a player who did not pay for it. Conversely, when it is not possible to do so, a good or service is said to be non excludable. In the later situation, the good is a public one. It is therefore impossible for the supplier to exclude individual actors at a zero or small cost on the

good is produced. A good is said non rival when the consumption of a unit of it by an individual does not prevent its simultaneous consumption by others players. Said by Samuelson, it gives a good "which all enjoy in common in the sens that each individual's consumption of such a good leads to no reduction from any other individual's consumption of it". Conversely, if a good does not satisfy this criteria, it is said rival. On the case of cluster, goods provided can be club goods (internal networking about marketing, production processes...), impure goods (transportation infrastructure...) or pure (the range of externalities accessible through proximity and collaboration...). Clusters could be seen as joint products. Nevertheless, in the forthcoming sections, we will consider, for simplicity, goods as pure public goods (non rival and non excludable) in order to show why and how a government should intervene in the management of a cluster.

III.3.1 Provision of a public good.

III.3.1.1 Model of voluntary contribution, with a corrective subvention

For this part, we will use a basic model of private contribution to public goods. We consider a local economy composed of two identical agents, here two firms located in the same area, A and B, who consume a private good Pri (an input for the production process) and a public good Pub (a collaborative network, for management and advertisement of cluster's production). Keep in mind that the local government is suppose to act as a stabilizer.

The preferences of the two agents are given by the function, quasi linear:

$$U(Pub, Pri_i) = (k\,Pub - Pub^2/2) + Pri_i \qquad \text{pour } i = A, B$$

where k is a positive parameter. As the two firms are identical, we do not need to index their utility functions. Both firms have an original endowment of Pri, Pri A and Pri B, that they can use directly

or convert into a Pub, on a one to one basis. That can be explain by the fact that each firm have an initial budget to respect, which allocate the best their resources under constraints. Thus, each firm can take an unit of Pri and convert it in a single unit of Pub, pub. Therefore, the aggregate level of Pub = pub A+pub B, being non necessarily equals, since agent has got Pri A-pub A of Pub and B have Pri B-pub B of Pub. The whole Pub is consumed in the process, since this a common pool of product share by both players (in the cluster case, Pub A+Pub B = 1 means that collaborative networks are fully used by the firms). Given Pub A and Pub B, the utility functions are given like that:

$$U(Pub, Pri\ A) = (k\ (pub\ A + pub\ B) - (pub\ A + pub\ B)^2/2) + (Pri\ A - pub\ A)\ and$$

$$U(Pub, Pri\ B) = (k\ (pub\ A + pub\ B) - pub\ A + pub\ B)^2/2) + (Pri\ B - pub\ B)$$

As this stage, both players decide simultaneously the level to which they will contribute to the provision of this public good. We consider it as a model of voluntary contribution game. That is to say that player's strategy is it contribution to Pub and its payoff is the utility resulting of its strategy. A Nash equilibrium of this game could be defined as a pair of (pub A*;pub b*), found by the intersection of the two best response functions:

$$\partial U(Pub, Pri\ A)/\partial\ pub\ A = (k - (pub\ A + pub\ B)) - 1 = 0\ and$$

$$\partial U(Pub, Pri\ B)/\partial\ pub\ B = (k - (pub\ A + pub\ B)) - 1 = 0$$

This equation shows that at a Nash equilibrium of a voluntary contribution game, each firms contributes to the public good until the point where the marginal utility from Pub, which is given by k-(pub A+pub b) is equal to 1, which is the marginal cost of the public good, since to produce one unit of Pub, it is necessary to give up one unit of Pri. At a symmetric Nash equilibrium, pub A*= pub B*, that implies that   pub A* = pub B* = (k-1)/2

Hence, the voluntary contributed level of Pub will be: Pub = pub A*+pub B* = k-1

The point now is to know whether Pub is Pareto optimal, that is to say, if the aggregate level of contribution to Pub by each firms reach the level that would maximize the welfare in the cluster.

To do so, let's characterize the set of Pareto efficient allocations. As we have chosen a substitution of Pri by Pub on a one to one basis, we have the production possibility curve as follows:

$$PPC(Pub, Pri\ A, Pri\ B) = Pub + Pri\ A + Pri\ B - PRI = 0, \text{ where}$$

$$Pri\ A + Pri\ B = PRI$$

Given PPC(Pub, Pri A, Pri B), the following maximization problem gives the set of allocations Pareto efficient: MAX U(Pub, Pri A)

Pub, Pri A, Pri B

under constraints U(Pub, Pri A)= Ŭ B

$$PPC\ (Pub, Pri\ A, Pri\ B) = 0$$

Making the substitutions on the last constraints and using the first equation, we obtain:

$$MAX\ (k\ Pub - Pub^2/2) + Pri\ A$$

Pub, Pri A

under constraint $(k\ Pub - Pub^2/2) + (PRI - Pri\ A - Pub) = $ Ŭ B

Now, substituting for Pri A from the constraint into the objective function:

$$MAX\ (k\ Pub - Pub^2/2) + (k\ Pub - Pub^2/2) + (PRI - Pub - Ŭ\ B)$$

Pub

Then we get the first order condition: $2(k - Pub) - 1 = 0$.

Solving this equation for Pub, the Pareto efficient level of Public Goods is:

$$Pub^* = k - (1/2) > k - 1, \text{ that is to say } Pub^* > Pub.$$

As we expected from the theory, we found that the voluntary contribution game leads to an inferior provision of public good, compared with the Pareto efficient contribution level. Indeed, while the agents share the benefits of the collaborative network of the cluster, each firm support a cost in providing this public good. We are here facing a situation, when players are let free to contribute to a good, where free riding behaviors are likely, since each of the players is waiting for the others to provide the good.

Unless the stabilizer government comes to balance the system, the result would be a

suboptimal level of public goods in the clusters, the consequence being the non maximization of networks effects and externalities that clusters are theoretically suppose to provide to member firms. At the level of the cluster, we can imagine a local authority, government (but it can as well be a private/public autonomous institution, such as the cluster board of directors...in charge of dealing with the daily operation and management of the cluster), aware of the problem posed by under provision of public goods by private firms. He could establish a series measures to equilibrate the situation between the firms who are properly contributing and those who free ride (or under contribute). It could, firstly, imagined to allocate a subvention, s, for each unit of good that they provide, in order to incite them to contribute more. Then we have new utility functions:

$$U(Pub, Pri\ A) = (k\ (Pub\ A + Pub\ B) - (Pub\ A + Pub\ B)^2/2) + (Pri\ A - Pub\ A + s\ Pub\ A) \quad \text{and}$$

$$U(Pub, Pri\ B) = (k\ (Pub\ A + Pub\ B) - (Pub\ A + Pub\ B)^2/2) + (Pri\ B - Pub\ B + s\ Pub\ B)$$

Now, the best response functions of the two firms on the voluntary contribution game are:

$$\partial U\ (Pub, Pri\ A)/\partial\ Pub\ A = (k - (Pub\ A + Pub\ B)) - 1 + s = 0$$

$$\partial U\ (Pub, Pri\ B)/\partial\ Pub\ B = (k - (Pub\ A + Pub\ B)) - 1 + s = 0$$

Thus, as in a symmetric Nash equilibrium we have Pub A* = Pub B*

so $\quad$ Pub A* = Pub B* = (k − 1 + s)/2

Hence, in a voluntary contribution game, the level of public goods will be

$\quad$ Pub* = Pub A* + Pub B* = k − 1 + s

Finally, if s = 1/2, then the level of public goods in a Nash Equilibrium is k − 1/2, which is also the Pareto efficient level.

III.3.1.2 Hotelling and Local Public Goods supply

After a consideration of public goods in a quantitative dimension in the previous sub part, we will take a look to a qualitative dimension through the Hotelling's model. Indeed, when a local authority has to take some decisions, it has to make quality choice, since it leads to rise the attractiveness of a territory through a better quality of life standards or technologically improved standards in communication and information networks, and others measures that create a business friendly environment. As we have seen, a community who want to attract creative workers, which are, according to Florida, responsible of regional economic leadership and share also, as social class, the positive characteristics described in the edge "Factor conditions" of the Porter's diamond, can invest on infrastructures that fit the needs of this class, such as cultural and resort facilities, public transport services, places where its members can meet after-work, an active night life, etc...or directly in investing in specific infrastructures to the cluster, such as broadband connections, in order to improve their working conditions and their willingness to stay in the given territory in a context of fierce competition to attract talent and skilled workers, in addition with leading companies (as we seen, firms locate where a pool of skilled workers is available, and workers locate near companies, in a self reinforcing process). Put at the top of its priorities the fight against a typical negative externality that occurs from agglomeration, congestion, is an important commitment for any territory that wants to attract valued economic activities to develop itself. An efficient and extended public transport system, within and outside the cluster's boundaries, adequate level of parking places...are measures that shows a dynamic territory. But, since every investment decision has an associated opportunity cost, government has to consider the trade-offs in its strategies. One of them is about the use of land, which is decreasing marginally. The problem of land use for developing its infrastructure is that the amount of land possibly usable, that ought to be on the direct neighborhood of the cluster, is limited. There must be a trade-off between the different possibilities to use this limited quantity. Efficient local government has to integrate this in its

decision making.

To explain this need of quality in public good provision, we will use a model where fiscal federalism is supposed, that allows to create differences between communities. Since one of the most important issue is the use of space/land, it is relevant to use Hotelling's model of spatial competition. The community/government representing it will take the decision of the quality of public goods provided, based on the preferences of median voter. For the model, we will put apart the fact that bureaucrats and lobbies' interests could modify the decision, far from median voter preferences. We will suppose the system totally democratic, that is to say that local governments fully follow the preferences of citizens.

Consider a very simple model composed of two communities, A and B. Each of the communities has a given number of firms F, each of them owning a building suitable for one activity. Each community decide about the type of public good it wants to provide, at a cost c.
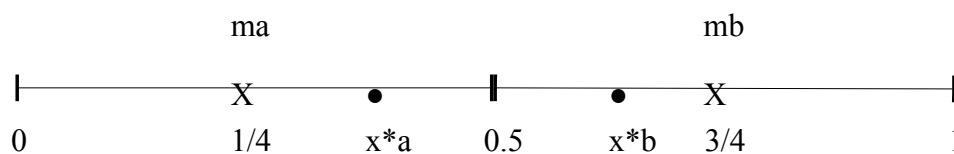
Costs and types of goods are sorted along the unit interval, so each community can choose some type $x \in [0;1]$ of the local public good. Firms differ on their preferences on the type of public good. If firm is located in the community providing the good it prefers, then is utility is α. However, if the type of the public good supplied in its community differs from its most preferred type, its utility is reduced by a term that is quadratic in the distance between the actual type chosen and the firm's most preferred type. Suppose that x_a^* is the type of the public good that is actually supplied in community A, but x_i is firm i's most preferred type. Then its utility is from the local public good is: $U(x_a^*, x_i) = \alpha - \beta (x_a^* - x_i)^2$

Firms can locate on the unite interval as they want, according to their preferences in public goods. In the present example, we assume that firms who prefer public good type smaller than 0.5 live in community A [0;0.5] and those with a greater preference locate in B [0.5;1]. Here, the median voter's preferences are $m_a = 1/4$ and $m_b = 3/4$. Under the restriction of owning a plant in the

community where firms consume the public good, they can migrate freely between the two communities. The game takes place this way. At the first stage, the median voter decides of the nature of the local public good that will be provide in the community. To finance it, a tax on land use is set up, of a C/0.5 amount, that each owner has to pay.

At this given moment, the choices in public goods in the communities are x^*a and x^*b, and the number of plants is fixed (to simplify the model) so that the firms will split evenly between the two communities, along the unit interval. The land price will just adjust to demand and supply of space. We thus have the market clearing price difference between the price of location in community A and B, $Pa - Pb = \beta (x^*b - 0.5)^2 - \beta (x^*a - 0.5)^2$.

Now we can state the maximization problem of the median voter in a community (say, community A) in stage 1, who takes the location decision xb as given. As it is standard in the literature on local public goods, he cares about what he gains selling its right to use an amount of space when moving to the other community, although he does not seriously consider moving or selling it in the equilibrium. In addition, he cares about the type of public good to be supplied as he is going to consume it. His utility can be considered as being the sum of the difference between the market values of his plant and a plant in the other community, plus the monetary equivalent of his utility of the public good, minus land taxes. That is, he maximizes:

$$U(x\,a) = Pa\,(x\,a,\,x\,b) - Pb\,(x\,a,\,x\,b) + \alpha - \beta\,(x\,a - 0.25)^2 - C/0.5$$

Then we have the first order condition as follows:

$$\partial U/\partial x\,a = -2\,\beta\,(x\,a - 0.5) - 2\,\beta\,(x\,a - 0.25) = 0$$

or, also $\quad\quad\quad\quad x^*a = 0.375 = 3/8.$

This result shows that median voter will always choose the quality level of public good that fit the best with the interest of its community. The issue here for the governance of a cluster is to be fully aware of the behaviors, needs and interests of the member firms, in order to supply a satisfying level of local public goods. This level of public goods will also make the community more attractive to firms located in the other community. Thus it is important for local authorities involved in a cluster to identify the median voter (even if it has often been said that the median voter was too

much of a theoretical individual) since he trades off the advantage of having a public goods that fits to its own preferences (otherwise he would be located elsewhere on the unit interval, either closer to 0 or 0.5) for the supply of a public good more adapted to the local needs, making the cluster functioning more efficient (all the externalities due to proximity in location are more likely to develop and be beneficial when the adequate measures are taken to ensure it). Indeed, if the firm median voter would care about his own preferences, all of the players doing the same, he would locate in 1/4 and 3/4, points corresponding to the social optimum as envisaged by Hotelling, since it corresponds to an even share of all the players between the two communities. Nevertheless, this decision to follow the model of median voter in the decision making process would lead to a similarity of public goods supplied between the two communities, making it more difficult to compete to attract firms on the qualitative side. The different could only be done at the margins, where firms are located on the extremities of the unit interval, having not interests but staying in the community. The Hotelling's model is very attractive in knowing better the process of provision of local public goods (crucial to create a competitive advantage to a territory). The assumption that each consumer buys exactly one unit of the good is very natural. It is a characteristic of a public good that all individuals consume the same amount of it, but they may derive different utilities from this consumption. In industrial economics, the Hotelling model typically leads to maximum or minimum horizontal differentiation, depending on the underlying distance cost function. The owner of a firm who maximizes profits does not care whether he likes the goods he produces or not, being interested only in achieving maximum profit. The median voter in the model considered here does care about the type of good he chooses for the community, as he is going to consume this good, too. He also cares about whether others like this good, as this has some impact on his value and image (belonging to an attractive location, see for instance, the importance of being located in an area that matters in Suire 2006). Hence, the fact that a median voter decides on the type of the public good is crucial.

Nevertheless, we can imagine than the result would be different if the communities were able to implement a tax competition, possibly leading to a race to the bottom situation, where the

adjustment variable would be the quality and/or quantity of provided public goods, in order to attract leading firms, in order also to develop "penguins effects", as explain previously, where final outcome could be a moving away firms once the tax effect is over.

III.3.1.3 What can we learn from game theory about institutions?

Since Von Neumann and Morgenstern's "Game Theory and Economic Behavior" in 1944, game theory has been extended to wide range of economics fields and has also been applied to others social sciences (see for instance, Bagwell and Wolinski, "Game Theory and Industrial Organization). We will based on Pénard's "Game theory and Institutions", since has he said game theory "has become an essential tool for studying interpersonal relationships....and analyzing strategic decisions", allowing to better understand the functioning of public institutions, in order to analyze the intervention of government, still with the large acceptance of the term we use, into the cluster's daily management and organization, mainly in all that concerns developing and enhancing the cooperation between members. Following Pénard, we will define institutions as "a player that can interact with the game's other strategic players, albeit with a specific status since it can influence or modify the rules of the game and directly affect the outcome, for instance by helping players to coordinate their strategies". This definition particularly suits to cluster management by government, since as we said previously, authorities should accompany the management by private players, in a context where the members firms share common views but have strategics behaviors.

We can first present cooperation and trust games that will emphasize the role of institutions. First, we use a basic coordination game, where the expected outcome is a Nash equilibrium, that is to say a solution concept of a game involving two or more players, in which each player is assumed to know the equilibrium strategies of the other players, and no player has anything to gain by changing only his own strategy, by changing unilaterally. If each player has chosen a strategy and no player can benefit by changing his or her strategy while the other players keep theirs unchanged, then the current set of strategy choices and the corresponding payoffs constitute a Nash equilibrium.
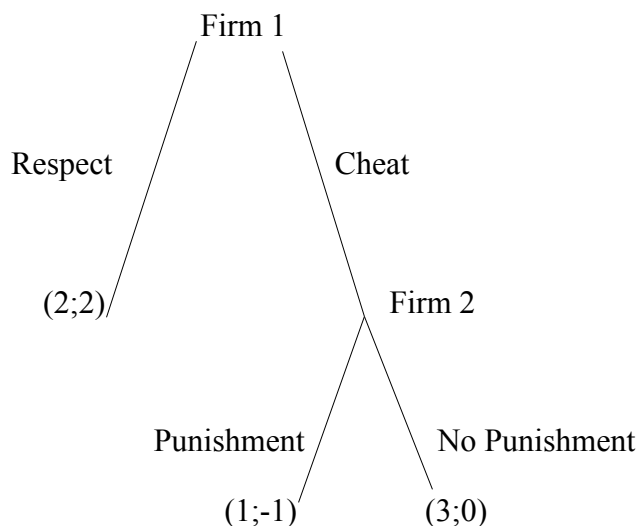
This situation is reached without any visible action of a government or public institutions of all type , since it is self reinforcing. As Pénard said, "game theory does not mention how decisions makers reach this stable state or how they coordinate themselves around this outcome". Thus the rational for institutions would be to coordinate player's actions and strategies towards this stable state. This situation is explained in a coordination game. We consider a local market constituting a cluster environment, where two members firms, A and B, compete to impose to the other(s) firm(s) of the cluster technological standard for a crucial internal network of management organization and information sharing, with broadband technology. Each firm has it own strategy and payoff resulting of it, the result being that its benefit will be greater than those of the other firm if its standard is chosen, and conversely.

Firm B

Firm A	Standard 1	Standard 2
Standard 1	4;2	1;1
Standard 2	0;0	2;4

Here two Nash equilibriums appear, but which one of the technology standard will prevail over the other? According to the theory, without any institution, no one of these standards will emerge since firms are unable to coordinate and a "standard war" will emerge, possibly leading to an inefficient and unstable situation. Risks of coordination failures explain thus the intervention of institutions. On of the envisaged solution is mandated standardization by public authority managing the cluster, which consider firstly the exigence of efficiency of the cluster, before firms' private interests. In a strategic game, as we know, players can search to influence the actions of the others, by cheating the established rules, like moving before the others or under contributing to a good, so it is needed to organize collective measures such as reward or punishment. Indeed, in a coordination game, these issues are often correlated with commitment problems, since players try to coordinate themselves by "means of announcements, threats or promises. Another rationale for institutions is to make these commitments credible and efficient". In the coordination game example, one of the
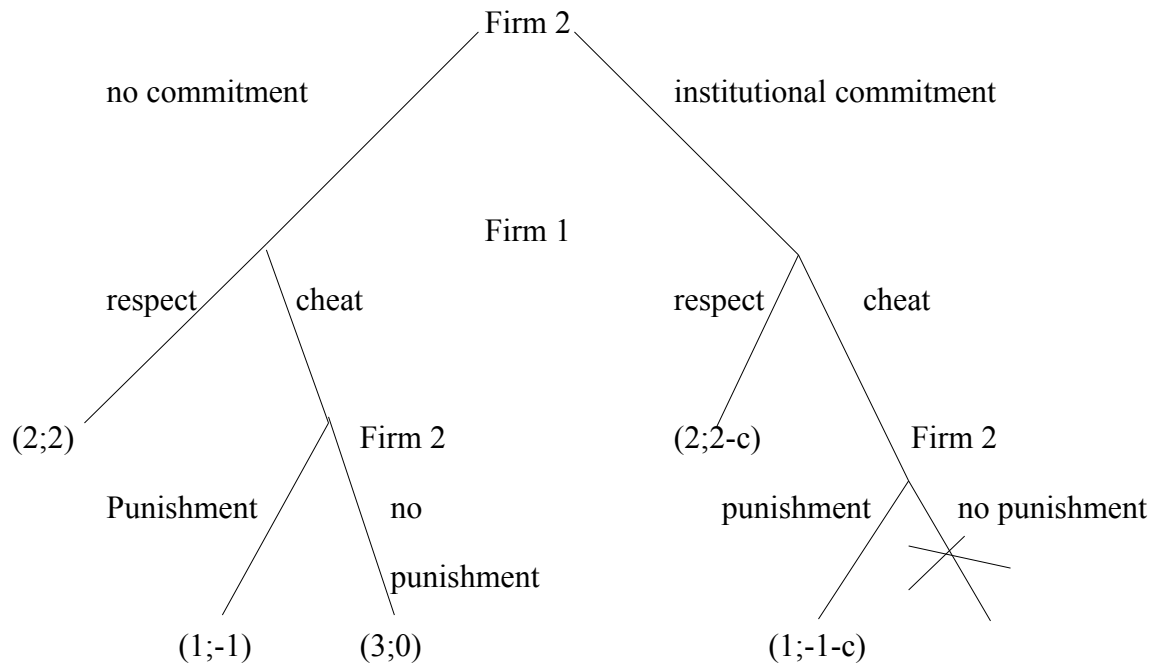
firms could, for instance, threats the other of a price war if it does not adopt its standard, or conversely, reward it if it does adopt. But the main issue here, better than to consider the fact that a firm would de facto lead the coordination process, is to ensure the other players that its commitment is credible. The most relevant way to explain this situation is through a "Principal-Agent" relationship.

```
                          Firm 1
                         /      \
                Respect /        \ Cheat
                       /          \
                 (2;2)/          Firm 2
                                 /     \
                    Punishment  /       \  No Punishment
                      (1;-1)            (3;0)
```

In this situation, firm 1 is the Agent, that is to say, it is supposed to implement an action that have an impact on the payoff of firm 2, the Principal, who delegates to the agent. A given firm on a cluster can take so much importance among the member firms, through its reputation of leader firm, that it can have the possibility to have an impact on the decision process of the others, forcing them (or at least trying through promises, threats or rewards commitments) to do particular actions. The problem is that, even if it has a dominant position on the cluster, the firm acting like a Principal, a orders donor, cannot change the intrinsics behaviors of agents, who still conserve their ability to act freely. Indeed, in this game, we assume that both Principal and agent have divergences on the actions to undertake, such as the agent can do as the principal said, but can also cheat by choosing actions that yield higher opportunity for himself. That gives the decision tree and the payoff above, where the principal have the possibility to punish the deviating agent. If respect is chosen, both firms receive a payoff of 2. If firm 1 cheat, without implementation of the punishment, then it will receive 3, while the principal will have a 0 payoff. If Punishment, costly (-1 for firm 2) is used, the agent is in a worse situation than if it do respect (1<2). The point here is about to know whether the

commitment is credible or not. Even if Firm 1 is better off not cheating, being honest is not a part of subgame perfect equilibrium since the punishment from Firm 2 is not credible. Indeed, since implemented a punishment is costly, principal will not do so, and agent is aware of it, so he will ignore the threat and cheat, thus the outcome is likely to be cheat and no punishment. Anticipating this outcome, firm 2 will not cooperate anymore with firm 1. In absence of credible commitment, a valuable relationship is undermined, with a potential aggregated payoff of 4, superior to all the others payoffs possible.

That is why institutions can act as "commitment devices". Quoting Dixit and Nalebuff (1993), Pénard shows that institutions have got severals means to provide an answer to this lack of credibility encountered in several strategic interactions. Institutions provide to decisions makers the means to "establish a reputation (repeated game), cut off communications with others, burn bridges (to let no other option than collaboration) or write contracts". For instance, implementation of a hierarchy into the cluster is a solution. Partners in the cluster can as well appointed a supervisor or create an adequate institution within the cluster boundaries, with the task to implement and coordinate the cooperation. If we adapt this new variable to the previous principal-agent game, the use of an institutional device by principal (considering that, as Porter said, public sector should not directly intervene in the management of relations between players, but should provide private players the best solutions or means to do it) can be charged at a cost c. This device enables credible commitments, by the elimination of the no punishment option. The decision tree is thus as follow:

```
                               Firm 2
       no commitment          /      \      institutional commitment
                             /          \
                          /               \
                        /                   \
                                 Firm 1
                      respect /  \ cheat       respect /  \ cheat
                            /      \                  /      \
                          /          \              /          \
        (2;2)                      Firm 2      (2;2-c)        Firm 2
                     Punishment /   \ no       punishment /   \ no punishment
                              /       \                  /       ✗
                            /          \ punishment    /       /  \
                        (1;-1)        (3;0)         (1;-1-c)
```

Since the no punishment option has been eliminated, the agent will cooperate in order to avoid retaliation from the principal and the subgame perfect equilibrium become respect and punishment if cheating. Thus, at a cost c not too much excessive (here c<2), commitment is the best strategy for Firm 2. Then, a stabilizer is needed for true and efficient cooperation in the cluster.

Chapter 4: Tools to identify and manage potential clusters

Identifying potentials clusters is the first step for local decision makers, but maybe the most difficult, or at least crucial, since it will engaged the territory and its development in a direction for several years, maybe decades, so an error in judgment could have negative impact. In this part we will introduce some of the methods that can potentially be used and we will apply one of them, the Location Quotient, to Rennes in France and Tampere in Finland.

IV.1 Some potential indicators on cluster's economic performance.

Firstly , they can be directly related to economic performance of the given territory. Thus it can be used the growth rate of jobs in particular sectors of the economy, aggregated and per sector unemployment rate, average salary per employee, growth in wages per employee (that allows to see if a particular sector is dynamic in the territory), cost of living in the area (proximity and agglomeration generate increase in cost of living through congestion..., but it can as well be a source of decreasing, through access to cheaper outputs locally produced and adapted to the local market), export value of goods and services exported from the territory per employee (that stresses the dynamism and availability of skilled local manpower in a sector). Performance of an economy can also be shown through the level of innovation it achieves. Thus it also exists series of indicators concerning innovation: aggregated and per employee number of patents; concerning education and training, growth in the number of facilities, in graduated students per university education programs or per cohorts, in adequacy with a particular economic sector, the availability of new formation, the number of graduated students staying in the territory...; aggregated and per employee amount of

venture capital invested in the territory; aggregated and per employee calls for bids; growth rates of firms, of sales, of public/private partnerships...

In addition with these general indicators, more specific are also available to local authorities or specialists they hire for their cluster development strategies.

An indicator of specialization: it allows to highlight the productive orientations of a territory by comparing the weight of a productive activity i in this territorial unit j, to the weight occupied by the same activity in a given geographical reference. The index of sectoral specialization indicates whether a n area is specialized in a few industries or whether it offers diverse activities. When the indicator is >1, the territory j is said specialized in this activity i. The indicators is calculated as follows:

$$(p_{i,j}/p_{i,e})/(p_j/p_e)$$

where p: variable production (employment, production value); $p_{i,j}$ is the production of the activity i in the area j; pj: total production in the area j; $p_{i,e}$ is the production of productive activity i in all the whole geographical reference; and pe is the production total in the geographical reference.

The Gini coefficient, also known as the coefficient of location or concentration. It compares the distribution of an activity i among n territorial units, to a reference distribution among these n units (mainly distribution of total employment). When the indicator equals 0, that means that the activity is not more geographically concentrated in the area than the others activities.

$$1/2 \; \Sigma \; [(p_{i,j}/p_{i,e}) - (p_j/p_e)]$$

$$j=1 \text{ to } n$$

The location Quotient is interpreted as the degree of geographical concentration in the area j of the activity i. It characterizes the "regional" distribution of a given industrial sector. A ratio higher than 1.25 indicates a specialization of regional employment in a given sector relatively consistent with the existence of a cluster.

$$(p_{i,j}/p_j)/(p_{i,e}/p_e)$$

IV.2 Application to Rennes

For the coming part, Rennes will be compared to region Brittany. Data are concerning period 2005/2006.

Interpreting the Location Quotient is very simple. Only three general outcomes are possible when calculating location quotients. These outcomes are as follows:

LQ<1 All employment is non basic. A LQ that is less than zero suggests that local employment is less than was expected for a given industry. Therefore, that industry is not even meeting local demand for a given good or service. Therefore all of this employment is considered non-basic by definition.

LQ = 1. A LQ that is equal to 1 suggests that the local employment is exactly sufficient to meet the local demand for a given good or service. Therefore, all of this employment is also considered non-basic because none of these goods or services are exported to non-local areas. For Rennes, we have mechanical equipments.

LQ > 1. A LQ that is greater than one provides evidence of basic employment for a given industry. When an LQ > 1, the analyst concludes that local employment is greater than expected and it is therefore assumed that this "extra" employment is basic. These extra jobs then must export their goods and services to non-local areas which, by definition, makes them Basic sector employment. This is the case in the Rennes region, for automotive (2.17), for publishing and edition (1.41), households equipment (1.33), manufacture of wood and paper (1,08, even if it could be counted for LQ = 1), clothing, leather and textile industry (1,12),

Industrial Location Quotient (LQ) is a tool to quantify how concentrated an industry could be in a region compared to a larger geographic area such as the State. That is why it constitute a strategic tool for local decision makers, trying to implement an industrial development policy. The basic use of the LQ is to determine which industry make the regional economy unique, to identify

the export orientation of an industry and the most export orientated industries of a region, to identify emerging export industries starting to bring new sources of income for the region and to identify endangered export industries that could erode the economic base of the region. Location quotient tells a much different story than merely job numbers or job growth. Industries with high LQ are typically (but not always) export-oriented industries, which are important because they bring money into the region, rather than simply circulating money that is already in the region (as most retail stores and restaurants do). Industries which have both high LQ and relatively high total job numbers typically form a region's economic base. Economic developers and government officials need to pay particular attention to these industries not only for the jobs they provide, but also for their multiplier effect (the jobs they create in other dependent industries like retail trade and food services). LQ is augmented by two other pieces of information: size of industry/cluster/occupation in terms of jobs, and percent change in LQ over a given time period. A high LQ industry with a small number of jobs may be an export-oriented industry, but is not vital to the region's economy. A large, high-LQ industry with declining LQ over time, however, is endangering the regional economy.

On the LQ graph, the vertical axis has the basic LQ measurement, while the horizontal axis shows the percent change in LQ over time. Entities like industries are plotted as dots. For the purposes of this explanation, we focus on interpreting the LQ graph for industries/clusters/occupations. The graph's four quadrants can usefully categorize various types of industries, occupations, or clusters. The following interpretation is oriented toward industry data. If you are dealing with clusters, the interpretations generally apply since clusters are just groups of industries. If you are interpreting occupation data, keep in mind that occupational growth and decline are tied to the performance of the major industries that employ workers in those occupations. Occupational LQ is simply a more workforce oriented way of examining industry trends. An industry in the upper right quadrant is more concentrated in the region than average, and also is becoming more concentrated over time. These industries are "standouts" that distinguish the regional economy and are doing so more every year and they are especially important if they are

also large in terms of jobs. Large industries in this quadrant are both important and high performing, which means they will have increasing workforce demand. Small industries in this quadrant are emerging, high-potential regional export industries that should be developed further. The lower right quadrant contains industries which are not yet as concentrated in the region as they are at the national level, but are becoming more concentrated over time. If they continue this trend, they will eventually move across the horizontal axis into the upper right-hand quadrant. We might call them "pre-emergent" industries, having the potential to contribute more to the region's economic base. The upper left quadrant contains industries that are more concentrated in your region than average, but whose concentration is declining. If a mid-size or large industry or cluster is in this quadrant, it is an important warning that the region is losing a major part of its export base and should form planning and investment priorities accordingly. If the region does not bolster these industries or replace them with other export industries, it will likely enter a general recession. A large occupation in this quadrant usually indicates that the major industry employing people in that occupation is in decline. Finally, the lower left quadrant contains industries/clusters/occupations which are less important regionally than nationally and are also declining in employment. Industries here could be warning signs that your region needs to attract more businesses in those industries in order to maintain an economy that is sufficiently balanced and diversified in comparison to the national economy. The case of Rennes can be seen in the annexes.

Conclusion

At the end of this exploratory work, it appears that clusters widely studied for more than a fifteen years, cover a heterogeneous reality, for their components and the way they are achieving their goals. At the crossroads of industry and space, they are subject to a resurgence of interest because they are considered as a key element of region's competitiveness in a context of increasing globalization: they are developing as both modes to review industries, and as modes of action to consolidate businesses around common issues and put infrastructure to support them. The clusters around which focus and organize economic development, are at the same time endogenous growth tools and local exogenous tools to enhance attractiveness, improving the visibility of regions on their economic specialization and their priorities for innovation. The complexity of the cluster concept is reflected both in theory and in its political implementation. The cluster is an elastic term multi dimensional and conceptual, depending on the intensity of networking, the size of the players and their relations, geographical extent, awareness of belonging to the cluster, content technology (from the "research-intensive" cluster strongly oriented toward research and development to" industrial cluster" based primarily on an agglomeration of players)...The dynamic clusters bring together logic a range of different initiatives, such as "bottom up" and "top down"; methods of statistical analysis (map by indicators) and negotiated (calls for projects). This concept raises questions because it brings together different artificial initiatives but have in common, however, to establish industry clusters and scientists meet, organize and develop collaborations within networks, formal or informal, that facilitate the flow of information, attract by their dynamic talent, and around which the authorities decide to concentrate priority economic development initiatives, including construction infrastructure (roads, incubators, science parks) investment in training and the scientific basis to support the establishment of financial structures or strategic (venture capital, strategic instruments).

Some policies or initiatives for clusters are in priority seeking to facilitate territorial anchorage of their strong players, which play a magnet role on activities that have tend to

agglomerate around the cluster, like American clusters such as the Silicon Valley but also Italian industrial districts. Other initiatives seek to boost the networking skills and intensity of links within a given territory, in order to promote innovation and benefit its local economic impact. Finally, some of the initiatives are in between, linking efforts to stimulate localization and to facilitate better networking skills.

Whatever the selected configuration, the public and private mobilization in the success of clusters is considered as essential. It relies on a necessary articulation and coherence between regional policy, science policy and technological and industrial policy. It must ensure the relay by the private, for a continuation efforts over time. The idea that we lack robust tools to measure the effectiveness of clusters or policies in their favor, and their territorial impacts, is shared. Thus, flexibility in organizing the cluster is justified, provided that the objectives are achieved. At region-wide scale, the relationship between attractiveness and growth with the possible national policy clusters remain unclear. Appropriate indicators and further studies of successes and failures of these policies are necessary, notably to know what can be particularly perverse clusters, on issues such as intellectual property and capture technology, cooperation within clusters, possible duplication of efforts by the authorities public at different territorial levels... On the relation that clusters have with the territory, it must be kept in mind that success of a cluster is often specific to the local cultural environment, legal framework or the social context of each country or region. Two are pitfalls to avoid. The first would be to consider that the organization of local actors clustered could be ordered from outside. In fact, institutional networks set up by a specific policy in this direction, can not always erase past difficulties in the cooperation between different actors, interests and contrasting rationales. The second concerns is about the boundaries of clusters. Cluster relations with the hosting territory are essential to explain its success. Indeed, beyond the triptych founding companies, research and development structures and training organizations, analysis of information provided by the territory in all its dimensions, is essential to understand the logic and inputs in the cluster. At the same time, it must be careful not to lock the cluster to its limits regional since companies will continue to acquire and develop skills that are rare within the local boundaries ,

from outside the region in their national or global business relationships . The regional authorities could be concerned about overcoming any deficits in their territorial offer, interest in helping companies to acquire knowledge, know-how or technologies, instead of seeking to develop an artificial and non appropriate local offer or pre-built cluster like environment, which is likely not to reach the crucial critical mass of agglomerated firms nor to attract, develop and maintain in its territory sufficient skills.

Annexes
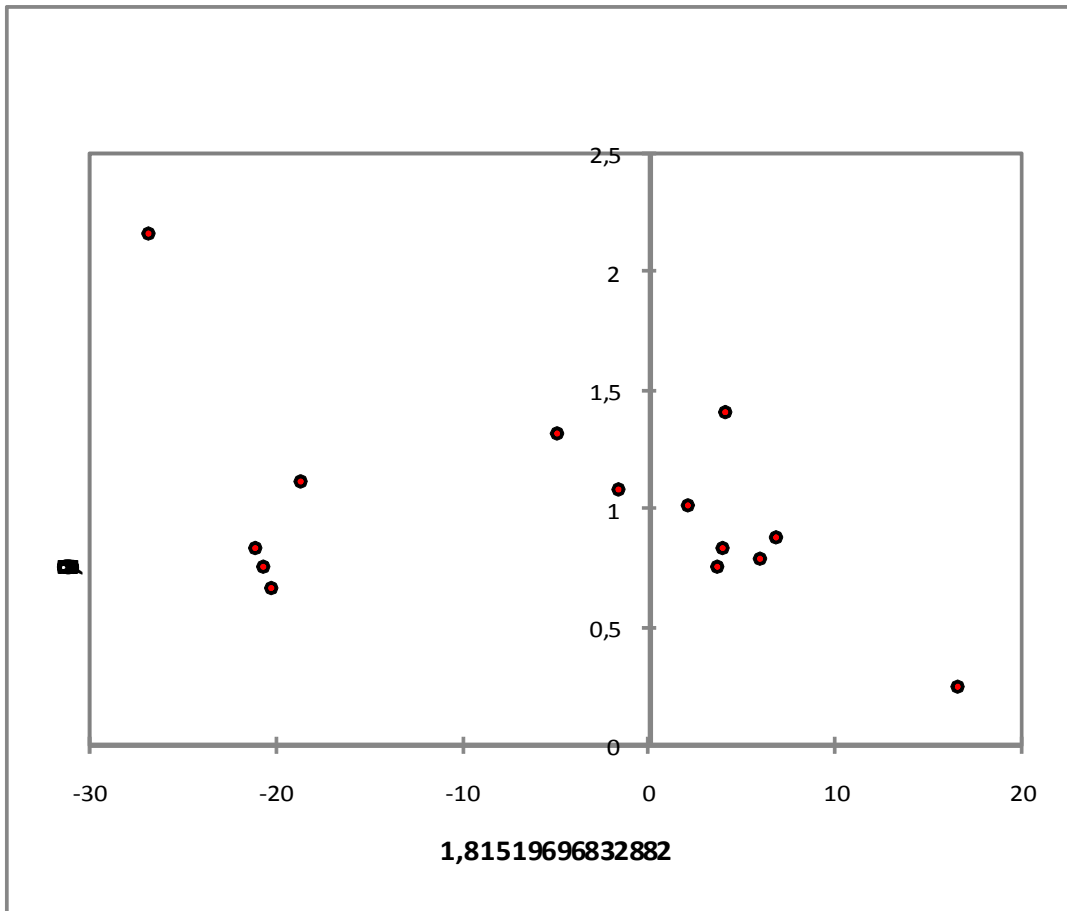
The LQ graph of Rennes for the period 2000 to 2005, with variation on LQ between 2000 and 2005 in horizontal and the 2005's LQ in vertical.

Industrial Sectors	Pi	Pj	Pie	Pe	Pij / Pj	Pie / Pe	LQ	Pij / Pie	Pj / Pe	Specialization's indicator
Food industry	15802	67980	58311	176545	0,23	0,33	0,7	0,27	0,39	0,7
Automotive	9545	67980	11418	176545	0,14	0,06	2,17	0,84	0,39	2,17
Mechanical equipment	6126	67980	15591	176545	0,09	0,09	1,02	0,39	0,39	1,02
Chemicals, rubber,plastics	5044	67980	14753	176545	0,07	0,08	0,89	0,34	0,39	0,89
Publishing...	3866	67980	7095	176545	0,06	0,04	1,42	0,54	0,39	1,42
Manufacture of electrical and electronic equipment	3560	67980	11034	176545	0,05	0,06	0,84	0,32	0,39	0,84
Households equipment	3141	67980	6140	176545	0,05	0,03	1,33	0,51	0,39	1,33
Metallurgy and metal processing	3029	67980	9893	176545	0,04	0,06	0,8	0,31	0,39	0,8
Electrical equipment and electronic	2866	67980	11034	176545	0,04	0,06	0,67	0,26	0,39	0,67
Mineral products industry	2677	67980	6404	176545	0,04	0,04	1,09	0,42	0,39	1,09
Manufacture of wood and paper	2045	67980	7007	176545	0,03	0,04	0,76	0,29	0,39	0,76
Clothing, leather , textile industry	1804	67980	4169	176545	0,03	0,02	1,12	0,43	0,39	1,12
Pharmacy, perfumery and maintenance	1516	67980	4675	176545	0,02	0,03	0,84	0,32	0,39	0,84
Shipbuilding, aeronautics, rail	828	67980	8540	176545	0,01	0,05	0,25	0,1	0,39	0,25
	61849	67980	176064	176545	0,91	1				
Total electrical equipment and electronic	6426	67980	22068	176545	0,09	0,12	0,76			

Industrial Sectors 2000	Pi	Pj	Pie	Pe	Pij / Pj	Pie / Pe	LQ	Var
Food industry	15787	71034	59885	186255	0,22	0,32	0,69	1,82
Automotive	13598	71034	12012	186255	0,19	0,06	2,97	-26,86
Mechanical equipment	5337	71034	14000	186255	0,08	0,08	1	2,09
Chemicals, rubber,plastics	4711	71034	14856	186255	0,07	0,08	0,83	6,79
Publishing...	3960	71034	7641	186255	0,06	0,04	1,36	4,14
Manufacture of electrical and electronic equipment	5137	71034	12689	186255	0,07	0,07	1,06	-21,07
Households equipment	3493	71034	6558	186255	0,05	0,04	1,4	-4,87
Metallurgy and metal processing	3113	71034	10882	186255	0,04	0,06	0,75	6,01
Electrical equipment and electronic	4096	71034	12689	186255	0,06	0,07	0,85	-20,3
Mineral products industry	2857	71034	6788	186255	0,04	0,04	1,1	-1,63
Manufacture of wood and paper	1959	71034	7021	186255	0,03	0,04	0,73	3,6
Clothing, leather , textile industry	2983	71034	5657	186255	0,04	0,03	1,38	-18,72
Pharmacy, perfumery and maintenance	1285	71034	4160	186255	0,02	0,02	0,81	3,98
Shipbuilding, aeronautics, rail	831	71034	10086	186255	0,01	0,05	0,22	16,55
		71034		186255			###	###
Total electrical equipment and electronic	9233	71034	25378	186255	0,13	0,14	0,95	-20,73

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