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ABSTRACT

In the context of globalization, countries are seeking ways to make their national economies competitive. Many of them take advantage of the trend for companies to gather so as to benefit and survive in the new economic environment. This new trend requires enterprises to innovate and develop a unique and competitive advantage that will reduce their operating costs. Recently a major effort of Greek companies that specialize in a specific economic activity and are characterized by geographical proximity to survive in open markets maintaining this competitive advantage has been observed. In this study, through research and analysis of important statistical data, especially employment, the existence of important industrial complexes in the Greek area for each of the 51 departments is studied. Furthermore correlation of these economic concentrations with important features taken into account such as the county welfare and productive dynamism is made.

Key words: clusters, agglomerations, competitive advantage, innovation, local development, specialization

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Acronyms:

- GDP: Gross Domestic Product

- IASP: International Association of Science Parks

- PPC: Public Power Corporation

- SWOT: Strengths, Weaknesses, Opportunities and Threats

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INTRODUCTION

The main feature of the 21st century is undoubtedly globalization. In the economic globalization framework local products/services face global markets and global competitors as well. So, the future of Small and Medium Size Enterprises is uncertain. The sustainability of SMEs depends on newly adopted methods of production. These new methods of production should be based on the development of a new competitive advantage which needs to be unique and not easily copied.

In addition, in the globalization framework the business should adopt new innovative activities in order to remain competitive. These innovative activities should be relevant not only to the production and the new innovative products but also to the specialization in fields of high technology and intensive knowledge - sectors and the promotion of industrial activities in the integrated market. At the same time, this promotion helps the region's development. Therefore, the region's development requires the industries to develop external economies. The development of external economies could be realized by the operational cost reduction of the region's main industrial sectors. Today, these external economies could be realized by the geographic industrial concentration.

In recent years, the scientists and entrepreneurs pay special attention to the interaction between the economic activities and the concept of place. The location of an industry influences significantly the company's development. So, the companies are located close to other companies in order to reduce the operating costs. More specifically, the companies should be located close to similar industries that have successfully operated industries that have operated like suppliers, consultancies and other.

In this study, special attention is given to spatial industrial concentrations. The industries that are located together achieved economies to scale, became more innovative and more competitive than in the past. At the same time, they promoted their economic activities worldwide.

The second chapter is a theoretical approach of clustering. The historical evolution of the concept of the Third Italy and Alfred Marshall until today is studied. Furthermore a clear distinction of different types of concentration of economic activities is made. Then the exact meaning of clusters, based on Porter's definition in the form it has taken today, is determined and the conditions for them to be able to operate smoothly are presented.

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Also the usual parts of a 'typical' cluster, key features and their life cycle are presented. In the same chapter in more detail some of the key features of a cluster as its contribution to the economic development, the importance of competitiveness and of course the diamond of Porter are exhibited. Further reference is made to the advantages and disadvantages of its operation. At the end of this chapter two of the most famous and successful clusters in the world are referred to. The first one is in America, in Silicon Valley and the second one is in Europe, Sophia Antipolis.

In the third chapter, the first part is a report on methods of identifying a cluster. In detail some calculation indices, spatial concentration of economic activities are presented. More specifically, the following indicators are mentioned: Location Quotient, Spatial Concentration Index, Specialization Index, Herfindalh-Hirschmann Index, Relevant Specialization Index. Then, the chapter lists the basic features and structure of the Greek economy and how it evolved from the postwar period until today. Following is the study of the existence of regional industrial complexes in Greece using the indicators mentioned above. Even an analysis of the correlation of spatial industrial concentration with two very important features of an economy such as welfare and the productive dynamism is made. Moreover there is also a report on some significant technological parks in the country to show that the Greek economy has a significance of industrial clusters.

CHAPTER 1: SPATIAL-INDUSTRIAL CONCENTRATIONS

1.1 <u>THEORETICAL FRAMEWORK OF CLUSTER</u>

Enterprises today tend to be concentrated in geographical areas which present some advantages either naturally or financially. So they have created spatial concentrations whose size depends on available inputs and the size of the urban centers where they are installed. Many of these firms in order to survive and meet the needs of ever-changing of the external environment over time develop cooperative relations. These firms aimed to take advantage of existing external economies-markets, specialized skills, intangible assets, suppliers, factors of production, bank institutions, research institutes and high developed innovative capabilities. In the modern economic theory such collaborations between enterprises is called industrial clusters.

Indicatively three interrelated concepts concerning the process of concentrating economic activities in various areas are mentioned. There are three types of spatial concentration the agglomeration, the industrial complex and the territorial network. The first type, the agglomeration is a limiting case. This type refers to the concentration of industries in a particular geographic area. The agglomerations are based on the Marshalian theory of concentration which is discussed below. The industries gain great advantages from the labor market pooling that derived from the concentration of economic activities from different kinds of industries in the area. The second type, the industrial complex, is a more common form of agglomeration compared to the first type. In this type, the main reason for regional concentration and cluster formation is the lower transport cost and the "just-in-time" production. The suppliers should hand over the raw materials to the production firms at a specified time. If one of the suppliers is not able to deliver them in the prescribed time and in the defined quality then they pay a fine. Essentially business groups which are in the same geographic area but operate as a standalone unit are called industrial clusters. In other words, the agglomeration concept is more general than the industrial cluster and is the basis for its integrated development in a region.

The third type, the territorial networks (Sprenger, 2001) is a more informal cluster. A social network is a social structure made up of a set of factors such as individuals or organizations. The cluster in order to survive should create network mechanism. Silicon

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Valley is a great example of this kind of agglomeration. The existent network nodes help the firms to resolve all kinds of technical problems. The most important feature that differentiates it from the above types is flexibility.

1.1.1 *THE EMERGENCE*

In recent years regional economists, economic development practitioners and policy makers gave increasing attention to industrial cluster analysis. In the following paragraph is analyzed the driving idea for the development of the theory of clusters.

The concept of cluster derived from Industrial Districts. Alfred Marshall (1919) referred to the successful operation of textile and metal working regions of Germany, France and the UK in the late nineteenth century. He stated that the Small and Medium Size enterprises gain economic advantages when clustered in terms of geographical concentration and typical industrial activity. In Marshall's account, the nature and the quality of the local labor market which is internal to the district and highly flexible make the Industrial District such a special model. He defines that there is an industrial atmosphere. More particularly, individuals move from firm to firm and owners as well as workers live in the same community. The workers are benefited from the fact that "The secret of the industry is in the air" (Fernando Alberti, 2008). They are strongly committed to the concept of district and labor out of migration is limited. The Industrial District community is relatively stable. It is characterized by a strong local cultural identity and shared industrial capability.

As suggested by Marshall (1920) there are three forces of agglomeration: the knowledge spillovers, the labor market pooling and the sharing of industry-specific non-traded inputs. By extending Marshall's concept of external localization of economies Hoover (1948) identified two more forces of agglomeration: the external economies of urbanization and internal returns to scale. The above theories of agglomeration economies importantly shaped the definition of the industrial cluster.

Clusters differ significantly from the Industrial District of Italy. Their main difference lies in the presence of networks, since networks are the mechanisms that intend to reduce production costs and contribute to more rapid dissemination of information. Essentially, it is a relationship of trust developed between enterprises to unite all companies in a social group. Such links were developed between members of the

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Industrial Districts. There are two types of networks, business networks and socioeconomic networks.

There were three kinds of firms that could operate in the Industrial Districts. The first kind involved firms that were producing the final product to be marketed. The second kind included those participating in only one stage of the product production and the third kind included the firms which did not belong to the same industrial zone, but belonged to the same supply chain (vertical integration).

Concerning that previously described, business networks are divided into three categories:

Horizontal networks: Horizontal relationships grow between enterprises. The horizontal relationships refer to the expansion of the business activities that are associated with existing activities or complementary ones. It is an attempt of the company to grow through acquisitions and strategic alliances with competitors producing identical or complementary products.

Vertical Networks: Vertical relationships grow between firms. This means extending an enterprise either with backward or forward inputs .i.e. outputs or both. It is an effort of the company to buy / ally with either suppliers or distributors of products / services.

Other types of networks: The firms in order to improve their production process work with different actors like universities, research and development centers, governmental actors and others.

The operation of clusters seems important to the operation of business networks.

1.1.2 THE CONCEPT

Developing a cluster in a region is an important element of regional and economic development. In the context of globalization where countries compete to develop a competitive advantage is not based exclusively on advanced large companies but in clusters that are located in the same geographic area. That's why in most growth models of a region or a country emphasis is put on the study of the concentration of economic activities.

There are many different ways to identify a cluster. So at times several definitions have been given to clusters which show how difficult and complicated their analysis is. Some of the best known industrial economists who have studied the phenomenon of clusters are Piore, Sabel, Porter and Krugman. The most famous and frequently used

definition is the one given by the famous American professor at Harvard Business School and business consultant Micheal E. Porter.

A cluster is "a geographically proximate group of interconnected companies, suppliers, service providers and associated institutions in a particular field, linked by externalities of various types" (Porter, 2003: 562).

Inside clusters one can find governmental or educational institutions, professional consulting providers, and employers who provide specialized training, research and technical support (Porter, 1990).

Another definition that is given by the United Nations Industrial Development Organization defines the cluster as a sectorial development and geographical concentration of enterprises, especially small businesses, which face the same opportunities and the same threats.

In other words, when we talk about industrial clusters we refer to companies especially SMEs which are organized in a particular geographical area and are trying to reap the benefits of their cooperation. Such benefits are: cost reduction, strengthening competitiveness, efficient operation, joint access to raw materials, better information regarding new technological data and more. They consist mainly of companies that produce and participate actively in a cluster and other enterprises and institutions which work to support them such as universities, private research centers and others. The main reason for running a cluster is to achieve collective results that companies could achieve if acting autonomously.

If a cluster has to be sustainable and successful there must be immediate and timely access to new technology, access to information, effort to develop trust and to support continuous funding. An important success factor for a cluster is its ability to magnify, expand and incorporate more and more partners. Therefore for a cluster to be regarded as successful it must be able to quickly understand the potential-disadvantages and opportunities-threats of the external environment. Furthermore, it should be to adjust easily to change, to be able to incorporate innovation and the new technologies in the already existing productive system. Finally, it should be to have immediate and timely information, to build relationships of trust and mutual cooperation, and to incorporate the already existing knowledge in its own data.

Some of the most famous clusters in the world are Silicon Valley in California, Wireless Valley in Stockholm, Biotechnology cluster in Heidelberg, Sophia Antipolis in France, "Saxony" Valley in Dresden, Automotive clusters in Graz and others. In

addition, there are a lot of successful clusters in South Asia like electronic clusters in Penang and Jo1hor in Malaysia, Greater Bangkok Area in Thailand, chemical and biomedical clusters in Singapore.

  In many countries such as the United Kingdom, Germany and Netherlands the clusters are the basis of the local and national policies.

1.1.3 *THE USUAL PARTS OF CLUSTERS*

  In a rapidly evolving economic environment the forms of clusters vary. A typical cluster will most likely consist of the following parts:

- ✓ *Companies that manufacture the final product or service.* The relationships developed between these undertakings are sometimes competitive and sometimes cooperative at various levels.

- ✓ *Suppliers.* Their basic responsibility is to supply firms that make up the cluster with raw materials, technological equipment, spare parts and other. Usually the relationships developed between suppliers and business is that of trust and they usually have a long and stable nature. Usually both sides work together seamlessly without malice or intent of deception which would harm the reputation of either one or the other. This would deprive the cooperation with the rest of the cluster. Even with the suppliers: the more they cooperate with a cluster the greater the specialization they acquire and they operate even more effectively meeting within a shorter timeframe the needs of the cluster.

- ✓ *Enterprises that produce complementary products.* One of the most important characteristics of an industrial cluster is the complementarity of businesses and therefore the products. Companies that produce complementary products are installed near each other to reap each other's benefits. However it is important to operate as efficiently as possible to have the same odds.

- ✓ *Educational institutions.* The educational institutions are both to educational institutions that undertake to train the human resources and institutions which do research and invest in new technology. Such institutions are universities, various research and development centers, human resource training institutions and others. Their contribution is very important for the successful operation of a cluster and for the development of the local economy where it is installed. Investing in research and development helps businesses to acquaint themselves with and adopt new

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technology, specializing both employees and senior managers to adapt to new developments.

✓ *Governmental bodies.* These are governmental agencies that directly affect the operation of a cluster through of their decisions and the actions they make. More specifically, these state-owned enterprises are controlled by the state and produce public goods. For example, they can provide the infrastructure that a cluster requires to operate effectively and educate human resources and others. They can even be part of the state apparatus. For example, part of a ministry which is responsible for the effective operation of the industrial complex and more specifically on issues such as how to boost demand in the sector of the economy in which the cluster operates , how to enhance the competitiveness, productivity and other. The general governmental sector affects the proper functioning of clusters since in essence it forms the economic, legal and political context in which the cluster operates.

✓ *Financial bodies.* These are financial institutions which undertake the financing of companies in the industrial cluster. Usually long lasting work relationships develop.

1.1.4 *FEATURES*

The main features of Clusters are:

1. *Geographical concentration:* Companies that tend to work by being installed in the same geographic area. This geographical proximity allows firms to reduce their costs (economies of scale) and to develop skilled labor force. In particular, companies have access to special / unique resources in this region. It becomes easier to access new knowledge as well as to distribute it, personal communication is facilitated through the daily exchange of information. Optimization of scale and scope economies can be realized. Access to more and more reliable technological resources, access to more funds as well as more specialized personnel is possible. There is better cooperation with local authorities which results in more specialized demand and more effective learning processes.

2. *Specialization:* All firms participating in a cluster are associated in every way with one basic activity. For this reason, traditionally each cluster is considered to specialize in a particular field. The principal activity can be traditional for example, a textile

cluster or it can be innovative and have horizontal features for example, a cluster of biotechnology. Still, companies can operate exactly in the same industry or in different sectors but in the same supply chain. Actually firms within a cluster complement each other with their services to produce a high expertise which couldn't be produced if the companies acted individually.

3. *Large number and diversity of participants:* The main aim of creating a cluster is to achieve economies of scale and feasibility. It is important therefore beyond the companies involved in a cluster, for universities, financial institutions, research centers, institutes, public and local actors and others to participate. There should be complementary to each other in skills and knowledge. So, the purpose for the viability of a cluster is to achieve competitive advantage and innovation. To achieve competitive advantage customers are needed with specific expectations, advanced partners and to focus on their core business skills. Regarding innovation companies they should be flexible to evolve and incorporate new knowledge in their production processes.

4. *Life:* Clusters are living cells and have long development and life. They work through some stages of development (these stages are analyzed in the following section). The duration of each phase depends on the particular characteristics of each cluster.

5. *Collaboration and Competition:* Actually the enterprises operating within a cluster complement each other's capacities. In this way they develop into associations and consortia that can get new projects participating in the required competitions. Still they can participate in research projects and undertake joint sourcing. They can even cooperate with others in different levels of the same supply chain as well as research organizations and local institutions. Cluster is principally based on the development of trust between the collaborating companies. This does not mean that they lose their independence. Each firm is autonomous and competes companies with similar products to attract new customers. This competition is based on quality rather than quantity (cost). Consequently these businesses become more efficient in their operations and maintain their competitive advantage.

The above reciprocity and the special trust developed make business clusters differ significantly from a simple geographical concentration of enterprises and organizations.

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6. *Horizontal and vertical links between companies:* On horizontal connections undertakings located in the same geographic area perform similar tasks. In this way problems are more easily solved and in more ways. Clearly the knowledge and information is spread more easily. On the other side of the vertical links companies that produce differentiated products but complementary to each other cooperate. Inflow / outflow relations develop between them. Suppliers and customers take advantage of opportunities in the area where the cluster is and install their economic activities there. Many indeed of these companies go through from the horizontal dimension to the vertical and specialize their activity in order to reap the benefits of their cooperation with the cluster. This way the problems faced by businesses are addressed easier and with the individual division, labor knowledge for effective operation develops as well.

1.1.5 CLUSTER'S TYPES

According to Ann Markusen there are four different types of clusters. The above separation was based on some common characteristics.

The types are:

- ✓ *Marshallian and Italianate*
- ✓ *Hub and Spoke*
- ✓ *Satellite Platforms*
- ✓ *State-Anchored*

Specifically:

Marshallian and Italianate clusters are local clusters. It is perhaps the most talked-about form of cluster and perhaps the most widespread in Europe. This kind of business concentration consists of many SMEs which are installed in a specific geographic area. Large vertically integrated companies are usually not included in these. A key feature of their operation is the economies of scale that are achieved. These firms develop a strong cultural identity and have a stable and permanent workforce.

Hub and Spoke cluster is one or more large companies that are vertically grouped with other smaller ones. These smaller companies are either suppliers or engage in activities that are related to the main business of large enterprises. A very important feature of this type of cluster is that of the strong links between the dominant firms. Even more

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important links with business competitors who do not belong to the same cluster develop, because many times the great production volume is not completely absorbed by the local market. The business axis is solely responsible for the innovation and has the right to safeguard patents. Moreover this type of cluster is characterized by low mobility of the employees.

Satellite platform cluster consists of large companies which carry uncorrelated activities and have a tendency towards extroversion. Usually this type of cluster is the result of public policy regions to attract new multinational ones which may exploit the very cheap production factor labor in the region. There is no great development of spin-off activities and there are single bonds between companies.

State anchored industry cluster is probably the most special form of the three types of clusters mentioned above. The concentration of businesses in an area is the result of a governmental decision or a nonprofit entity (for example the army, a university or a governmental authority). Usually the characteristics and innovation of this type of cluster are differentiated according to the organization they are directed by. Around these public activities the supply services that develop do not contribute significantly to the development of the cluster.

According to Markusen all four types of clusters above create new jobs. So the four types of clusters depending on their characteristics require different policies of development. Regarding the Marshallian and Italianate cluster the strategy of development should support operational activity, improve internal collaboration and help small businesses grow. In the Hub and Spoke clusters the activity of the basic enterprise axis should be enhanced and links with small business suppliers should be strengthened. Concerning satellite clusters the strategy should focus on attracting new different business activities. Finally the state anchored industry cluster should form the development strategy based on the ability of local authorities to fund and support the main business.

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1.1.6 *LIFE CYCLE*

These growth stages are the following:
- ✓ *High geographic concentration:* There are a large number of companies and relevant agencies operating in the region.
- ✓ *Emerging cluster:* In this stage is creating a central / key activity in which businesses and institutions coordinate their action matures. In this phase it is urgent the cooperation both members companies in order to benefit.
- ✓ *Growing cluster:* In this stage the partner companies and institutions have started to form a single identity. They are officially a cluster either by placing an information plate or creating a joint website and more. At the same time, new companies that are wishing to cooperate with the cluster installed in the region. So, these companies promote new activities and new partnerships.
- ✓ *Mature cluster:* The cluster has been fully configured. It has a sufficient number of members / business, has developed partnerships with companies belonging to other clusters and generally develops a new trend of entrepreneurship in the form of spin-offs, start-ups or joint ventures.
- ✓ *Transforming cluster:* In the rapidly changing economic environment and global competition clusters forming a living cell of the economy need to evolve and adapt to changes in the external environment. It is important to evolve in order to maintain their competitive advantage and ensure their sustainability.

1.1.7 *DRIVING FACTORS OF CLUSTERS DEVELOPMENT*

The development of an industrial cluster in a region is based on the existence of a competitive advantage. As previously mentioned, a competitive advantage can be the qualified workforce, the region's natural resources and the innovative production methods. Furthermore, a different competitive advantage can be the appropriate policies to promote and general factors that can not easily be copied within the pooled activity of an industrial complex. This section lists the factors which push the development of industrial clusters and therefore competitive advantage. The interaction of four key players such as Firm Strategy, Structure and Rivalry, Factor Conditions, Demand Condition and Related and Supporting Industries and two other accompanying factors such as the government and investment opportunities shape the national environment in

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which companies operate and learn to compete. The above interaction contributes to the development of a competitive advantage. This system is known as Porter's Diamond.

Chart 1: Porter's Diamond
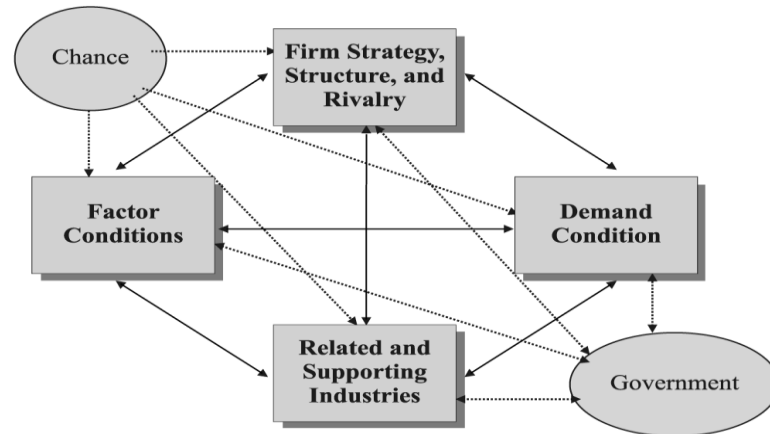
Source: Porter (1998, p.127)

The main driving factors of clusters are:

The Factor Conditions: They are referred to the natural benefits in an area like the human capital, the natural resources, the source of knowledge, the capital and the infrastructure develop a different competitive advantage for this area. More specifically, the wealth of natural resources does not only help the existing businesses to survive but also helps the new entrants businesses in the area. So, the use of new, innovative activities makes companies more competitive.

The Local Demand Conditions: The high consumer demand creates agglomeration economies. The high demand means a great number of consumer products. So, the firms use specialized equipment in production. The competition is higher and the companies produce viable products that are exported in regional, national and supranational markets.

The Related and Supporting Industries: They are referred to upstream and downstream companies that are active in the same area exchange more easily information, ideas and innovation. Additionally, the action of the interrelated companies that produce complementary products or services in the same area help the coordination and allocation of production activities.

The Firm Structure, Strategy and Rivalry: The competition makes companies innovative and productive. The firm structure, strategy and rivalry are closely related with the local rivalry and competitive advantage. The differences in the management

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system of companies create competitive advantage and the relationships between employers and employees affect the innovation and development. The local rivalry decreases the production cost, creates new innovative products and services and enhances the organization. In long term, the local rivalry helps businesses to become successful and leads to the local economic development.

The Government Support: The factors that make businesses competitive also contribute to the competitiveness of regions or countries. The government encourages businesses to operate more efficiently than in the past. It means that the companies use specialized factors to produce improved products. Moreover, the creation of an industrial cluster requires the appropriate development of infrastructure.

The Chances: The clusters that based their operation on innovation are more productive and efficient. Following Porter, the firm's competition in an area is affected by the five forces of interaction. The forces are the threat of new entrants, the trading power of suppliers and buyers and the use of substitute and complementary products. However, there are other factors as well that affect the operation of businesses in an area, like the cost structure and the market structure. Many of these factors can not easily be predicted or avoided by the firms of a country. Therefore enterprises will be able to assess in order to take advantage of some opportunities, or to cope with potential threats. Such events might be wars, inventions, natural disasters, sudden price increases in basic raw materials and more.

1.1.8 *THE SUCCESS REASONS*

There are four special reasons (four special characteristics) that make the concept of clusters so successful:

• *Knowledge diffusion:* The majority of the pre-existing cluster theories present the clusters as "knowledge economy" or "new economy". Their operation is based on the knowledge diffusion on the local level. Therefore, there is a great interaction among the network members. So, the agents and the groups that are located together diffuse knowledge through the relations among them.

• *Network externalities:* In cluster formation, the presence of a member importantly affects the presence of another member. There is a community of shared interests. More specifically, there is a great interaction among the members regarding the quality of

products, the kind of products, the production, the services, the opportunities and other. The positive network externalities exist if the benefits are an increasing function of the number of other users. Negative network externalities exist if the benefits are a decreasing function of the number of other users.

• *Vertical integration:* An industry has backward integration when it expands its businesses backwards on the production system (suppliers). On the other hand, it has forward integration when it expands its businesses forward on the production system (sellers). Sometimes, both could happen. The main benefit of vertical integration is the reduction of cost. The industries take the advantages of the pooling of certain infrastructures. They reduce their transportation cost and reduce turnaround time.

• *Agents of globalization:* The cluster operation is closely connected with the processes of globalization. They are localized structures that enhance the competitiveness in global economy. The comparative advantages that are results of positive externalities affect the process of globalization.

1.1.9 *ADVANTAGES OF CLUSTERING*

The first and most important advantage of industrial clusters is the localization of economies. The localization of economies refers to the costs saved by a company from its installation close to others. This geographical proximity enables it to acquire specialized labor force, to deal with lower costly suppliers, investments in public infrastructure that will facilitate the firm operation in the region and improve access to knowledge and technology.

Small firms become more momentum. In contrast with the large enterprises small firms produce specialty. So, they can cope with the global competition and are more flexible to adopt new and more efficient ways of production and new technologies. The cluster is usually a magnet for small niche companies that are oriented to new technologies. Through clusters and geographic proximity which result, access becomes easier to suppliers and raw materials and therefore more skilled manpower follows. Therefore these companies are easier to cope with the ever-changing external environment.

Major cooperative relationships among members develop. Complementarities rapidly grow, the access to knowledge and information and the access to new markets become

easier. The trust developed among cluster members contributes to the uptake of new production systems and the continuous upgrading of technology.

1.1.10 *DISADVANTAGES OF CLUSTERING*

Undoubtedly, the cluster operation is very important for the economy. There are a lot of advantages that are explained in the above study. On the other hand, there a lot of disadvantages connected with the cluster existence.

Firstly, in the local system of innovation there are opportunistic behaviors (Blien U. and Maier G., 2008: 35). Highly innovative companies can negatively be affected by competitors that are located close to them. This usually happens to clusters where companies with similar activities operate and to clusters where companies with supplementary activities are co- located. Practices like knowledge leakages, industrial spying and poaching of specialist employees are easier to occur.

These practices are very dangerous for innovation and sometimes they lead the companies to relocate to more favorable areas. In addition, the feedback mechanisms are underperformed (Blien U. and Maier G., 2008:36). The production process is inflexible. It is influenced more by its internal rules and processes than the external demands and external conditions. Thereafter, the specialization and the single industrial activity reduce their competitiveness in the global market. They are not innovative. So, the ripe clusters decline. Another negative effect can be the growth of exclusivity.

Crucial mistakes can be made in the determination of the strategy for the development of the industrial cluster so they do not reap the benefits of their cooperation.

In particular, establishing a cluster in a region requires considerable study of the region and its economy. In this study industrial clusters determine their competitive advantage. This process is difficult as conditions for establishing a competitive advantage are constantly changing. It is therefore very likely to lead to wrong conclusions.

Furthermore, the newly introduced -clusters which specialize in the same industry with existing clusters find it very difficult to reap the benefits of cost reduction. This can only be done under certain conditions. These conditions are referred in the selection of a different location, in the quickly selection of workforce and enterprises and in the rapid development of economies of scale. Even newly introduced clusters may be more

successful when they specialize in a new and innovative activity. Without these conditions it is very likely for the cluster to fail.

Finally, as mentioned above, the institutional environment is very important for the effectiveness and development of a cluster. Concepts such as trust and collegiality should be promoted. So, changes are often required in the social, political and economic environment.

1.1.11 *THE CONTRIBUTION OF CLUSTERS TO ECONOMIC GROWTH*

The existence and proper functioning of an organized cluster is very important for the economic development of a region. Its presence is as important in a growing and a developed economy. A growing economy cannot be described as developed if there isn't an organized network of companies. On the other hand, the presence of a developed economy gives higher rates of growth. It contributes to the revival of the economic activity and growth rates of the whole economy.

Productivity growth

The financial synergies which develop in a region contribute to the increase of the value added which contributes in turn to GDP growth. Companies become more effective due to geographical proximity and repeated cooperation between them. They reduce the average cost and develop competitive advantage. Many of them specialize even further in some tasks such as sourcing, further cost reductions and further maximizing the benefits for the entire cluster. Even externalities developed by the presence of a cluster create more products for the economy. In essence the income generated in a cluster increases which is comparatively larger than the individual income that a business would produce if each business produced it separately.

Strengthening entrepreneurship

The presence of a cluster in an economy increases its entrepreneurship. In fact it attracts companies in the same industry and improves the conditions for a smooth entry into the area. In particular, barriers to entry are reduced since essential inputs such as human capital and raw materials are readily available and accessible. Even the financial risk is reduced since financial institutions fund in a more favorable manner such entrepreneurial endeavors and provide significant investment advice. Interpersonal

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relationships develop into an industrial cluster which facilitates dissemination of information and therefore firm opportunities are easily spread.

When companies operate in an industrial mesh and cooperate they acquire another dynamic. They can achieve things they could not do if they were operating as a unit. More specifically, they could achieve better value in their negotiations with a supplier or a company which will undertake the formation of the image and their advertising. They could even negotiate with the government to create new infrastructure that will facilitate and improve business and even affect those who conduct their economic policies in order to promote the investment policy. For example they are reducing tax rates, deregulation and more.

Developing a cluster in an area not only positive affects the region's economy, but affects the entire economy as a whole. The savings of synergies and externalities resulting always in combination with the increasing entrepreneurship, the attraction of new investors and the construction of major infrastructure projects undoubtedly make an economy clearly more developed compared to the past.

1.1.12 *CLUSTER AND PUBLIC POLICY*

As seen throughout history the most famous and successful clusters emerged by chance and not through an organized action or policy. However there are some basic factors which significantly affect their efficient functioning. Many of these factors are influenced by public authorities at both a regional and national level. Therefore an effort will be made to see how important public policy for a properly organized cluster is.

The role of public authorities then lies in formulating policies at four levels: In support of the successful operation of existing-clusters in the development and renewal of existing ones, creating new conditions that will support the emergence of new clusters and finally giving incentives to companies to innovate and invest in research and development.

Regarding support, it is important that the operation of existing clusters have a harmonious cooperation between the private and public sectors. So, the utilization of existing universities is required in two ways. Whether companies can collaborate on research to evolve and adapt to the new conditions of technology either by contacting students with private companies in order to see the real picture prevailing in them and familiarize themselves with the environment. Even initiatives like the organization of

seminars to continuously train employees. In addition, the state should give incentives to clusters to hire intermittently workers from other regions to become more flexible, to evolve, to exchange views and to adapt easily to the new technologies. Yet it is important to ensure that appropriate technological infrastructure exists to facilitate the technical functioning of enterprises.

Regarding the development and renewal of the existing role of the state is particularly important. It would be interesting to create an advisory committee for clusters which will be composed of scientists of various disciplines including economists, planners and others. They are responsible to support businesses that make up the cluster, to deal with any potential problems that arise. They will even inform businesses about potential opportunities and threats presented internationally.

Regarding the creation of conditions for the emergence of new clusters the state should take the role of the "protector" from international competition and major multinational companies. At this point there are fine limits. A cluster can not be innovative if not exposed to international competition. For example, in China there are committees that promote the 'controlled competition'. As we mentioned in several points above the role of universities is catalytic for the successful operation of an industrial complex. The state for its part should ensure that there is timely and prompt financing of such surpassing bureaucratic obstacles that cause delays and thus force companies to turn to other private and considerably more expensive solutions. However, this cooperation should be done in moderation because universities should not lose their academic identity. Another effective solution for research funding is even more technology / science parks and incubator services to be provided to new budding clusters

Regarding incentives for business investment in innovation and research and development actions, the actions that the state can make are as follows: Assessment at a national system of innovation. This can be done in terms of specialization and in certain areas. An overall assessment should take place of the degree of specialization of labor, the existence of technological infrastructure and institutions. They should cooperate with old traditional companies which act as a unit and help them to organize their production system from scratch and attract new businesses to operate innovatively. To perform a SWOT analysis for the external companies environment by studying potential opportunities, threats, strengths and drawbacks to exploit untapped resources.

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1.2 <u>SUCCESSFUL EXAMPLES</u>

In this section there are some of the most successful clusters in the world. The first non-European Silicon Valley is in California and is a pattern for many clusters worldwide. The second Sophia Antipolis is a European cluster located in France and is noting a significant trend.

1.2.1 *SILICON VALLEY*

Silicon Valley is one of the most famous clusters in the world. The vectors of Silicon Valley are located in the San Francisco Bay Area, in North California. The area is surrounded by the San Francisco Bay on the east, the Santa Cruz Mountains on the west and the Coast Range to the southeast. Many years ago the area was known as the "Valley of the Heart's Delight". This name probably came from the fruit trees that were grown in the area.

The first idea for its operation was given during the period of the Second World War. During this period some of the most important universities like Stanford University, University of California at Berkeley and the Massachusetts Institute of Technology planned and produced weapons for the federal government. After the end of the Second World War the federal government asked from the universities to continue their cooperation. So, the research organizations of universities operated like businesses. The name of Silicon Valley was given from the great amount of innovation companies that operated in the area. The main characteristic of these companies is that they used silicon to produce microchips. The rapid improvement of the area was due to the operation of the University of Stanford in the area. More specifically, during the period between 1940s and 1950s the head of the University of engineering Frederick Terman motivated their graduates to start up their companies in the area in order to gain from the area's advantages. The first successful company that had operated in the area was Hewlett Packard. So, Terman is often called "the father of Silicon Valley». Most of the Silicon Valley firms used a small amount of initial capital.

The companies are linked by social and economic networks. These networks made them more flexible in the market changes and more competitive. There are strong trading relationships among the employees. Essentially, this sense of community that

existed in Silicon Valley among the technical people helped to the successful operation of the cluster.

The main characteristic of the cluster is that it is built around one of the best nexus universities in the world. The most important of these universities are Stanford University, the University of California Berkeley (UC Berkeley), the University of California San Francisco (UCSF), and San Jose State University (SJSU).

In the beginning there was a large number of small firms in the area. In 1980 the number of firms amounted to three thousand. In a short time, these firms significantly grew. A few years later, there was a variant technical workforce and a various supply of technical services.

Finally, we could say that the successful operation of Silicon Valley was based on the three following factors: education, venture capital and legal infrastructure.

Today, this place is considered as a "talent magnet" by many scientists. The Silicon Valley cluster attracts scientists and researchers from the California pool, American pool and global pool (especially, 2 billion talents came from China and India). Most of them specialized in technology, engineering and the field of mathematics. This variety of ethnic networks is very important for the development of the area. More significantly, different people talk to each other, propose different ideas, test their ideas and result in a common decision.

Some of the most profitable companies of the world are located there. Such firms are Apple, Hewlett Packard, Google, Cisco systems, Oracle, Intel, Gilead Sciences, eBay, Franklin Resources and Yahoo.

1.2.2 *SOPHIA ANTIPOLIS*

In the beginning of 1970 another important cluster the Greenfield cluster of Sophia Antipolis was created.

The article of Senator Pierre Laffitte that was published in the French newspaper "Le Monde" was the starting point. At this text, the need for decentralization was stressed. The most suitable place for him was the Alpes-Maritines. So, the Science Park of Sophie Antipolis was built up there. He convinced new companies to establish there since the area was still undeveloped. The Silicon Valley centre was the standard for this new park. A big centre for research and study that could promote new technologies was created. Multinational companies like IBM and Texas Instruments established factories.

It gave credibility to the region. So, new entrepreneurs established their factories. Most of these companies specialized in the sectors of telecommunication, information technology, medical and chemical sciences, biotechnology and spatial and environmental sciences.

At these sectors of research and development play a vital role. So, many of them were in close collaboration with universities, research institutes and hospital institutions. During the period between 1992 and 1995, the big multinational companies stopped settling in Sophia Antipolis due to the recession that hit Europe. Generally it could be described as a widespread campus where knowledge, creativity and productivity were generated. The entering of new industries in the region of Sophia Antipolis was between 40 and 60 companies each year.

Sophia Antipolis started with a few big firms and some research laboratories. In 1959, it created the first Establishment of Higher education, and in 1965 it established the first University. The main components of the high-tech cluster of Sophie Antipolis were the following: institutions for higher education and basic research, incubators, venture capital, networks and professional Associations and governmental support institutions.

In the institution for higher education and basic research framework the collaboration between teaching institutes and the other world followed the slogan of "Learning-Research- Industry". Every institution and research centre has its incubator to innovate and increase the importance of their activity. The CERAM business school which specialized in management activities became one of the most important schools in France. Many universities and schools that were established in the area had a key role in the development of the French economy. At the same time, many other companies and organizations carried out research and training. The Sophie Antipolis cluster was different from the other pro existing clusters and had an informal network that developed the formal relations inside the clusters. In the beginning there was not a suitable strategy and financial structure to support the companies of Sophie Antipolis.

So, the incubators created one to support them. Some of the most important incubators were the INRIA-Transfer, Institute Eurecom, Incubator CERAM, PACA Est and Incubator CICOM. More specifically, the INRIA-Transfer provided the structure for information technology companies. The Eurecom Institute was European centers that specialized in communication and networking research. The incubator CERAM supported the entrepreneurial students in their projects. The PACA Est supported new projects and services that came from universities, engineering schools and companies.

Finally, the incubator CICOM supported new companies in the field of information and communication technologies. The venture capital that was attracted by innovative companies in Sophia Antipolis was high. The biggest part came from national and foreign funds and the other part came from regional funds. This happened to financially support the small and medium-sized companies. At the same time, there were some networks and Professional Associations. An important association was the Telecom Valley in telecommunication and information technology. It gave its members the prizes of "Label of Innovation" and the "Quality Award to Best Customer Satisfaction" to encourage their cooperation. Finally, the governmental support institutions in the Science Park of Sophia Antipolis were high. There were a lot of public support agencies like SYMISA, SAEM SACA, CC INCA, CAD and CICA. However, there were volunteers that welcomed the new residents of Sophia Antipolis.

In summary, Sophia Antipolis is a high tech cluster. It has schools for advanced studies, research institutes, qualified people, support agencies, incubators, multinationals, associations and venture capital. It is an organized cluster which has survived until now. Some of the most famous companies that are established there are: Air France, European Telecommunications Standards Institute, France telecom, Hitachi, Hewlett Packard, Wall Street systems, Intel and others.

CHAPTER 2: CLUSTER IDENTIFICATION INDEXES

2.1 <u>CLUSTER IDENTIFICATION</u>

There is a large amount of methods and techniques that identify the cluster operation in a region. It could be done by the use of Location Quotient coefficient as well as with the use of complicated model of input/output. Some of the types that will be used in this study are the following:

2.1.1 *LOCATION QUOTIENT (LQ)*

The Local Quotient coefficient analyzes the structure of regional economic activities. Additionally, the LQ coefficient could be used to compare regional activities by using national sizes. It compares the developed activity of a region rather than the country's size. The employment is the main size that which is used to estimate the LQ coefficient. It indicates the regional employment in a particular sector in comparison with national employment in the same sector. The other lower importance indexes that could be used in order to estimate the LQ coefficient are: the Income, the Gross Domestic Product, the Population and others. The regional Local Quotient coefficient is calculated by the following equation:

$$\text{LQ}_{ir} = \frac{E_{ir}}{E_r} / \frac{E_{in}}{E_n} = \frac{E_{ir}}{E_{in}} / \frac{E_r}{E_n} = \left(\frac{E_{ir}}{E_r} \right)\left(\frac{E_n}{E_{in}} \right)$$

Where:

E_{ir} = The employment of sector i in region r

E_r = The total employment in region r

E_{in} = The employment of sector i in the whole country, particularly

$$E_{in} = \sum_{r=1}^{n} E_{ir}$$

E_n = The country's total employment, particularly $E_n = \sum_{r=1}^{n} E_r$

- If LQ=1, the economic activity i is developed both in the region and the country. So, the region has normal participation in the market for the economic activity i.

- If LQ>1, the economic activity i is more developed in the region compared with the country. So, the participation of the region in the market for the economic activity i is better than the country's.

- If LQ<1, the economic activity i is less developed in the region compared with the country. So, the participation of the region in the market for the economic activity i is worse than the country's.

The location quotient coefficient could estimate the region's exports and imports of different sectors.

- If LQ>1, the region is specialized in a particular sector. Consequently, the economy of the region should have an export surplus. So, this sector is the basic economic sector of the region.

- If LQ<1, the region is less specialized in the particular sector compared with the country. Consequently, the economy of the region is deficient in the products of the particular sector. So, the imports are needed to supply. This sector is not the basic economic sector of the region.

- Finally, if LQ=1 the region does not realize imports and exports in the particular sector.

The LQ calculations of imports and exports are approximate. The LQ coefficient doesn't calculate the net trades of a region. It should have the following special features:

a. All the regions of the country should have the same rates in productivity of the particular sector.

b. All the regions should have the same per capita consumption.

c. All the regions should not realize imports and exports in all these sectors.

d. If a region has the coefficient consumption bigger than one unit it should be fed in particular from this sector.

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If the above conditions are valid, the amount of imports and exports of a particular sector in a region could be calculated by the following equations:

- By using the export's employment (or other sizes that could be used to estimate the LQ coefficient) X_{ir} of the economic sector i in region r. The particular equation is the following:

$$X_{ir} = \left(\frac{LQ_{ir} - 1}{LQ_{ir}} \right) E_{ir} = \left(\frac{E_{ir}}{E_{in}} - \frac{E_r}{E_n} \right) E_{in}, \text{ where } LQ_{ir} > 1$$

- If we use the country's production P_{in} in the economic sector i the imports could be calculated by the equation:

$$X_{ir} = \left(\frac{LQ_{ir} - 1}{LQ_{ir}} \right) P_{ir} = \left(\frac{E_{ir}}{E_{in}} - \frac{E_r}{E_n} \right) P_{in}, \text{ where } LQ_{ir} > 1$$

- The employment of imports M_{ir} of sector i in region r could be calculated by the equation:

$$M_{ir} = \left(\frac{1 - LQ_{ir}}{LQ_{ir}} \right) E_{ir} = \left(\frac{E_r}{E_n} - \frac{E_{ir}}{E_{in}} \right) E_{in}, \text{ where } LQ_{ir} < 1$$

- As mentioned above the total product in the specific sector to estimate the region's imports could be used:

$$M_{ir} = \left(\frac{1 - LQ_{ir}}{LQ_{ir}} \right) P_{ir} = \left(\frac{E_r}{E_n} - \frac{E_{ir}}{E_{in}} \right) E_{in}, \text{ where } LQ_{ir} < 1$$

Generally, the Location Quotient coefficient estimates the spatial differentiation and classification of regions. It is used to determine economic structures, to specify or compare different regions. The comparisons of the regions are unspecified and they do not clearly define the real problem of the region for example, the operational problems

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of the industry in a region, the sufficient development of the activity in the region and other.

The lack of knowledge about the region's participation rate in an economic activity doesn't give firm conclusions. However, it could be combined with quantitative analysis techniques. So, the conclusions are specified.

2.1.2 *CONCENTRATION RATIO*

It is a traditional structural measure of market concentration of n largest industries of a particular sector (where n=4 or 5). It is based on market shares. The Concentration Ratio is usually counted by the size of sales. The sales are denominated on quantity or on value.

The Concentration Ratio is estimated by the following equation:

$$CR_N = S_1 + S_2 + ... + S_N$$

According to the result of the index we have the following interpretation:

- If $CR_N = 0\%$ means perfect competition or at the very least monopolistic competition in the market of the region.
- If $0\% < CR_N < 50\%$, this category ranges from perfect competition to oligopoly in the market of the region.
- If $50\% < CR_N < 80\%$, an industry in this range is likely an oligopoly
- If $80\% < CR_N < 100\%$, this category ranges from oligopoly to monopoly.
- If $CR_N \approx 100\%$ means an extremely concentrated monopoly in the market of the region.

On the other hand, the concentration ratio uses the market share of a limited number of the firms in the industry and does not provide the distribution of firm size. It does not give more information about the competitiveness of the industry. They are useful to

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provide a sign of the oligopolistic nature of an industry and indicate the degree of competition.

2.1.3 *SPATIAL CONCENTRATION (CL) INDEX*

Another more specialized form of concentration ratio is the Spatial Concentration Index. The CL index calculates the regional concentration of a particular economic activity.

The Spatial Concentration index is given by the following equation:

$$CL = \frac{1}{2} \sum_{r=1}^{n} \left| \frac{E_{ir}}{E_{in}} - \frac{E_r}{E_n} \right|$$

Where:

E: The employment

n: The country's number of regions

More specifically:

E_{ir} : The total employment of economic activity i in region r

E_{in} : The total employment of economic activity i in country

E_r : The total employment of region r

E_n : The country's total employment

The values of Spatial Concentration Index are ranging among zero and unit.

➢ If CL=O, the distribution of the activity i is identical to the distribution of all the activities.

➢ If CL=1, the distribution of the economic activity i differs from the distribution of all the activities.

The Spatial Concentration indices can be used to evaluate a policy to strengthen an economic activity in a region. A low value of CL means that an economic activity is less concentrated regionally. Therefore efforts should be made to settle in a region

which seeks to diversify its economic activities. Even the study of spatial concentration ratios over time indicates whether there is a trend of regional concentration or diversification of activities and assists in shaping the similar regional policy.

2.1.4 *SPECIALIZATION INDEX*

The above spatial concentration ratio can be used with some variations and can explain different regional characteristics. A variant then of the above index is the specialization index. The specialization index is used to indicate whether a region has specialized in some economic activity and takes values from zero to one. It can be calculated from the following equation:

$$CS = \frac{1}{2}\sum_{i=1}^{m}\left| \frac{E_{ir}}{E_r} - \frac{E_{in}}{E_n} \right|$$

➢ If CS = 0 then this region shows no specificity and therefore the composition of employment does not differ significantly from the composition of employment in the country.

➢ If CS = 1 then this region shows complete specificity to an activity, and therefore the composition of employment is the same as the composition of employment of the country.

2.1.5 *HERFINDALH- HIRSCHMANN INDEX (HHI)*

It is a measure of the size of the firms in relation to the industry. It is used to amount the competition among them.

$$HHI = \sum_{i=1}^{N} S_i^2 \qquad 1<\text{HHI}<1/\text{N}$$

Where:

S_i : The market share of the industry i.

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N: The total amount of the firms in a sector.

The HHI coefficient is sensitive to the changes of N. More specifically, if the number of industries increases the HHI coefficient will decrease.

More specifically,

- If HHI=1/N in the market operates N industries with the same size.
- If HHI=1 in the market operates one large industry. This market is characterized as monopoly.

It is useful to combine different concentration indexes in order to have more credible results. Each different index gives different results about the structure of the sector. Also, high correlation has been observed among the concentration indexes.

Another form of Hirschmann-Herfindalh Index is the following:

$$G_i = \sum_{r=1}^{n} \left[\frac{E_{ir}}{E_r} - \frac{E_{in}}{E_n} \right]^2$$

Where:

n: The regions of the country

E_{ir} : The total employment of economic activity i in region r

E_r : The total employment of the region

E_{in} : The country's total employment of the economic activity i

E_n : The country's total employment

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2.1.6 *RELEVANT SPECIALIZATION INDEX*

It is a variant of Hirschmann-Herfindahl index. It measures the concentration of activity in a region. It is calculated by the following equation:

$$RDI_r = \frac{1}{\sum_{i=1}^{m} \left| \dfrac{E_{ir}}{E_r} - \dfrac{E_{in}}{E_n} \right|}$$

Where:

$\dfrac{E_{ir}}{E_r}$: Participation of each sector in the regional economy

$\dfrac{E_{in}}{E_n}$: Contribution of each sector in the national economy

The greater the index value relative differentiation the more the distribution of the industry in this region resembles to the distribution of the industry throughout the country. Unlikely, the smaller the index value relative diversification both the regional and sectorial distribution of employment differs from the national distribution.

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CHAPTER 3: CLUSTER IN GREECE

3.1 <u>GREEK ECONOMY</u>

   The Greek economy after a post-war period of impressive growth over the past three decades is at an unchanged. In order to remain competitive and meet the needs of globalization and to overcome the structural problems in the early 1980s Greece entered the European Union.

 3.1.1 *STRUCTURE OF THE GREEK ECONOMY: STRUCTURE OF KEY SECTORS*

  Primary sector: Due to the abandonment of land and the rise of the phenomenon of migration, labor employment in this area has gradually declined. One of the major problems faced by agriculture in Greece was the cutting of ownership of agricultural land into small farms which did not favor intensive exploitation. Noteworthy is the fact that over 50% of farms have an area of less than 20 acres. In 1950 an attempt was made to address the above problem with land consolidation. The aim was to replace the multi-segmented land with uniform farmlands, efficient farming and replacing old with new technological production methods. It is obvious that since 1950 there have been significant changes in the agricultural sector in the country. However there are still some major structural weaknesses such as the small size of farms, lack of skilled human resources, degraded soils and clearly low profitability.

  Secondary sector: With regard to employment in the industry in Greece the creation of several infrastructure projects contributed significantly to employment growth in recent years. The 1950 and 1960 the development of the Greek industry was due not only to the large public investments made in large infrastructure projects, but also to investment projects in areas of heavy industry such as the steel industry, shipyards and ores. One of the major problems faced by the Greek industry is the large number of small businesses in the country. With the launch of the Customs Union with Europe and the regime change from protectionism to liberalism trade, the Greek small businesses were weak to cope with the new situation and the ever-increasing competition. There was a significant lack of technological infrastructure, unregulated location, lack of environmental integration, lack of applied research on market needs and demand, lack of cooperation of the Greek industry with university research and generally unmet international demand. However at times there have been attempts by the respective

governments to address the above problems either with the privatization of firms in difficulty, either by providing incentives to promote research and renewal of technological equipment, training of executives and workers from different firms and the extensive effort to link research in industry with universities and research institutes. As for the heavy industry the largest industrial companies in the country operate in industries such as stationery, fertilizers, aluminum, cement, steel, nickel, petroleum, chemical and shipyards.

Tertiary sector: This is perhaps the weakest sector of the Greek Economy. However over the years considerable efforts have been made to develop it. In 1990 and 1991 there was a slight increase in transport and communications. Then there was a significant increase in the banking sector and the insurance sector mainly due to the large margin observed. However most of the tertiary sector share growth is due to the rapid increase in the public sector and the significant development of the tourism sector.

3.2 <u>GREEK CLUSTERS</u>

The competitiveness and economic prosperity of the regions play an important role in the regional development clusters. As mentioned above one of the most important features of clusters is the geographic concentration. That is why this section attempts to identify the spatial concentration of economic activities in each of the 51 departments of the country. The following analysis is based primarily on the theory of Marshall Merger economic activities. At the level of expertise in manufacturing and energy it would be particularly interesting to study that in Greece but unfortunately there are no statistics available. So in this study 10 productive sectors of the economy are used such as: Agriculture, forestry and fishing, Manufacturing, Construction, Wholesale and retail trade, transport, accommodation and food service activities, Information and Communication, Financial and insurance activities, Real estate activity , Professional, scientific and technical activities, administrative and support service activities, Public administration, defense, education, human health and social work activities, Arts, entertainment and recreation, other service activities, activities of household and extra-territorial organizations and bodies. They used quantitative methods to calculate the concentrations which are analyzed extensively in the previous section and figures which reflect the Greek reality from the data sources of Eurostat. The primary variable is

employment in each of the productive sectors of the economy. In addition, some of the characteristics of the Greek economy as the structure of its production are analyzed.

Table 1: Department's employment per economic sectors

Departments	Total - All NACE activities	Agriculture, forestry and fishing	Manufacturing	Construction	Wholesale and retail trade, transport, accomodation and food service activities	Information and communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical activities; administrative and support service activities	Public administration, defence, education, human health and social work activities	Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies
Greece	4711,7	545,0	470,2	322,1	1489,9	87,0	111,1	4,4	324,1	976,2	317,4
Evros	55,7	11,5	3,7	2,9	14,8	0,5	1,1	0,0	1,8	16,3	2,9
Xanthi	43,3	9,9	3,7	3,1	10,5	0,4	0,4	0,0	3,0	10,1	1,5
Rodopi	52,9	22,8	3,6	1,9	9,8	0,2	0,4	0,0	1,7	11,3	0,9
Drama	30,1	4,7	3,5	2,5	9,5	0,2	0,6	0,0	1,4	5,9	1,4
Kavala	60,1	9,0	5,9	4,5	18,7	0,4	0,9	0,1	2,8	12,8	3,5
Imathia	54,4	18,3	4,7	2,7	14,1	0,4	0,7	0,0	2,0	8,3	2,7
Thessaloniki	498,5	15,3	66,2	27,4	173,4	9,0	9,7	0,7	46,0	111,9	34,5
Kilkis	32,1	4,9	6,0	1,3	10,2	0,2	0,4	0,0	0,7	6,6	1,3
Pella	61,1	20,6	6,9	3,8	15,2	0,1	0,7	0,0	1,6	9,3	2,2
Pieria	52,3	9,8	3,5	4,8	18,3	0,3	0,9	0,0	1,5	10,0	1,6
Serres	56,0	18,7	5,1	2,3	15,2	0,4	0,6	0,0	2,1	8,5	2,0
Chalkidiki	29,2	5,9	2,2	2,8	10,7	0,2	0,3	0,0	0,6	3,5	2,2
Grevena	9,5	3,5	0,6	1,1	2,0	0,1	0,1	0,0	0,2	1,6	0,5
Kastoria	23,1	4,6	4,1	0,8	6,9	0,0	0,1	0,0	0,9	4,5	1,0
Kozani	58,0	7,3	4,8	5,4	15,1	0,2	0,7	0,0	2,0	12,4	2,5
Florina	18,9	3,5	2,2	0,8	4,1	0,2	0,2	0,0	0,6	4,6	0,9
Karditsa	44,7	18,8	2,6	2,1	9,4	0,1	0,2	0,0	0,7	9,3	1,2
Larisa	124,7	29,4	12,1	4,4	34,3	0,4	2,2	0,1	7,3	29,0	4,0
Magnisia	74,3	8,3	9,3	4,7	25,4	0,1	1,1	0,1	3,9	15,6	4,5
Trikala	59,0	12,7	4,8	5,1	16,2	0,1	0,7	0,1	3,9	11,9	3,3
Arta	37,4	10,9	2,6	2,9	10,3	0,1	0,4	0,0	1,0	6,7	1,3
Thesprotia	16,8	3,1	1,0	1,5	6,2	0,0	0,2	0,0	0,6	3,3	0,8
Ioannina	66,7	6,6	6,5	6,4	21,3	0,3	0,8	0,0	4,3	16,2	3,6
Preveza	26,1	6,7	2,3	1,5	8,5	0,1	0,5	0,0	0,7	4,9	0,9
Zakynthos	29,1	6,8	1,4	2,8	10,2	0,1	0,5	0,0	1,6	3,8	1,5

Continue…

Kerkyra	48,7	5,0	1,4	4,6	23,0	0,1	0,8	0,1	3,1	7,4	3,1
Kefallinia	11,2	1,2	0,5	1,9	4,3	0,0	0,1	0,0	0,8	1,5	0,5
Lefkada	7,8	1,5	0,4	0,7	3,0	0,0	0,1	0,0	0,3	1,4	0,4
Aitoloakarnania	87,2	20,1	6,6	7,3	26,2	0,4	1,1	0,0	4,4	15,0	5,0
Achaia	142,7	16,5	10,5	12,7	45,5	2,0	2,8	0,1	8,8	35,1	7,8
Ileia	71,1	24,7	5,1	5,5	17,3	0,3	0,7	0,0	2,5	10,3	4,4
Voiotia	49,4	10,5	12,0	3,0	11,4	0,4	0,6	0,1	1,8	6,8	1,5
Evvoia	81,4	13,7	16,0	8,7	21,2	0,8	0,7	0,1	3,3	10,5	4,6
Evrytania	8,3	1,6	0,3	0,8	2,6	0,0	0,1	0,0	0,2	1,5	0,9
Fthiotida	71,5	17,2	8,4	6,0	18,3	0,4	0,9	0,1	3,2	14,4	2,2
Fokida	15,1	2,0	0,6	0,9	4,2	0,1	0,3	0,0	0,6	4,5	1,2
Argolida	49,8	9,7	3,9	4,6	18,0	0,5	0,6	0,0	2,8	5,9	2,9
Arkadia	33,0	7,9	2,4	3,5	8,6	0,2	0,5	0,0	1,0	6,1	1,3
Korinthia	59,0	16,5	5,9	4,1	14,9	0,7	0,6	0,0	2,6	8,2	5,0
Lakonia	39,5	17,5	2,3	2,1	8,6	0,4	0,5	0,0	1,3	4,5	1,7
Messinia	76,1	20,0	3,7	6,8	21,5	0,5	0,8	0,0	2,5	13,3	5,4
Attiki	1781,5	15,4	193,3	104,9	580,9	61,8	69,6	1,6	167,5	403,4	165,0
Lesvos, Limnos	38,8	5,5	2,4	2,7	11,5	0,6	0,6	0,0	1,8	12,4	1,2
Ikaria, Samos	16,2	2,4	1,1	1,0	6,3	0,1	0,3	0,0	0,5	3,9	0,6
Chios	19,5	1,9	1,1	2,3	7,3	0,3	0,3	0,0	0,6	4,6	0,8
Dodekanisos	78,8	5,0	4,5	8,2	32,5	0,7	0,8	0,1	4,1	16,6	3,9
Kyklades	47,5	4,4	2,2	7,2	20,9	0,4	0,5	0,0	2,0	5,4	2,6
Irakleio	133,7	25,2	9,2	10,5	48,4	1,2	2,0	0,1	8,8	21,2	5,8
Lasithi	31,9	10,3	1,2	2,5	9,0	0,3	0,5	0,1	1,3	5,3	1,3
Rethymni	33,9	7,0	1,9	3,4	11,6	0,3	0,3	0,0	1,7	5,4	2,0
Chania	64,1	8,6	3,9	6,7	22,1	0,5	0,6	0,1	3,7	13,1	3,7

Source: (Eurostat, 2010)

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3.2.1 *LOCATION QUOTIENT*

Table 2: Location Quotient by department

Departments	Agriculture, forestry and fishing	Manufacturing	Construction	Wholesale and retail trade, transport, accomodation and food service activities	Information and communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical activities; administrative and support service activities	Public administration, defence, education, human health and social work activities	Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies
Evros	1,78	0,67	0,76	0,84	0,49	0,84	0,00	0,47	1,41	0,77
Xanthi	1,98	0,86	1,05	0,77	0,50	0,39	0,00	1,01	1,13	0,51
Rodopi	3,73	0,68	0,53	0,59	0,20	0,32	0,00	0,47	1,03	0,25
Drama	1,35	1,17	1,21	1,00	0,36	0,85	0,00	0,68	0,95	0,69
Kavala	1,29	0,98	1,10	0,98	0,36	0,64	1,78	0,68	1,03	0,86
Imathia	2,91	0,87	0,73	0,82	0,40	0,55	0,00	0,53	0,74	0,74
Thessaloniki	0,27	1,33	0,80	1,10	0,98	0,83	1,50	1,34	1,08	1,03
Kilkis	1,32	1,87	0,59	1,00	0,34	0,53	0,00	0,32	0,99	0,60
Pella	2,91	1,13	0,91	0,79	0,09	0,49	0,00	0,38	0,73	0,53
Pieria	1,62	0,67	1,34	1,11	0,31	0,73	0,00	0,42	0,92	0,45
Serres	2,89	0,91	0,60	0,86	0,39	0,45	0,00	0,55	0,73	0,53
Chalkidiki	1,75	0,75	1,40	1,16	0,37	0,44	0,00	0,30	0,58	1,12
Grevena	3,19	0,63	1,69	0,67	0,57	0,45	0,00	0,31	0,81	0,78
Kastoria	1,72	1,78	0,51	0,94	0,00	0,18	0,00	0,57	0,94	0,64
Kozani	1,09	0,83	1,36	0,82	0,19	0,51	0,00	0,50	1,03	0,64
Florina	1,60	1,17	0,62	0,69	0,57	0,45	0,00	0,46	1,17	0,71
Karditsa	3,64	0,58	0,69	0,67	0,12	0,19	0,00	0,23	1,00	0,40
Larisa	2,04	0,97	0,52	0,87	0,17	0,75	0,86	0,85	1,12	0,48
Magnisia	0,97	1,25	0,93	1,08	0,07	0,63	1,44	0,76	1,01	0,90
Trikala	1,86	0,82	1,26	0,87	0,09	0,50	1,81	0,96	0,97	0,83
Arta	2,52	0,70	1,13	0,87	0,14	0,45	0,00	0,39	0,86	0,52
Thesprotia	1,60	0,60	1,31	1,17	0,00	0,50	0,00	0,52	0,95	0,71
Ioannina	0,86	0,98	1,40	1,01	0,24	0,51	0,00	0,94	1,17	0,80
Preveza	2,22	0,88	0,84	1,03	0,21	0,81	0,00	0,39	0,91	0,51
Zakynthos	2,02	0,48	1,41	1,11	0,19	0,73	0,00	0,80	0,63	0,77

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Kerkyra	0,89	0,29	1,38	1,49	0,11	0,70	2,20	0,93	0,73	0,94
Kefallinia	0,93	0,45	2,48	1,21	0,00	0,38	0,00	1,04	0,65	0,66
Lefkada	1,66	0,51	1,31	1,22	0,00	0,54	0,00	0,56	0,87	0,76
Aitoloakarnania	1,99	0,76	1,22	0,95	0,25	0,53	0,00	0,73	0,83	0,85
Achaia	1,00	0,74	1,30	1,01	0,76	0,83	0,75	0,90	1,19	0,81
Ileia	3,00	0,72	1,13	0,77	0,23	0,42	0,00	0,51	0,70	0,92
Voiotia	1,84	2,43	0,89	0,73	0,44	0,52	2,17	0,53	0,66	0,45
Evvoia	1,46	1,97	1,56	0,82	0,53	0,36	1,32	0,59	0,62	0,84
Evrytania	1,67	0,36	1,41	0,99	0,00	0,51	0,00	0,35	0,87	1,61
Fthiotida	2,08	1,18	1,23	0,81	0,30	0,53	1,50	0,65	0,97	0,46
Fokida	1,15	0,40	0,87	0,88	0,36	0,84	0,00	0,58	1,44	1,18
Argolida	1,68	0,78	1,35	1,14	0,54	0,51	0,00	0,82	0,57	0,86
Arkadia	2,07	0,73	1,55	0,82	0,33	0,64	0,00	0,44	0,89	0,58
Korinthia	2,42	1,00	1,02	0,80	0,64	0,43	0,00	0,64	0,67	1,26
Lakonia	3,83	0,58	0,78	0,69	0,55	0,54	0,00	0,48	0,55	0,64
Messinia	2,27	0,49	1,31	0,89	0,36	0,45	0,00	0,48	0,84	1,05
Attiki	0,07	1,09	0,86	1,03	1,88	1,66	0,96	1,37	1,09	1,37
Lesvos, Limnos	1,23	0,62	1,02	0,94	0,84	0,66	0,00	0,67	1,54	0,46
Ikaria, Samos	1,28	0,68	0,90	1,23	0,33	0,79	0,00	0,45	1,16	0,55
Chios	0,84	0,57	1,73	1,18	0,83	0,65	0,00	0,45	1,14	0,61
Dodekanisos	0,55	0,57	1,52	1,30	0,48	0,43	1,36	0,76	1,02	0,73
Kyklades	0,80	0,46	2,22	1,39	0,46	0,45	0,00	0,61	0,55	0,81
Irakleio	1,63	0,69	1,15	1,14	0,49	0,63	0,80	0,96	0,77	0,64
Lasithi	2,79	0,38	1,15	0,89	0,51	0,66	3,36	0,59	0,80	0,60
Rethymni	1,79	0,56	1,47	1,08	0,48	0,38	0,00	0,73	0,77	0,88
Chania	1,16	0,61	1,53	1,09	0,42	0,40	1,67	0,84	0,99	0,86

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Table 3: Location Quotient by department (with notations)

Departments	Agriculture, forestry and fishing	Manufacturing	Construction	Wholesale and retail trade, transport, accomodation and food service activities	Information and communication	Financial and insurance activities	Real estate activities	Professional, scientific and technical activities; administrative and support service activities	Public administration, defence, education, human health and social work activities	Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies
Evros	■	□	♦	♦	○	♦	○	○	●	♦
Xanthi	■	♦	●	♦	○	○	○	●	●	□
Rodopi	▲	□	□	□	○	○	○	○	●	○
Drama	●	●	●	♦	○	♦	○	□	♦	□
Kavala	●	♦	●	♦	○	□	■	□	●	♦
Imathia	▲	♦	□	♦	○	□	○	□	□	□
Thessaloniki	○	●	♦	●	♦	♦	●	●	●	●
Kilkis	●	■	□	♦	○	□	○	○	♦	□
Pella	▲	●	♦	♦	○	○	○	○	□	□
Pieria	■	□	●	●	○	□	○	○	♦	○
Serres	▲	♦	□	♦	○	○	○	□	□	□
Chalkidiki	■	□	●	●	○	○	○	○	□	●
Grevena	▲	□	■	□	□	○	○	○	♦	♦
Kastoria	■	■	□	♦	○	○	○	□	♦	□
Kozani	●	♦	●	♦	○	□	○	○	●	□
Florina	■	●	□	□	□	○	○	○	●	□
Karditsa	▲	□	□	□	○	○	○	○	♦	○
Larisa	▲	♦	□	♦	○	□	♦	♦	●	○
Magnisia	♦	●	♦	●	○	□	●	♦	●	♦
Trikala	■	♦	●	♦	○	○	■	♦	♦	♦
Arta	▲	□	●	♦	○	○	○	○	♦	□
Thesprotia	■	□	●	●	○	○	○	□	♦	□
Ioannina	♦	♦	●	●	○	□	○	♦	●	♦
Preveza	▲	♦	♦	●	○	♦	○	○	♦	□
Zakynthos	▲	○	●	●	○	□	○	♦	□	♦

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Kerkyra	♦	○	●	●	○	□	▲	♦	□	♦
Kefallinia	♦	○	▲	●	○	○	○	●	□	□
Lefkada	■	□	●	●	○	□	○	□	♦	♦
Aitoloakarnania	■	♦	●	♦	○	□	○	□	♦	♦
Achaia	♦	□	●	●	♦	♦	♦	♦	●	♦
Ileia	▲	□	●	♦	○	○	○	□	□	♦
Voiotia	■	▲	♦	□	○	○	▲	□	□	○
Evvoia	●	■	■	♦	□	○	●	□	□	♦
Evrytania	■	○	●	♦	○	□	○	○	♦	■
Fthiotida	▲	●	●	♦	○	□	●	□	♦	○
Fokida	●	○	♦	♦	○	♦	○	□	●	●
Argolida	■	♦	●	●	□	□	○	♦	□	♦
Arkadia	▲	□	■	♦	○	□	○	○	♦	□
Korinthia	▲	♦	●	♦	□	○	○	□	□	●
Lakonia	▲	□	♦	□	□	□	○	○	□	□
Messinia	▲	○	●	♦	○	○	○	○	♦	●
Attiki	○	●	♦	●	■	■	♦	●	●	●
Lesvos, Limnos	●	□	●	♦	♦	□	○	□	■	○
Ikaria, Samos	●	□	♦	●	○	♦	○	○	●	□
Chios	♦	□	■	●	♦	□	○	○	●	□
Dodekanisos	□	□	■	●	○	○	●	♦	●	□
Kyklades	♦	○	▲	●	○	○	○	□	□	♦
Irakleio	■	□	●	●	○	□	♦	♦	♦	□
Lasithi	▲	○	●	♦	□	□	▲	□	♦	□
Rethymni	■	□	●	●	○	○	○	□	♦	♦
Chania	●	□	■	●	○	○	■	♦	♦	♦

Where:

- ▲ : LQ>2
- ■ : 1,5<LQ<2,0
- ● : 1,0<LQ<1,5
- ♦ : 1,0>LQ>0,75
- □ : 0,5<LQ<0,75
- ○ : LQ<0,50

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Chart 2: Specialization in Agriculture, forestry and fishing
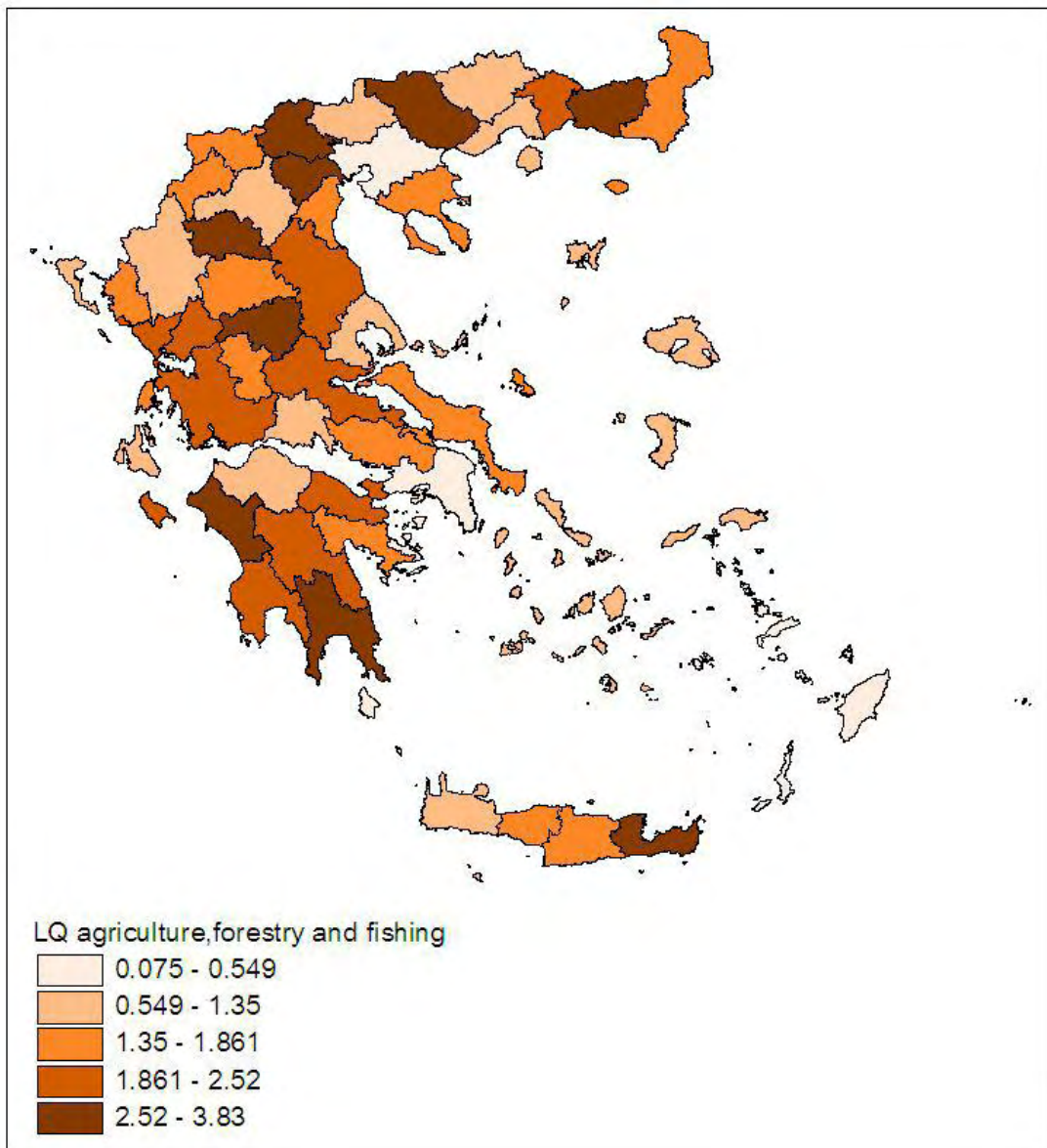
Agriculture, forestry and fishing

  In the table above we see that most of the districts (37 out of 51 departments) of the
country have high values of the index of local specialization in the primary sector
(agriculture, forestry and fishing). The highest value of Location Quotient index is
observed in the region of Lakonia. Much of its population is employed in rural farming
and agricultural production. The most common agricultural products in the region are
oranges, olives, olive oil and wine. Furthermore high prices are observed in regions of
Rodopi, Karditsa, Grevena, Ilia, Imathia, Pella and Lasithi. The index values for these
regions are considerably larger than a unit. It means that there is a strong concentration

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of economic activities in primary cultivation. On the other hand, lower prices (considerably smaller than a unit) are observed in two large regional units of the country, Attiki and Thessaloniki.

Chart 3: Specialization in Manufacturing
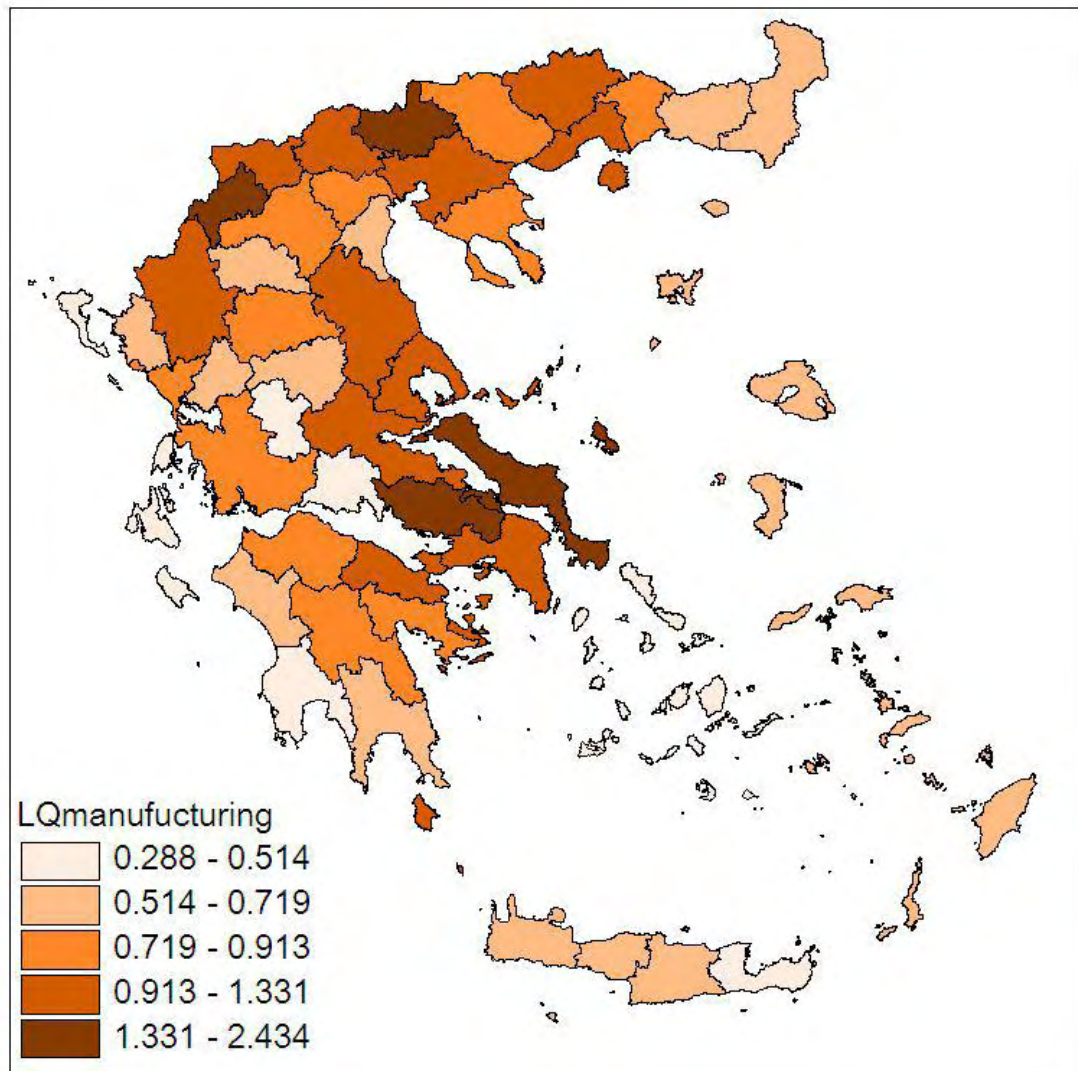
Manufacturing

39 out of the 51 departments of the country are not skilled in manufacturing. The LQ values that emerged are significantly less than unit. So, the productive system of the country is weak. The highest value of LQ is observed in the department of Voiotia. A large piece of industrial activity in Attiki (Industrial area Simatariou-Inofita) is hosted in Voiotia which explains the higher specialization and the higher number of employees. Quite high is the concentration of economic activities in the sector in the

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geographic area of Kilkis (it accommodates a large piece of industrial activity of Thessaloniki). In addition, high industrial concentration is noticed in districts of Kastoria and Evoia. In both the metropolitan and foremost industrial centers of the country, where theoretically the index should show the highest values they are marginally larger than a unit. The index gives the lowest of prices in the departments of Evrytania and Lasithi.

Chart 4: Specialization in Construction
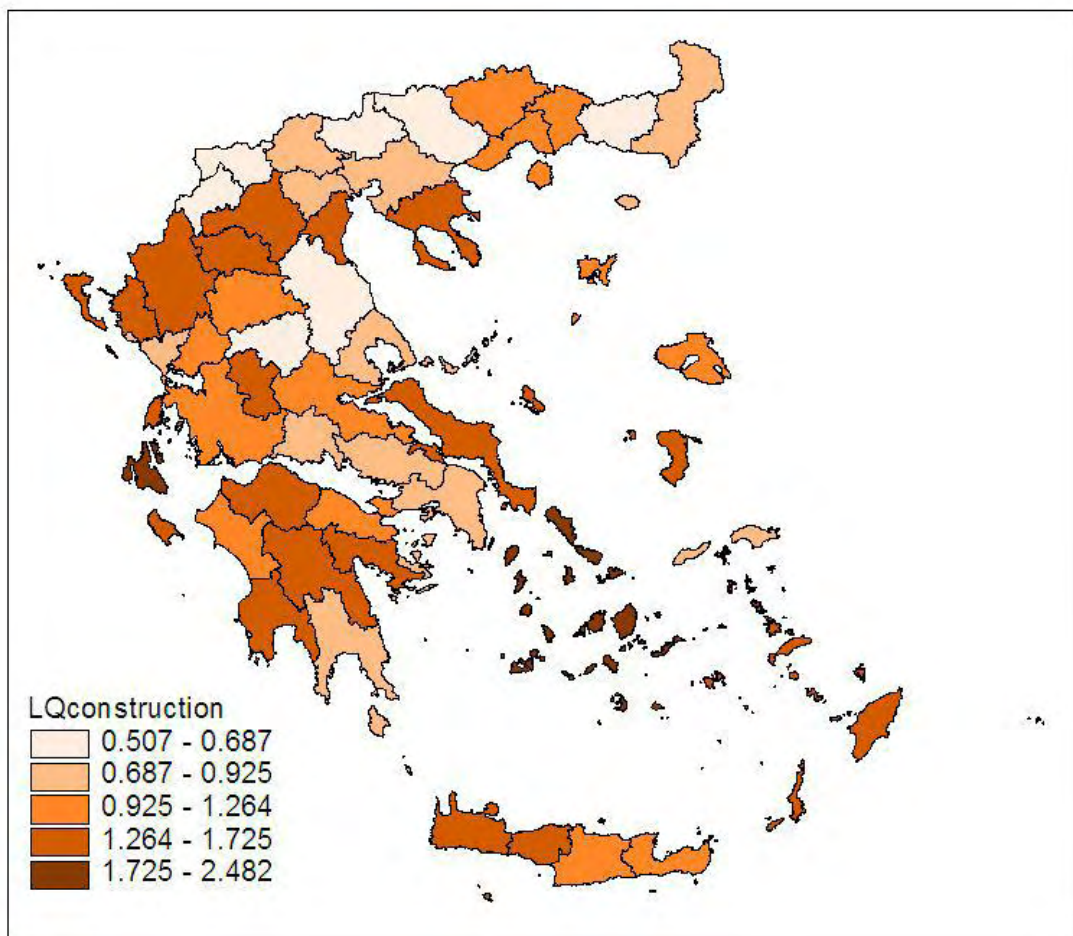
Construction

  In the construction the local specialization index does not vary greatly. The values observed in several areas are greater than a unit. There are not important differences among the department's values. In Greek islands is observed a specialization in construction. In the departments of Kefallinia, Kyklades, Chios, Grevena higher values of the index of local specialization are observed. In Kozani it is observed that there is specialization. It happens because many of the powerhouses of PPC are installed there.

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Chart 4: Specialization in Tourism
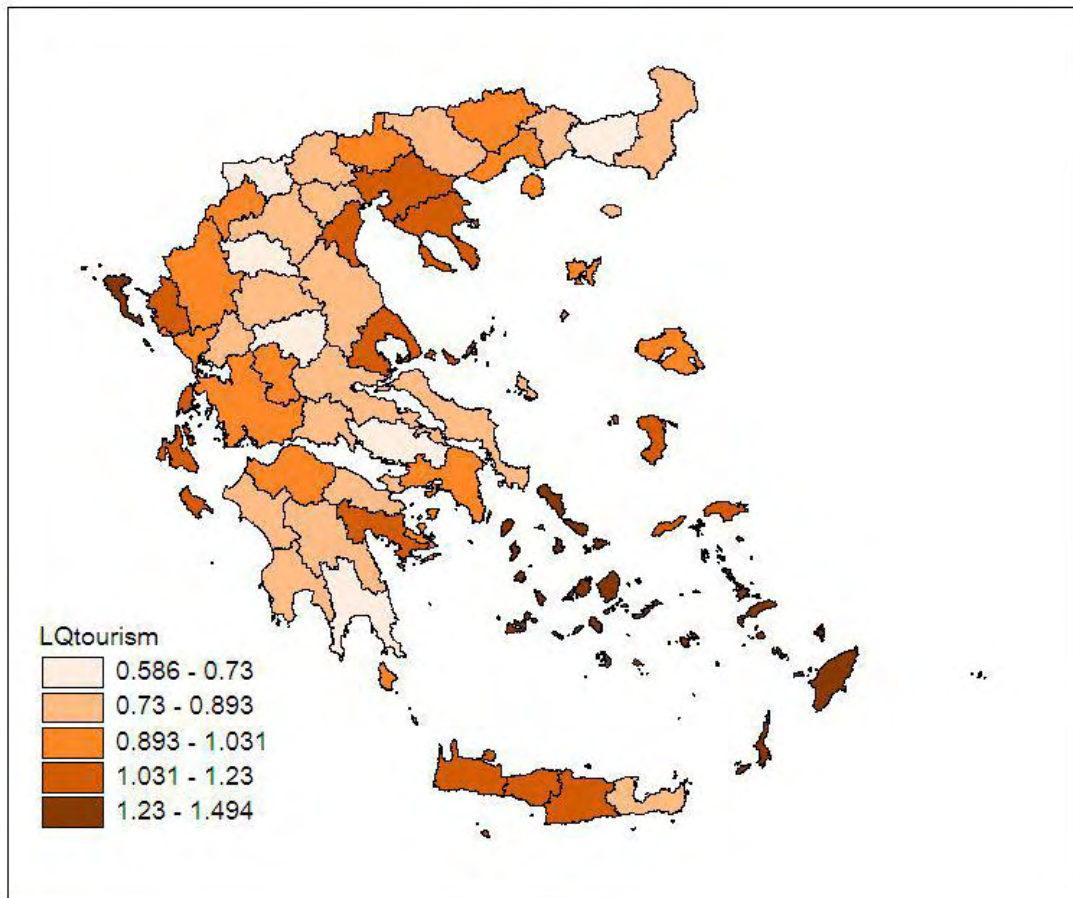
Wholesale and retail trade, transport, accommodation and food service activities

In the tourism as it was expected indeed higher prices of local specialization index are observed in the departments of the Dodekaniso and Kyklades. The Greek islands base their economies on tourism by exploiting the natural advantages of the country. Also, the climatic conditions favor the competitive advantage growth. So all the Greek islands and the coastal areas such as Thessaloniki, Pieria, Chalkidiki, Argolida and others have local expertise in tourism. The lowest rates are observed in regions that base their economy on the primary sector. These departments are Rodopi, Grevena and Karditsa.

Information and Communication

The information and communication activities in Greece are not developed. The number of employees by department is small. There is specialization only in the

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country's capital, Attiki. Even highly compared to other areas is the value of LQ index for Thessaloniki. However it does not exceed the national average and therefore shows no specialization.

Financial and insurance activities

  The highest value of LQ index unsurprisingly is observed in Attiki. No other region in the country is specialized in this field.

Real estate activity

  The number of employees on rental services is small enough for the whole country. However there are concentrations of activities in this area. The highest prices of local specialization index are observed in the regions of Lasithi, Kerkyra, Voiotia. Approximately 36 of the 51 districts are observed the LQ value close to a unit. It means that there is no specialization.

Professional, scientific and technical activities, administrative and support service activities

  No special expertise is observed in the above activities in Greece. The highest values are observed in the departments of Attiki, Thessaloniki, Xanthi and Kefallinia.

Public administration, defence, education, human health and social work activities

  The highest prices of local specialization index are observed in the districts of Lesvos, Limnos, Fokida, Evros. Even with a specialization index value LQ greater than a unit are the regions of Xanthi, Rhodope, Kavala, Thessaloniki, Kozani, Karditsa, Larissa, Florina, Thesprotia, Aitoloakarnania, Magnisia, Attiki, Lesvos, Limnos, Ikaria-Samos, Chios and the Dodekanisos. On the other hand the lowest prices are observed in the departments of Kyklades and Chalkidhiki.

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<u>Arts, entertainment and recreation, other service activities, activities of household and extra-territorial organizations and bodies</u>

The highest values of the LQ index are observed in the departments of Evrytania, Attiki, Korintho, Chalkidiki and Thessaloniki. These regions are specialized in these activities compared with the other departments of the country.

3.2.2 *SPATIAL CONCENTRATION INDEX*

Table 4: Spatial Concentration Index per economic sector

Economic activity	CL
Agriculture, forestry and fishing	0,442
Manufacturing	0,120
Construction	0,119
Wholesale and retail trade, transport, accomodation and food service activities	0,052
Information and communication	0,332
Financial and insurance activities	0,248
Real estate activities	0,240
Professional, scientific and technical activities; administrative and support service activities	0,175
Public administration, defence, education, human health and social work activities	0,071
Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies	0,151

The highest value of the spatial concentration index is observed in the primary sector (agriculture, forestry and fishing). It means that the agriculture, forestry and fishing are distributed spatially differently from all the other economic activities in the country. There are indications for spatial concentration and clusters of this economic activity. Even in the field of information and communication there is a strong spatial concentration. On the other side the activity that does not seem to have a different distribution in space is tourism, the price of which indeed is the lowest compared to other economic activities.

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3.2.3 *HIRSCHMANN-HERFINDAHL INDEX*

Table 5: Hirschmann-Herfindahl Index per economic activity

Economic activity	G
Agriculture, forestry and fishing	0,924
Manufacturing	0,113
Construction	0,049
Wholesale and retail trade, transport, accomodation and food service activities	0,298
Information and communication	0,009
Financial and insurance activities	0,007
Real estate activities	0,000
Professional, scientific and technical activities; administrative and support service activities	0,051
Public administration, defence, education, human health and social work activities	0,169
Arts, entertainment and recreation; other service activities; activities of household and extra-territorial organizations and bodies	0,034

Based on the values of the table above and the results of the Hirschmann-Herfindahl index of all economic activities of the Greek economy agriculture, forestry and fishing are unevenly distributed in the peripheral system of Greece. The emerged values directly prove the spatial concentration. All the other branches of economic activity are more equally distributed to the regional system of the country.

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3.2.4 *SPECIALIZATION INDEX- RELEVANT SPECIALIZATION INDEX*

Table 6: Specialization Index-Relevant Specialization Index per department

Departments	Specialization index	Relevant specialization index	Departments	Specialization index	Relevant specialization index
Evros	0,171	2,920	Kefallinia	0,183	2,737
Xanthi	0,144	3,472	Lefkada	0,160	3,133
Rodopi	0,318	1,573	Aitoloakarnania	0,130	3,856
Drama	0,071	6,995	Achaia	0,058	8,563
Kavala	0,053	9,475	Ileia	0,236	2,119
Imathia	0,218	2,288	Voiotia	0,247	2,021
Thessaloniki	0,105	4,748	Evvoia	0,192	2,598
Kilkis	0,127	3,949	Evrytania	0,157	3,176
Pella	0,234	2,141	Fthiotida	0,155	3,235
Pieria	0,137	3,642	Fokida	0,136	3,675
Serres	0,221	2,260	Argolida	0,151	3,321
Chalkidiki	0,179	2,793	Arkadia	0,177	2,820
Grevena	0,283	1,768	Korinthia	0,180	2,776
Kastoria	0,159	3,151	Lakonia	0,328	1,524
Kozani	0,100	4,988	Messinia	0,175	2,850
Florina	0,163	3,065	Attiki	0,118	4,227
Karditsa	0,302	1,654	Lesvos, Limnos	0,134	3,726
Larisa	0,145	3,456	Ikaria, Samos	0,132	3,791
Magnisia	0,056	8,908	Chios	0,137	3,641
Trikala	0,113	4,413	Dodekanisos	0,144	3,469
Arta	0,194	2,575	Kyklades	0,220	2,271
Thesprotia	0,139	3,603	Irakleio	0,127	3,943
Ioannina	0,065	7,712	Lasithi	0,214	2,335
Preveza	0,144	3,480	Rethymni	0,146	3,417
Zakynthos	0,180	2,774	Chania	0,086	5,841
Kerkyra	0,177	2,817			

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The specialization and relevant specialization indexes present similar effect. So, the departments which exhibit more intense specialization in a single business is that of Lakonia- Rodopi- Karditsa in agriculture, forestry and fishing, and Grevena and Voiotia in manufacturing. In other departments there is a relative diversification but not in such a pronounced degree. The regions that do not specialize in an economic activity are the regions of Kavala, Magnesia, Drama and Chania. On the other hand, the departments of Attiki and Thessaloniki are moderately specializing in a particular economic activity. These regions compared to the rest of the country due to the large number of activities they host.

3.2.5 *SUMMARY*

Greece is a mostly rural country. Both the fertile lands and favorable climatic conditions contribute to the development of primary culture. A lot of Greek employees specialized in the primary sector. The above study and the results obtained from the application of the formulas of the Location Quotient index, the Spatial Concentration index, Hirschmann- Herfindahl index, Specialization and Relevant Specialization indexes to the primary sector present a strong concentration of economic activities. Indeed, the values of these indicators for the primary sector in comparison with the others sectors of economy differ significantly. Regarding the manufacturing results they do not seem to be that favorable for Greece. It is evident that the productive system of the country is weak. There are spatial concentrations in industry but not to the expected extent to which the Greek economy can be competitive. The manufacturing employment rates are quite low. There is specialization in the tourism activities. A lot of employees mainly in Greek islands, in the two major urban centers of the country and in some isolated coastal areas are occupied in tourism. These areas that have important tourist resources and high quality human resources are more highly developed than the others (Petrakos and Saratsis, 2000). Regarding the sectors of 'Information and Communication, Financial and insurance activities and real estate activities' employment rates are low. Regarding the others economic activities there isn't important specialization. So, the amount of employees that occupied to them are low.

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3.3 <u>PROSPERITY LEVEL OF GREEK DEPARTMENTS</u>

Prosperity measures the quality of life in a society. However, the measurement of prosperity index is often difficult. In addition to the quantitative factors there are qualitative factors which should be taken into account and which are difficult to convert into numbers.

At a regional level, the per capita output (GDP) is a good indicator for measuring the prosperity of its inhabitants. However, the calculation involves a significant weakness. It's only based on reported figures of an economy rather than the actual ones because it takes no account of factors relating to the consumption. More specifically, the measurement of per capita product that produced is based on the relevant income statements for companies. So do not take into account the size of the shadow economy. There are several enterprises that evade taxes and do not declare their real income. Even some state benefits (related to health, education, infrastructure, environment and others) because they differ from one region to another may not be included in the prosperity index. For this reason, consumption data is used as the power supply for domestic use, the area of housing, the amount of deposits in bank accounts, the number of private cars and more. These figures do not include qualitative information such as quality of housing or cylinder capacity of cars. However we assume that there is a large deviation between the actual and the calculated prosperity index (Polyzos, 2011: 180-181). In the Annex 1 the values of Prosperity Index per department are included.

3.3.1 *CLUSTERS IN GREECE AND PROSPERITY*

Graph 1: Correlation between Loqation Quotient Index in Agriculture, forestry and fishing and Prosperity Index
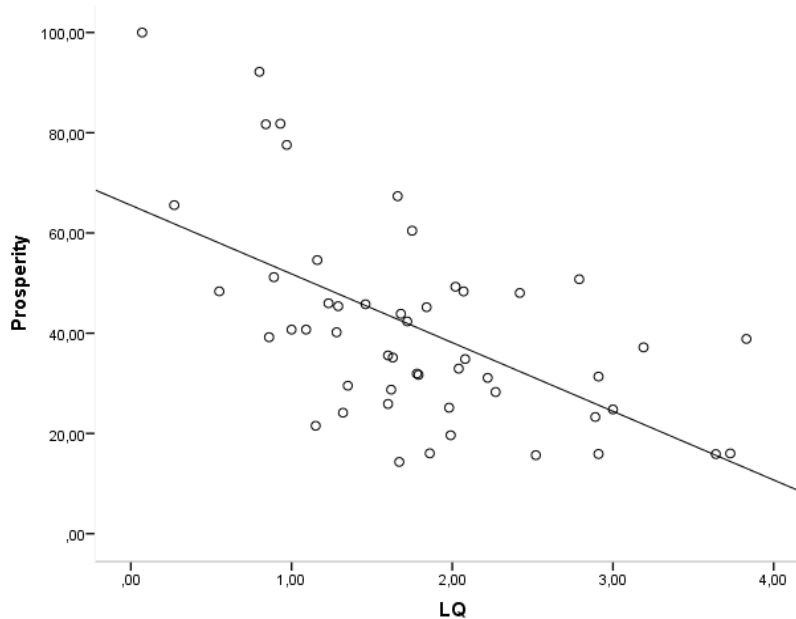
As seen from the above study the spatial concentration of economic activities in agriculture, forestry and fishing are negative correlating with the prosperity index of regions. Indeed, their increased concentration of the primary sector reduces prosperity.

Graph 2: Correlation between Loqation Quotient Index in Manufucturing and Prosperity Index

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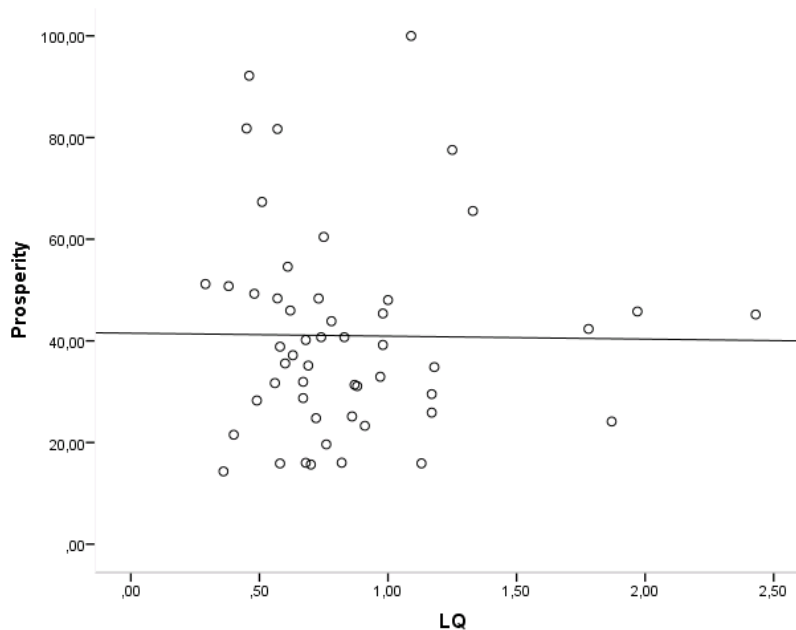
At a region the concentration of economic activities in the manufacturing does not affect its prosperity. Indeed, the more specialization increases in one region the more the prosperity level remains stable.

Graph 3: Correlation between Loqation Quotient in Construction and Prosperity Index
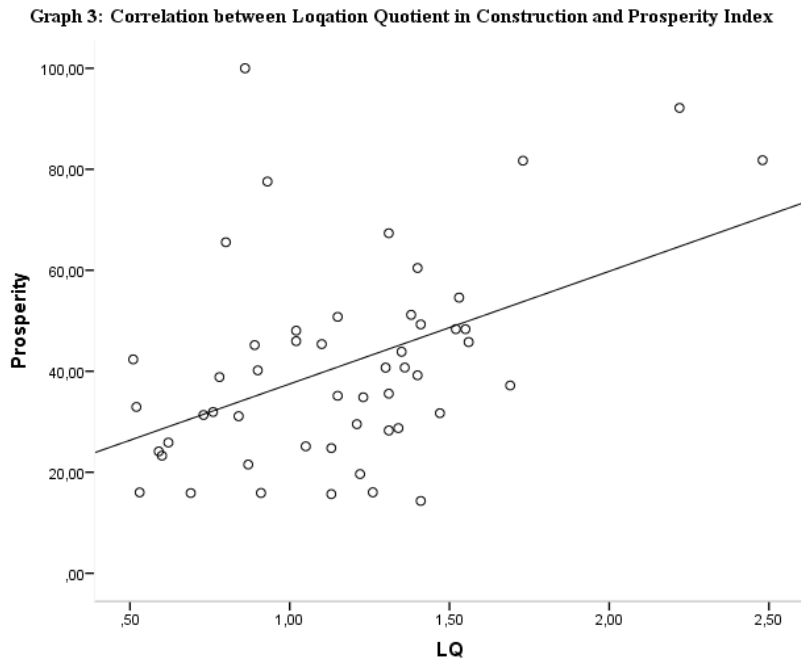
Regarding the concentration of economic activities in construction the results are different. The more local expertise increases the greater the prosperity.

Graph 4: Correlation between Loqation Quotient Index in Tourism and Prosperity Index
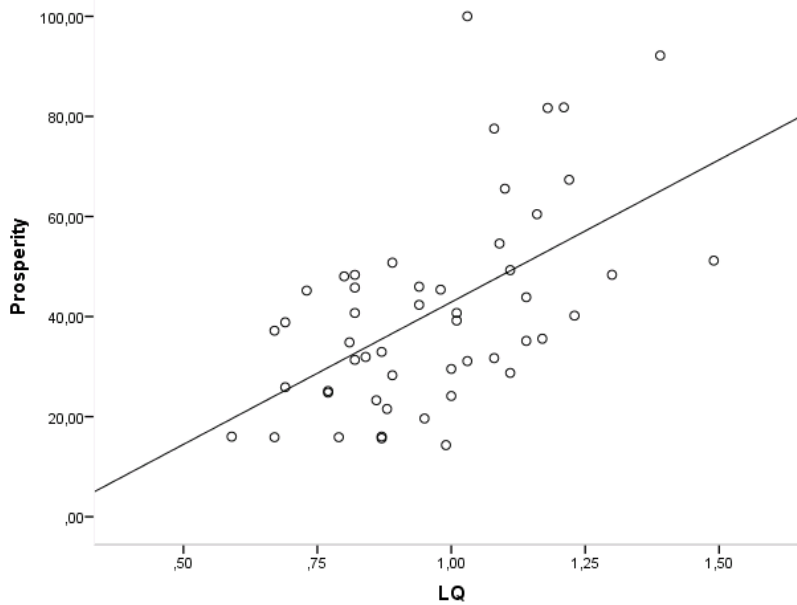
The same applies for the specialization in tourism in a region. Here there seems to be an even stronger specificity-prosperity correlation compared with the construction.

3.4 PRODUCTIVE DYNAMISM OF GREEK DEPARTMENTS

Apart from prosperity another important feature of a region is the productive dynamism. It describes the momentum of the region and the extent to which it makes use of the productive factors. There is not a clear definition of the productive dynamism of a region. In this study the values used were calculated on the basis of following:
• The change in the gross added value of the product of every county for the period 2001-2006. It is an important feature of an economy that shows the possibility of forming capital, competitiveness and to a point its prospects.
 • The inverse of the unemployment rate of every county for the period 2002-2003. It is used to indicate whether the economy utilizes the labor factor.
 • The labor productivity for the period 2003-2004, calculated as the quotient of the Gross Added Value to all employees for each county. It shows prospects that a region has for further growth and survival in the face of competition. The employment rate for the period 2003-2004, calculated the ratio of the total employed in an area to the entire population. Likewise the inverse of the unemployment rate is used to show whether the

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economy exploits the labor factor. Differences in labor productivity in geographical districts may be due to the different structure of the economy or to the amount of capital per worker, size of business, the urbanization of economies, the concentration of economic and social capital (Polyzos, 2001: 185-187). In the Annex 2 included the values of Productive Dynamism per department.

Observing the values of productive dynamism index there are significant differences between the country's regions. The highest value was observed in the regions of Lasithi, Attiki, Voiotia, Chania, Korinthos, Chalkidiki and Fthiotida. On the other hand the lower prices were observed in the regions of Drama and Imathia.

3.4.1 *CLUSTERS IN GREECE AND PRODUCTIVE DYNAMISM*

The results do not appear to differ significantly from those obtained by correlating local expertise and prosperity.

Graph 5: Correlation between Loqation Quotient Index in Agriculture, forestry and fishing and Productive Dynamism Index
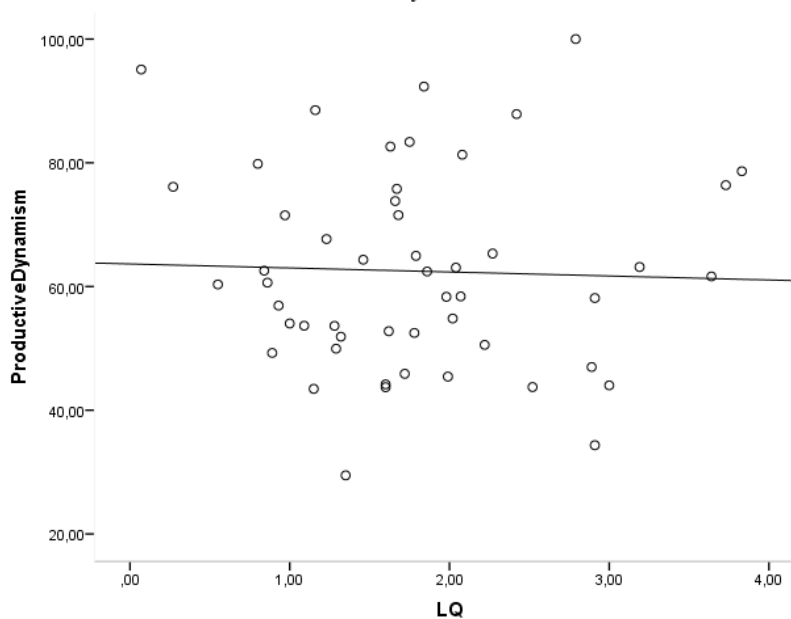
Specifically, the concentration of economic activities in agriculture, forestry and fishing does not appear to positively affect the productive dynamism of regions.

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Graph 6: Correlation between Loqation Quotient Index in Manufacturing and Productive Dynamism Index
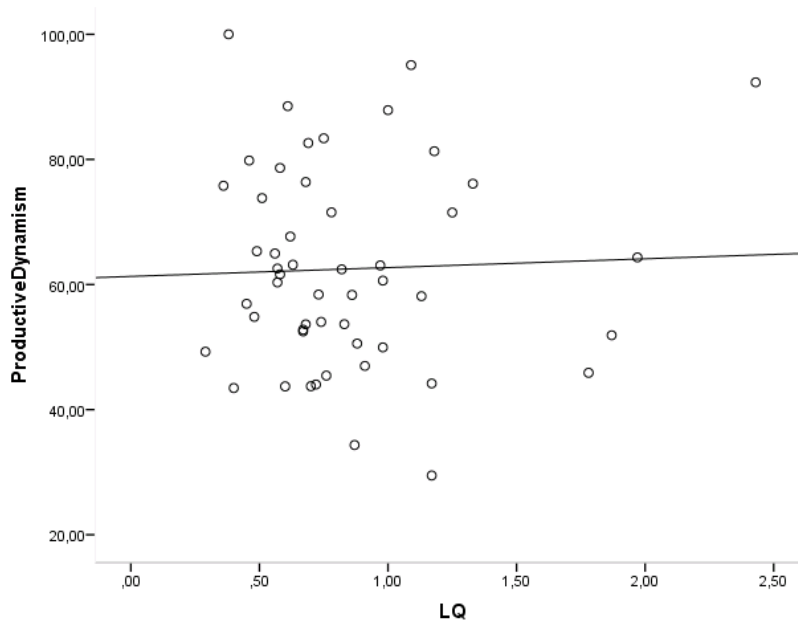

The same result applies to regions which have specialized in manufacturing. With the increasing employment rate in the secondary sector in one region and particularly in the manufacturing, the productive dynamism grows very slowly almost zero.

Graph 7: Correlation between Loqation Quotient Index in Construction and Productive Dynamism Index

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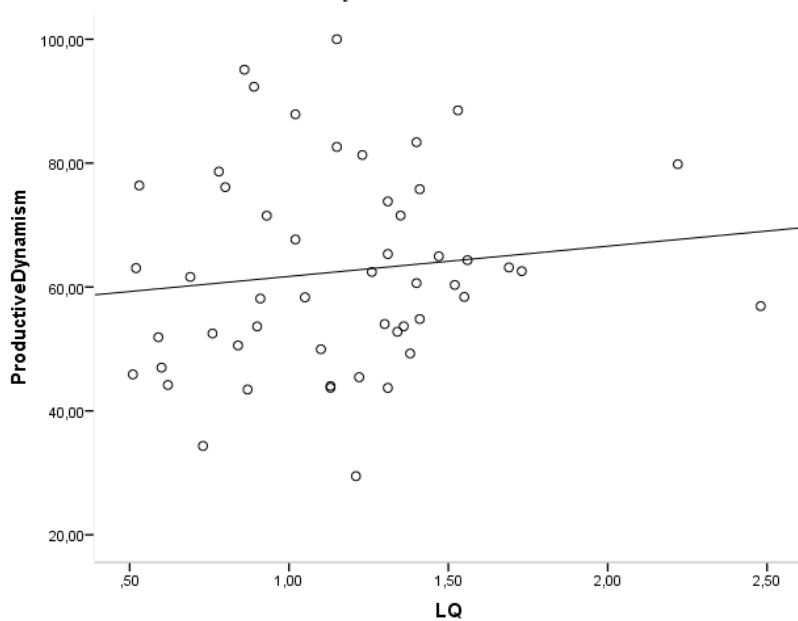
The specialization in infrastructure gives a different picture compared to the above two productive sectors. The more specialization increases the greater the productive dynamism.

Graph 8: Correlation between Loqation Quotient Index in Tourism and Productive Dynamism Index
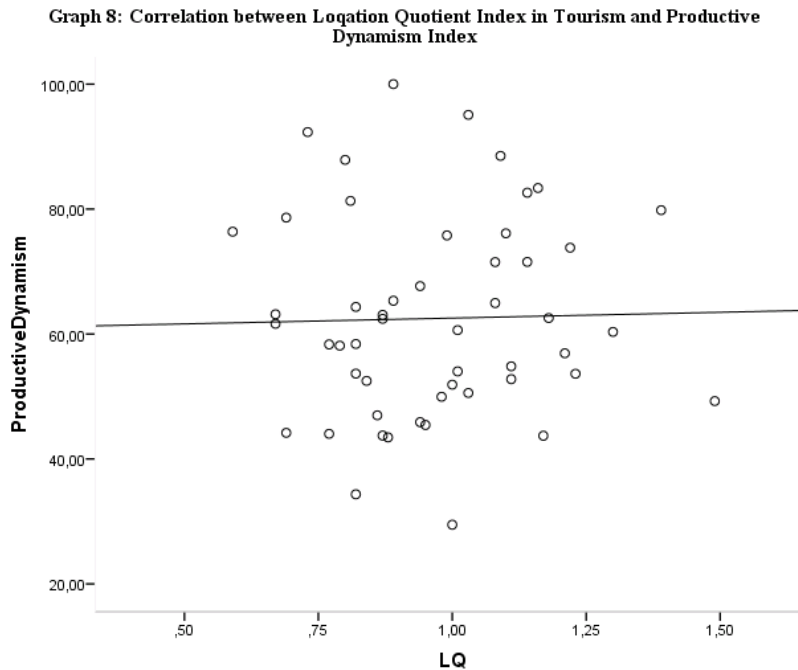
Regarding tourism the specialization in a region does not significantly affect the productive dynamism.

3.5 SCIENTIFIC TECHNOLOGICAL PARKS IN GREECE

Scientific Technological Parks were established as an institution for the first time in the US after the Second World War. In Europe the first technology park was established in the late 70s. In Greece since the early 90s we have made significant efforts to create industrial clusters that are based on innovation and the development of competitive advantage. As mentioned above the prerequisite for the creation of industrial concentration is the geographical proximity and at the moment there are 30 industrial business areas operating in our country with prospects of creating even more. Another extremely important prerequisite for the efficient operation of industrial concentration is the creation and functioning of numerous technology / science parks in different regions

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of our country. More specifically a science / technology park is an organization managed by specialized professionals with the main aim of enriching their community by promoting a culture of innovation and competition in emerging companies and knowledge institutions' (IASP).

These complexes are located in the same geographic region and seek to create technological environment and development. A technological park includes or may include the following institutions: university laboratories, municipalities, banks, research and development centers, banks, chambers of commerce, local industries and others.

The presence and their action are extremely important because it enhances entrepreneurship, supports the domestic industry, boosts the national and local economy. The operation of such units directly converts the results of Research and Development in business success. Let's see below the analytical research centers and clusters in Greece:

Technological and Scientific Park of Attica "Leucippus'

The Technology and Science Park of Attica 'Lefkipos' was founded in September 2009 on the initiative of the National Centre for Scientific Research' Demokritos'. Its facilities are located in Agia Paraskevi, Attica. Currently it is the home to 26 companies that are active in the fields of technology. All functions and actions at this time aim to link research with production and economic development not only in business but also the whole economy. The main reason of function is to support new companies which exploit innovative ideas and cutting-edge technologies. The companies located in the park are active in biotechnology, biomedicine, pharmaceuticals, information technology and telecommunications.

Science and Technology Park of Epirus

The Science and Technology Park of Epirus was first established in 2003. Its main activity is the incubator services offered to new businesses. For this reason it has offices which are fully trained in conventional and electronic equipment. Today it hosts 15 companies in its incubator.

Science and Technology Park of Crete

The Science and Technology Park of Crete has been operating for 20 years. It was established at the initiative of the Foundation for Research and Technology for the support of entrepreneurship of the island. It directs new businesses through the services, it provides and helps unleash the technology startups through facilities and incubator services provided.

Technological Cultural Park of Lavrion

Established at the initiative of the National Technical University in 1992 it replaced the old French Mining Company of Lavrion. Restoration work began in 1995 with European and national co-financing. It is a body of scientific research and development, training, education, business and culture. The main function of reason is the connection of research carried out at the National Technical University of Athens with the needs of the businesses. It specializes mainly in areas such as information technology, electronics, robotics, laser technology, telecommunications and other. Therefore it is the only technology park in the region of Attica which specializes in areas of applied technology. Today it hosts at its premises 22 institutions and enterprises.

Patras Science Park

It is a 'special structure' organization which creates mechanisms and provides services. It works as an incubator for start-ups based on knowledge and innovation. It offers significant advantages to hosting businesses. It provides important infrastructure, support services, interfaces with respective parks abroad and professors of the University of Patras. The main objective of the operation is to create a business area that is based on innovation in the region of Western Greece.

Center Research and Technology Thessaly

It was established for the first time on November 10, 2001. The main objective of the operation is to improve the quality of life and economic prosperity of the inhabitants of Central Greece. It brings together researchers from different parts of the country with a view to finding solutions to major issues the region is facing. It consists of 4 different

institutes in the region of Thessaly. More specifically, these institutes are located in Volos, Karditsa, Larissa and Trikala.

Mechatronics Institute (IMTRONICS)

It is headquartered in the area of Volos. Specifically mechatronics deals with a combination of various disciplines such as Information Technology, Electronics and Engineering to manufacture products that will be useful in manufacturing, medicine and agriculture. It mainly specializes in producing products that are technologically advanced and greatly facilitate human life. These products are based on wearable technologies. More specifically, it produces products which significantly facilitate the lives of people with disabilities, agriculture, multidimensional mobility machines, information systems, biomedical technology, energy systems, new environmental technologies, the production of new 'smart' materials and construction and others. The technologies used to produce the above are based on computer networks, telecommunications and sensors.

Institute of Technology and Management of Agricultural Ecosystems (ITEMA)

Headquartered in the region of Karditsa. The main objective of the operation of the laboratory is the study of the causes and treatment of diseases at a molecular level in medicine, veterinary medicine and agronomy. Besides the main laboratory there are similar ones which support additional activities in the production of drugs.

Institute of Biomedical Research and Technology (BIOMED)

Headquartered in the region of Larissa and founded in 2007. The main objective of the operation is the basic and applied research in Medicine and Biology. It seeks to discover new innovative methods for early diagnosis of diseases which hitherto could not be diagnosed immediately. Furthermore, it targets the discovery of new drugs to treat these diseases. The Institute of Biomedical Research and Technology contributes important work in the health sector and is composed by leading scientists. It is the birthplace of innovative research projects.

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Institute of Human Performance and Rehabilitation (PerfoTech)

 Headquartered in the region Trikala , it is the only institute with such specificity. The main objective of the operation is generally to improve the quality of human life and in particular the improvement of physical performance through physical movement. The purpose of the operation of the Institute of Human Performance and Rehabilitation is the combination of various disciplines such as biochemistry, industrial human motion and physiology. Its operation is very important for people as they daily benefit from its results. Through continuous research and development new methods of treatment and support result as new diagnostic devices are discovered.

 National Center for Research and Technological Development

 The National Research and Development Centre was first established in 2000. It is a subsection of the Technology Park. The main objective of its operation is production based on research. Its research contributes to the production of innovative products and services in the areas of telematics, pharmacogenetics, biomedical informatics, biomedical engineering, telecommunications and others.

 Technopolis Thessaloniki

 Technopolis Thessaloniki is a High Technology Enterprise park. It was founded by the Association of IT Companies of Northern Greece. Its existence helps to promote innovation and entrepreneurship not only in Thessaloniki and Northern Greece but also across the country. The incubator Technopolis is subject to this park and offers complete incubator services.

 Corallia Clusters Initiative

 Corallia cluster represents the first organized body for the development of clusters in Greece and its operation is based on innovation and growth. It is a technological cluster. It creates integrated ecosystems bringing together donors, corporations, government agencies, research institutions, research institutes, technology transfer organizations and more. Although its operation counts a few years, several products have already been

produced in the market efficiently. It's headquartered in Athens and specifically in Maroussi. This cluster hosts fifteen foreign companies twelve of which are Greek. The remaining three are subsidiaries of large US companies. The workers employed in this cluster count up to five million. Two million out of these are employed in Maroussi and the remaining three million are employed in other Greek cities. Over 80% of its total sales are available in foreign markets.

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CONCLUSIONS

In this study, pay special attention to the presence of industrial clusters in the Greek space in regional units. There was a thorough study of the existing bibliography and some formulas for their quantitative measurement were given. The key feature upon which this specialization was made was the geographical concentration of economic activities in the same industry. Clearly there are clusters and concentrations of economic activities but not in an organized and cooperative action that we know from the international bibliography. The structure of the Greek economy is weak to support any kind of such effort.

Theoretically while there is a large number of a small and medium enterprise there isn't the mindset to promote cooperation and trust that are required in an industrial cluster. Usually these small and medium-sized businesses do not give the Greek economy specialization and a competitive advantage to be able to survive in the ever increasing competitive global economic environment. These are mainly characterized by defensive survival policies, lack of confidence, lack of risk taking in adopting new innovation and caution on new collaborations not only at an international and national level but also at a local level. Therefore, most of them are unable to adapt to the constantly changing environment and cannot survive long. More specifically, the conclusions reached are that although the biggest part of the Greek population is employed in the tertiary sector more concentrations are observed in the activities of the primary sector. In manufacturing there are few concentrations and therefore few clusters. Suggesting that in 2010 two years after the outbreak of the financial crisis of 2008 the productive system of the country is weak. Regarding specialization in manufacturing there are not statistics available in districts units. There are concentrations in construction in several regional units. There are mainly in the two major urban centers and in several islands. In the tertiary sector and more specifically in tourism increased specialization is noticed in the islands.

In the above study there was additionally a correlation of these industrial clusters with two very important features of Greek regions, prosperity and productive dynamism. In both cases we concluded that concentrations of economic activities in agriculture, forestry and fishing and in manufacturing do not significantly affect the level of

prosperity and quality of life or the productive dynamism of regions. In contrast to the above, the concentration of economic activities in construction and tourism positively affect the prosperity and productive dynamism.

In summary, in the past few years Greece was unable to exploit the opportunities that were given with its input in the European Union. Untapped resources that flowed into the country, weakness of exploitation of immigrants who have entered are just some of the mistakes made. Greece is a country which has many advantages compared with other European countries and beyond due to its geographical position. The competitive advantage that came from the fact that the Greek country is surrounded by the sea gives it the opportunity to develop tourism to the most. What is missing is the essential organization. It may not have the major European and international clusters and lag quite much but significant efforts have started being made both through the different technological and educational parks and incubator services offered to new businesses and the investigations conducted by the universities. So the development of industrial clusters mainly in the tertiary sector and more specifically in tourism which will be based on innovation and the development of a unique competitive advantage contributing to the development of individual local economies can be an important gate way out of the crisis.

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Annex 1:

Departments	Prosperity Index (time 2005)	Departments	Prosperity Index (time 2005)
Evros	31,93	Kefallinia	81,80
Xanthi	25,13	Lefkada	67,34
Rodopi	16,01	Aitoloakarnania	19,64
Drama	29,53	Achaia	40,71
Kavala	45,38	Ileia	24,79
Imathia	31,35	Voiotia	45,19
Thessaloniki	65,55	Evvoia	45,78
Kilkis	24,13	Evrytania	14,32
Pella	15,90	Fthiotida	34,84
Pieria	28,74	Fokida	21,53
Serres	23,28	Argolida	43,87
Chalkidiki	60,45	Arkadia	48,34
Grevena	37,18	Korinthia	48,03
Kastoria	42,35	Lakonia	38,85
Kozani	40,73	Messinia	28,27
Florina	25,88	Attiki	100,00
Karditsa	15,88	Lesvos, Limnos	45,97
Larisa	32,93	Ikaria, Samos	40,18
Magnisia	77,56	Chios	81,69
Trikala	16,03	Dodekanisos	48,35
Arta	15,67	Kyklades	92,16
Thesprotia	35,57	Irakleio	35,14
Ioannina	39,20	Lasithi	50,77
Preveza	31,10	Rethymni	31,70
Zakynthos	49,28	Chania	54,59
Kerkyra	51,18		

Source: (Polyzos, 2001: 182)

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Annex 2:

Departments	Productive Dynamism	Departments	Productive Dynamism
Evros	52,49	Kefallinia	56,91
Xanthi	58,34	Lefkada	73,82
Rodopi	76,38	Aitoloakarnania	45,44
Drama	29,47	Achaia	44,02
Kavala	49,95	Ileia	92,32
Imathia	34,34	Voiotia	64,33
Thessaloniki	76,12	Evvoia	75,79
Kilkis	51,89	Evrytania	81,31
Pella	58,13	Fthiotida	43,45
Pieria	52,77	Fokida	71,54
Serres	46,98	Argolida	58,4
Chalkidiki	83,37	Arkadia	87,87
Grevena	63,16	Korinthia	78,64
Kastoria	45,89	Lakonia	65,33
Kozani	53,67	Messinia	95,09
Florina	44,18	Attiki	67,68
Karditsa	61,63	Lesvos, Limnos	53,64
Larisa	63,05	Ikaria, Samos	62,56
Magnisia	71,52	Chios	60,34
Trikala	62,42	Dodekanisos	79,82
Arta	43,74	Kyklades	82,62
Thesprotia	43,72	Irakleio	100
Ioannina	60,62	Lasithi	64,96
Preveza	50,57	Rethymni	88,52
Zakynthos	54,83	Chania	
Kerkyra	49,26		

Source: (Polyzos, 2001: 187)

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