Ceramic Tile District of Castellon

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0. INTRODUCTION

0.1. Justification of the issue studied

The Spanish ceramic sector is the first European exporter and the second largest exporter, which means for the Spanish economy 14,500 direct jobs and positions itself as the third industrial sector that more surplus fund brings to the country's trade balance.

The motivation for this project is focused on the impact of this sector on the economy and the importance of knowing how, thanks to the way of working within an industrial district, competitiveness and innovation are enhanced by interactions between agents and relationships cooperation.

The concept of industrial district has been extensively studied and has great relevance within the theoretical framework of research on the functioning of local production systems. It is a great opportunity to deepen this economic phenomenon and find out how companies, through inter-organizational relationships, achieve competitive improvements and generate knowledge and learning, key concepts for innovation.

0.2. Objectives

This study aims to explain the theory of industrial districts based on several factors to the reader, first conducting a historical tour in order to analyse the evolution undergone by the concept, to understand the changes that have happened in theoretical terms, as well as the different approaches that have been given to this topic when studied. On the other hand, it seeks to analyse the characteristics of the companies that make up the ceramic industrial district of Castellón and their inter-organizational relationships in order to understand how they work and how their actions impact.

0.3. Structure and methodology of work

The methodology used for the performance of this work has been the use of secondary sources of information as specialized books, reports related to the industrial district and technical articles on ceramics and its situation and characteristics.

The structure of the work is based on three main blocks: first a theoretical analysis of the concepts of industrial district, reviewing the most important authors and their differences together with other considerations, a very similar one, used by the most of the authors: the cluster. This distinction has been made in order to enlighten the reader the differences between these two concepts and to testify because the Castellón ceramic region is considered as an industrial district and not a cluster.

Secondly, there has been a study on innovation since it is one of the most important characteristics of the industrial district: its ability to generate and distribute knowledge. For it, we have made a theoretical analysis of innovation and classes, as well as a study on innovation within the ceramic industrial district of Castellón.

Finally, we find the central part of the work, the study on the characteristics of the industrial district, its data and its members, dividing them into different groups to visualize the difference actors and their characteristics.

CHAPTER 1. Industrial Districts

Introduction

The main objective of this chapter is to explain to the reader the concept of Industrial District. For it, it is divided into several sections: first we conducted an analysis of the origins of the origins of this economic idea, by following the ideas of the economist Alfred Marshall and later the ideas of Giacomo Becattini, considered the engine of the current Industrial District, as well as the interpretations of the most contemporary scholars.

To carry out this section several secondary sources have been reviewed. First, CajaMar publications, a collection of articles specialized in industrial districts and their characteristics, the authors find between specialized economists Molina Herrera, Soler i Marco Bellandi, Lazzeretti or Molina (2008) authors, which have helped us, understand the impact of industrial districts in the economy and its beginnings. From there we have used the studies by the proponents of this idea, Marshall and Becattini, in order to understand in depth their ideas.

Second an analysis of a similar concept, Cluster, driven by the English economist Michael Porter, was performed in order to witness the differences between the two concepts.

This first chapter seeks to define these two concepts which, although similar, have significant differences that will help us to refer to how the local production system of ceramic in the province of Castellón is not a cluster but an industrial district based on the importance that the geographical situation and tradition in the manufacture of ceramic tiles have on the territory.

1.1. Industrial District. Beginning

1.1.1. Alfred Marshall

Industrial District concept first emerged thanks to the English economist Alfred Marshall (1842-1924). He was a professor at the University of Cambridge (1885-1908) and he became an economic reference with the publication in 1890 of his major work Principles of Economics, which reflected concepts of the classic economy like wealth, production, capital and work and linked them to notions by the Marginalist School such as utility and marginal utility. As an innovation, these classic production agents added a new coefficient: the industrial organization.

In his book, *Principles of Economics*, Alfred Marshall exposed from the beginning the importance of knowledge for the production and the need for an organization to optimize such knowledge. "Knowledge is our MOST powerful engine of production; it enables us to subdue Nature and force her to satisfy our wants. Organization aids knowledge; it has many forms, e.g. that of a single business, that of various businesses in the same trade, that of various trades relatively to one another, and that of the State providing security for all and help for many". (Marshall, 1920, p.115)

Based on this organization, Marshall wields two different ways to achieve increasing returns in the industry: first the concentration of large companies with vertical integration, having them power over the input and output as well as the entire value chain.

The other route that includes the author is the existence of a territory in which a significant number of small businesses compete and cooperate; it is a concentration of very specific types of specialized industries. Unlike large companies whose business covers the entire production process, such associations are made up of business networks.

The concept of business networks first appears thanks to the British economist Ronald Coase (1910-2013) in his article *The Nature of the Firm* (1937). Coase explains that "when you want to operate a transaction in a market, you need to research contractors, providing certain necessary information and establishing the conditions of the contract, in order to conduct negotiations to put in place a real market, to establish a control

structure of the benefits respective obligations of the parties, etc."[1] With all these, companies create links between them, thus achieving a relationship of trust and strategic partnership that translates into a competitive advantage.

Resuming the arguments of Alfred Marshall, a concept related to these strategic alliances, the "industrial atmosphere"[2], arises. In *Industry and Trade* (1919) Marshall argues that the binding of different companies in the same sector in the same geographical location would establish this "industrial atmosphere", creating and transmitting common knowledge, confidence and then respect, all carrying to win contracts and thus leading to a reduction in transaction costs and an improvement in the value chain of the companies forming such an atmosphere creating what Marshall calls a "sense of belonging", not only with other organizations but also with society, political economy and institutions seeking not only the benefit or economic welfare but also the social, this being the turning point that differentiates the industrial district of the cluster, which will be discussed in depth in later chapters of this study.

We must remember that there is no single form of organization, so the study of industrial districts is important, since it emerges as a new concept, knowledge creation and dissemination within the Industrial District. To deepen this new concept we divide the organization. According to Marshall, there are three forms of productive organization within the Industrial district: first the individual company, in second place substantial companies in the same sector and finally companies from multiple related sectors.

First, we will analyse what the individual company implies within the industrial district. The individual company is responsible for knowledge creation either through work routines, research or investment that the company individually carries out either with relations existing with their environment or with suppliers. The customers of a company also are a source of important knowledge creation.

On the other hand, when we talk about companies in the same sector we must remember that there is no single form of productive organization and every company works differently to achieve, in this case, the same or similar objectives. Repetition and imitation of processes results in a "Organizational Learning", a concept widely studied

1 Coase R. (2005). *L'entreprise, le marché et le droit, éd. d'Organisation*, p. 23.

that emerged thanks to two experts from the theory of organizations, Cyert, M. and G. March, who, in their book *Behavioral theory of the Firm* (1963) tell us how organizations learn through decisions of its members and through adaptation to changes in their environment. If this is moved to the theory of industrial districts, we can argue that those companies form them learn thanks to the variety of choices and increased competition arising within districts, forcing organizations to improve to survive.

Finally, we will find companies that work jointly although they belong to different, although interrelated, sectors. In such associations there is often a specialization in a part of the production chain. This forces the alliance between different companies and the result is not only an output, it is also a way of contrasting, sharing and assimilating knowledge that they have reached individually, giving rise to new forms of innovation and learning.

The principles of Alfred Marshall on industrial districts remained in the background until the late 60s, when several Italian economists observed that an alteration in its industrial fabric was happening to pass from large companies to specialized areas where small businesses converged. As we can see in the following table, there was an increase in these types of groups, creating business networks such as the area of northeastern Italy and Lombardy, Piedmont and Emilia Romagna, where currently 50 % of industrial districts in Italy are.

1.1.2. G. Becattini

As we said in the previous point, during the late twentieth century there was a change in the Italian industrial fabric. Among the economists who portrayed this fact, there was Giacomo Becattini. G. Becattini is considered the engine of the modern industrial district since he rescued the writings of Alfred Marshall and applied them to the Italian reality, explaining why and how was the birth of these industrial districts.

Becattini (1991) defines an industrial district as "a socio-territorial entity characterized by the active presence of both a community of people and a group of companies in a natural and historically determined area". Thanks to this new definition of industrial district we can distinguish differences in the theoretical studies of A. Marshall. In the first place, Becattini shows us the industrial district not as a productive zone, but as a

part of the territory where production and partnership converge with all that it entails: values, institutions and tradition. They are areas where a specific production has traditionally been established, creating a sense of belonging in that territory.

Other authors have explored the idea that there is a direct relationship between the territory and the district. These include Harrison (1991), Crewe (1996) and Russo (1997), where the main idea of Becattini that the industrial district goes beyond an agglomeration of businesses but it is a community of people who can be identified by the idea of "embeddedness" is clear (Granovetter, 1985), a concept that serves to detail the relationship between the economy and the institutions, economic or non-economic. According to Granovetter, there are two meanings of embeddedness: first the fact that the theory that states that economic behaviours are independent social actions is wrong. Secondly he discusses the advantages of information and knowledge through social networks, being this the cause of achieving a trust that will lead to reduced costs making "economic transactions generate social ties" (quot. in Della Giusta, 2001: 56).

Luciana Lazzeretti, Professor of Economics and Business Management from the Faculty of Economics of the University of Florence (Italy), argues that culture and tradition are two essential factors for the economic development of a region and that without the existence of that "socio-territorial entity" defined by Becattini innovation and knowledge creation are more difficult. Lazzaretti (2008)[3] urges to understand the region where the industrial district is set as a strategic variable for economic growth, together with the institutions, innovation and technology.

As I will explain in subsequent points, the advantages for both the industry and the region due to the existence of this socio-economic synchrony has become clear, but I see advisable, within this theoretical introduction, to make a mention of another idea very similar to the industrial district economic one: the cluster, because I believe that this will help discern the importance the ideas by Becattini have in the current economic situation and especially in the ceramic industrial district of the province of Castellon.

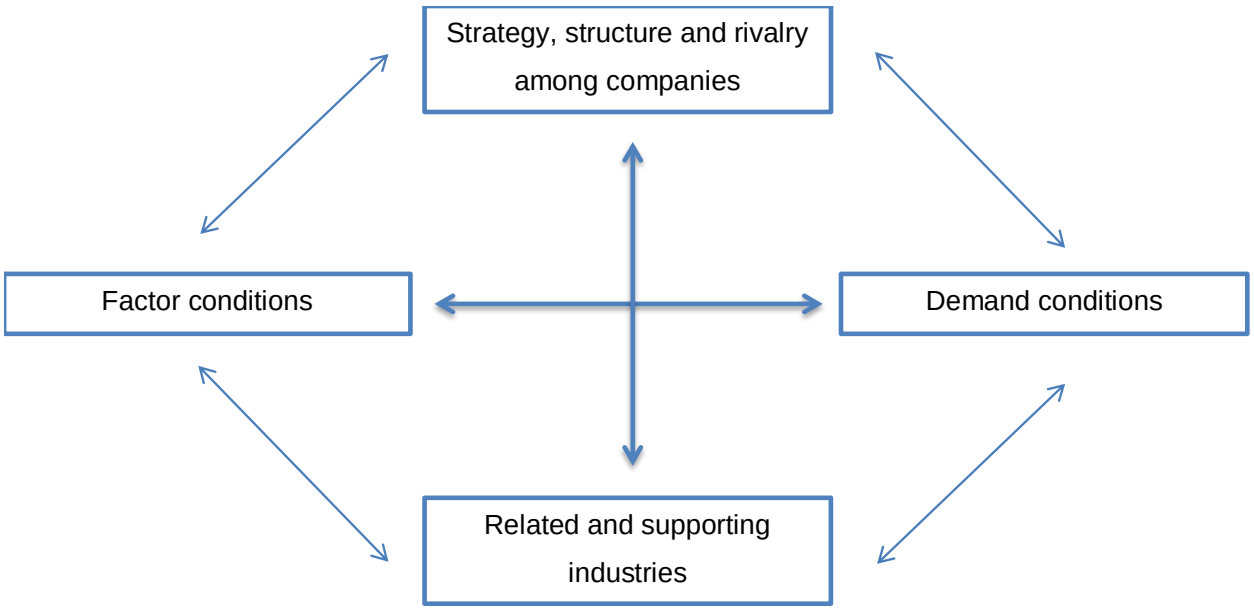
[3] Cooke, P. & Lazzaretti, L. (2008): *Creative cities, cultural clusters and local economic development*. Cheltenham, Edward Elgar

1.2. Industrial District vs Cluster

After analysing the historical path that has occurred in the concept Industrial District, we should delve into another approach related to the economic development of the industrial zones. As we have seen in the previous section, Becattini, takes the concept of Industrial District to a new philosophy, arguing in his book Dal settore industriale al distretto industriale (1979) that its existence is determined by the binding of certain socio-cultural characteristics, this being a community that contributes to the existence of this district and not vice versa.

The cluster concept was born thanks to Michael Porter in his book *The Competitive Advantage of Nations* (1990), where he stated that "clusters are geographic concentrations of companies and interconnected institutions acting in a particular field". But, unlike the ideas of Becattini, the social aspects of the territory where industries are located do not have significant relevance, but he focuses on finding the competitive advantage of business groups. In order to explain the factors of competitive advantage of clusters, Porter (1990) designed the "diamond" model, in which, as seen in the example, each apex is a basic factor that characterizes the competitiveness of the cluster.

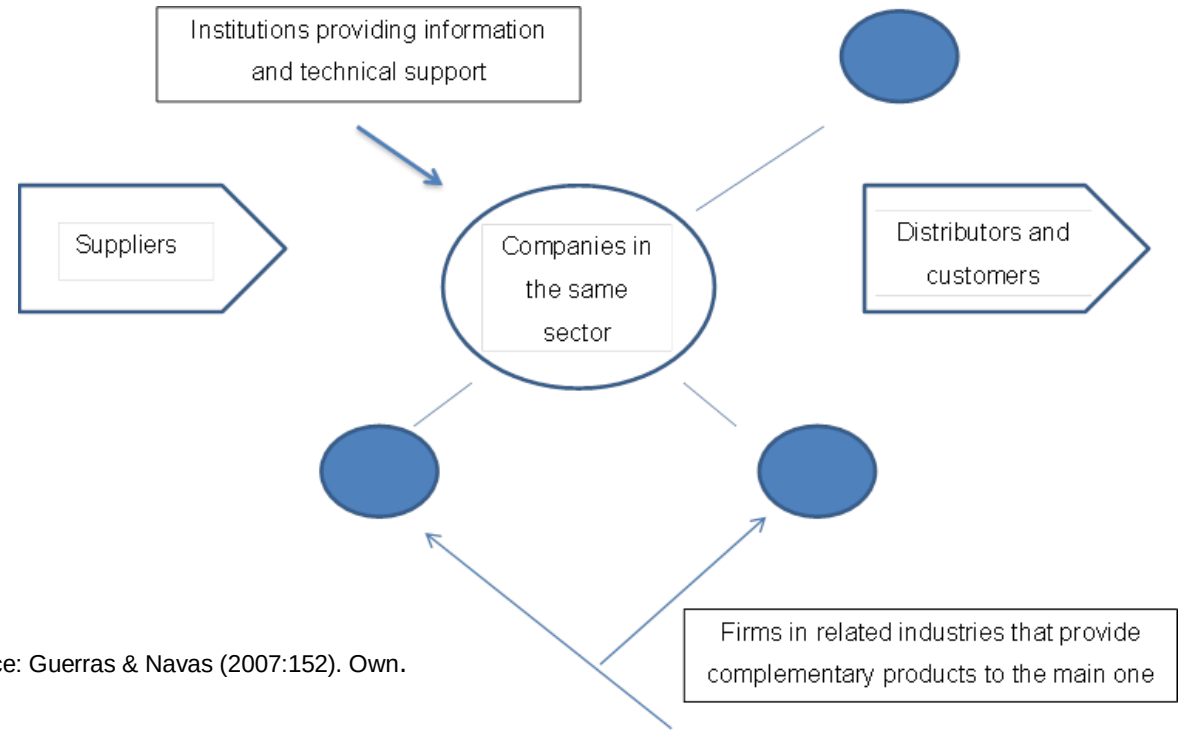
Figure 1: The determinants of the competitive advantage



Source: Based on Porter (1990): *The Competitive Advantage of Nations*

Within this system where competitiveness is the most important factor there are different agents deployed in the same geographical area that help achieve this competitive edge.

Figure 2: Kinds of cluster agents



Source: Guerras & Navas (2007:152). Own.

According to Porter, the competitiveness of the cluster depends on several factors. The most important are (Porter, 1999: 220-231):

- ✓ Increased productivity. The increase in businesses related to the cluster depends on the access to the place where these resources are. This depends on the location of the cluster as it is: the faster the acquisition, the greater effectiveness in reducing waiting and production times and costs. On the other hand, the proximity to suppliers leads to the creation of ties and greater confidence giving rise to greater access to information and innovation.

- ✓ Creation of new businesses. We should note that cluster entry barriers are low, giving rise to the entry of new companies. This leads firms to enter these increasing competitions and improving training. A very important factor for the introduction of new companies is funding. There are multiple public and private organizations that focus on subsidizing the entry of new companies; for example we find Innovative Business Groups Program (AEI) by the Ministry of

Industry, energy and Tourism (MINETUR), launched in 2007, part of the European strategy for promoting competitiveness through the creation and development of innovative clusters.

Other examples at European level can be found in the following table:

Table 1: Cluster Initiatives in Europe

Aachen Centre of Competence for Medical Technology – AKM (Germany)
BioM Biotech Cluster Development GmbH (Germany)
Cluster auto-mobilité (Belgium)
Oresund Science Region (Denmark)
Ubiquitous Computing Cluster Programme (Finland)
Aerospace Valley (France)
Cluster Wood & Technologies (Italy)
Cluster Quality Butchers of South Tyrol (Italy)
ICT Pomerania (Poland)
Biocluster Madrid (Spain)
Kista Science City (Sweden)
Northwest Automotive Alliance (UK)
Scottish Enterprise Life Sciences Cluster (UK)

Source: Compiled from information on "The Competitiveness Network - TCI". Support factors for the emergence of the Industrial Districts

These data are closely related to the third decisive factor for the existence of Porter Cluster.

- ✓ The boost to innovation. In his research on competitiveness in innovative regions (Porter, 1998, 2001), he emphasizes in the fact that in the current global economic system acquiring physical, technological and human resources is easier, but geographical location such as the proximity to a seaport, natural sources of energy or resources are not as significant as in the past. At present, relations of rivalry, trust between companies or flow of information that a local environment can provide the organizations with are competitive advantages with longer durability over time and therefore they are a major stimulus for innovation.

Conclusions

Once studied the origins of the Industrial District and the significant differences between this and the economic theory of Cluster, we can conclude with different relevant aspects:

- The productive tradition in a specific location encourages the emergence of new firms entering within the district, since the districts "self-generate" resources.
- The Industrial District is a competitive advantage over companies that are not found within it, thanks to networks of trust and cooperation between the different actors.
- The institutions of local, national regional ambit which support the district are a key factor transmission of knowledge.
- Members of the industrial district create cooperation networks and relationships that help innovation and technology diffusion, achieving a competitive advantage.

In the second part of this work, and once we have analysed the theoretical characteristics of the industrial district, we must get into one of the most important factors: its capacity for innovation; how belonging to an industrial district encourages the emergence and expansion of knowledge.

CHAPTER 2. Innovation and knowledge in Industrial Districts

Introduction

The purpose of this chapter is to explain the concept of innovation and knowledge within the theory of industrial districts. Given the current economic situation, an indisputable reality arises: innovation is an essential factor to survival not only of companies, but also of the productive sectors. In this chapter I seek to explain how the innovations have influenced in industrial districts, their evolution and future prospects. On the first point I'll analyse the types of knowledge and innovation pathways that can lead organizations to achieve competitive advantage. Finally I'll analyse different studies that testify how the ceramic industrial district of Castellón encourages innovation and technology diffusion through its relations and cooperation between them.

2.1. Conceptual aspects of innovation and knowledge

To discuss innovation in economic matters we must appoint Joseph Schumpeter (1883-1950), an Austrian-American economist who introduced intangible factors within the production function of an industry, away from the neoclassical theories based on mass production, the emphasis in the purpose and results, the division of labour, discipline, unity of command, unity of direction, subordination of individual interests to the general interests or the hierarchy or Scalar Chain according Fayol (1841-1925).

Schumpeter was perhaps the economist who, during the first half of this century most contributed to the understanding of industrial innovation and its importance in the dynamics of economic growth. In the eyes of Schumpeter, the innovative activities are the most important force of capitalist growth.

Among his most important books we can find his *Theory of Economic Development* (1912), which tells us that growth is seen as the result of changes in the promoter activity in innovation activity. For him, the competition for "new products" and "new processes" matters much more than price competition. According to his research, "in the nature of innovations is implicit vertigo to undertake major changes to make great leaps. The best way for a nation to be better off in the future is assuming definitely that only by innovating we can become the most prosperous countries".

Knowledge has become one of the main elements to achieve competitive advantages, not only for business, but also for public institutions and for society in general, so there has been a change in business mentality regarding management knowledge, understanding innovation as knowledge turned into products, services or processes.

According to the Oslo's manual (OECD; 2005) [4] innovation is defined as "the introduction of a product, process, marketing method or new or significantly improved internal organizational practices over existing".

As we read in the work of Drucker (1958) *Innovation and entrepreneurship*, there are two types of innovations: those that are outside the company, external, and those occurring within the organization, internal.

On the other hand, the ability of the company to innovate depends on two factors: first providers, because in many cases is what gives the possibility to access new technologies or, conversely depend on demand, according to their needs.

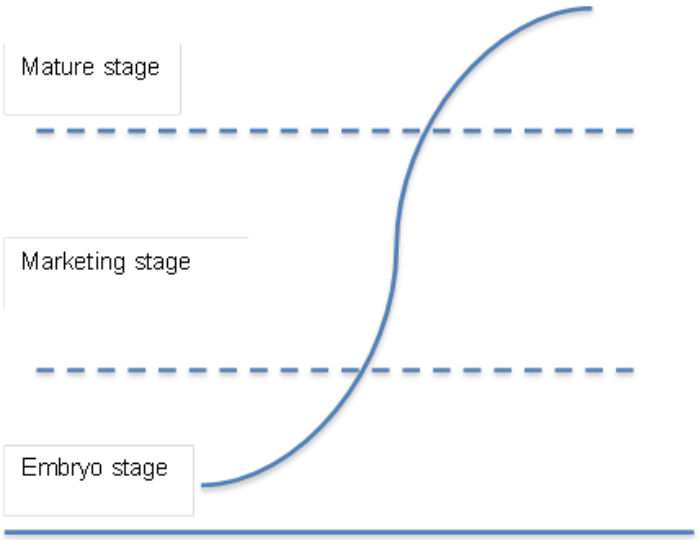
As for the types of innovation we can speak of two results:

- ✓ Radical innovation: innovations that represent a new business for the company as it is a change or introduction of a new product or service.
- ✓ Incremental innovation: that innovation in which value added is created by integrating improvements to an existing product.

Technological innovation is essential to the issue at hand in this work, the ceramic industrial district of Castellón, and companies also have a life cycle which is divided into three stages: embryo, growing or marketing and maturity, being the dynamism of the industry in charge of not letting the technologies be obsolete with the introduction of continuous improvements and innovations within the system.

[4] The OECD is a forum where the governments of 30 democracies work together to address the economic, social and environmental challenges that globalization makes them face.

Figure 3: Curve “S” Technological maturity



Source: Steele (1989) and Alfonzo and others (2002)

In the book *Game Rules* (Alfonso, 2000) we find the assumptions that "invasive" technology replaces a "dominant" technology, what implies a major change within the district. This process is coined as "Technological Discontinuity" and we will see it reflected in the next section on the ceramic industrial district of Castellón with the introduction of a new innovation: inkjet technology.

2.2. Innovation within the ceramic industrial district of Castellón

As we will see afterward, the ceramic industrial district of the province of Castellón consists of multiple actors that will be developed in more detail in the next section. Among them we must differentiate among affiliated companies, specialized companies, integrated companies and finally local institutions.

Many experts have studied the relationships between the components of the ceramic industrial district of Castellón and the diffusion of technology; among them we find Albors, J. and Molina, X. (2000) with their study on *The diffusion of decentralized inter-organizational innovations. The case of the ceramic industry*[5]. In it we can see how, under the theory of innovation systems based on networks, exchange of knowledge of routine and discontinuous nature happens, a concept coined by Dyer & Singh (1998) as "Knowledge sharing routines". This concept refers to routines that are performed in production processes and help produce a shared knowledge, assuming an inter-organizational learning.

These routines were described by Grant (1997) as "regular patterns of interactions within the companies that allow the transfer, recombination or creation of specialized knowledge". A key factor for this type of behaviour of is the evolution of the production of ceramic tiles. We must consider that this is a young industrial district and only 10 % of them have more than 35 years old and because of it during the 80s a very significant growth occurred, coinciding with technological advances of great importance from Italy that changed the manufacturing method.

The inter-organizational learning that the authors expose is largely due to the relationships the different member actors establish between them in the industrial district as well as its capacity for technological absorption, therefore innovation within the ceramic industrial district of Castellón is discontinued innovation, with the peculiarity that extends and spreads to all members through informal channels, being the “spillovers” of these innovations very important, as Molina ensures (2002), in the way of working of the ceramic industrial district of Castellón.

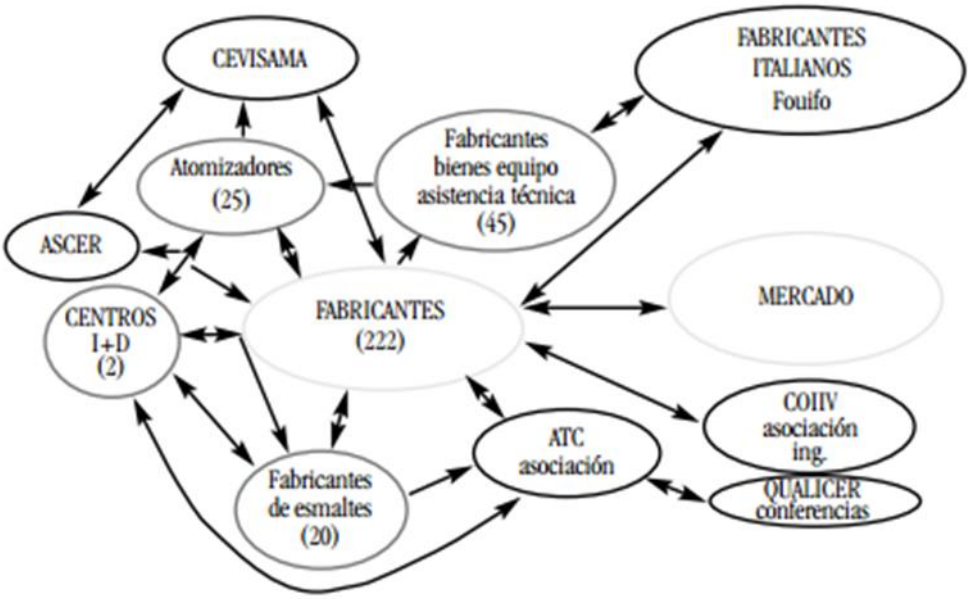
According to Nicholls-Nixon (1995) technological absorption is defined as "the ability or competence to identify, assimilate and exploit technological knowledge or know-how of

[5] Published on Revista Valenciana d´Estudis autonomics, vol.VII nº 33

the environment". As we read in the article, the technological capacity depends on the relationships one has with the outside: suppliers, customers or competitors; economic activities of enterprises.

In the following figure we can see how the district components exchange information, compete and cooperate within the same geographical area thus creating this technological absorption.

Figure 4: Components of the Spanish ceramic industrial district



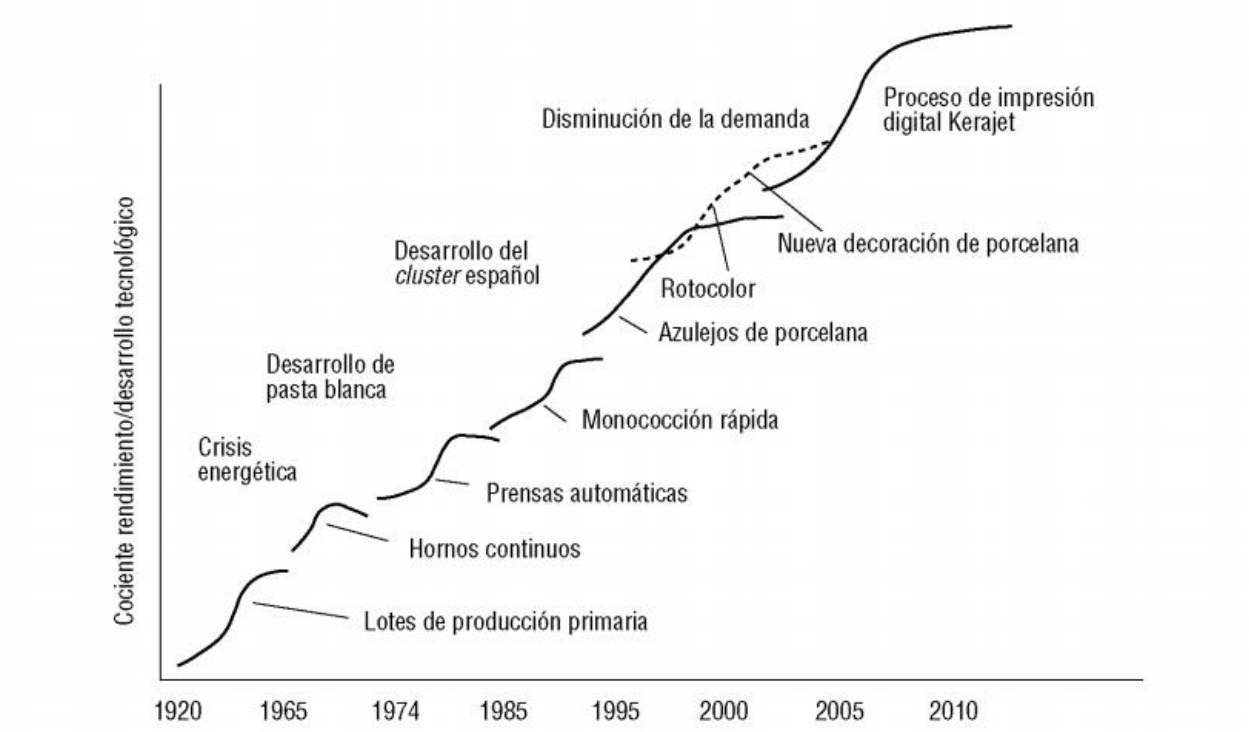
Source: Albors, 1999

With this illustration we can see how in reality there are relations not only between manufacturers and suppliers, or the association of Italian manufacturers and the manufacture of machinery, but, as the authors point out, there are other types of relationships that promote exchange and development of innovation and new technologies, which are those relationships between companies and professional associations with research institutes and training of professionals in the sector.

A problem which the companies of the ceramic industrial district have to face is the technological discontinuity. As we have seen in the preceding paragraph, technological discontinuity is the creation of a new technology that represents a drastic improvement within the district itself, creating new niches market, reducing costs or creating new

skills. In the following graph we can see the curves of technological discontinuity that have been in the ceramic industrial district of the province of Castellón.

Figure 5: Technological discontinuity for the ceramic industry



Source: Albors, 2002

Conclusion

After analysing the theoretical aspects of innovation and technology and translating them in the present case, the industrial district of Castellón, we can conclude that this system favours the creation and dissemination of technological innovation, as we can see in the figure 5, a clear example of how, through cooperation and technology diffusion companies improve together reaching new goals and seizing the opportunities offered by these technological discontinuities.

In order to know in depth the ceramic industrial district of Castellón, in the next chapter we will be able to see examples of such partnerships and networks of trust.

CHAPTER 3. Structure of Industrial District of Castellón

Introduction

After analysing in a theoretical way the route that investigations on the phenomenon of industrial districts have taken over time, I consider it important to analyse the industrial district of Castellón.

3.1. Background and identification of Castellón ceramic district

Much has been studied since 1979 Giacomo Becattini expanded, in the *Rivista di Economia e Politica Industriale*, opening a new vision on industrialization and production clusters. The concept of Industrial District is introduced in Spain in 1980, at that time the Spanish researchers sought ways to identify industrial districts in the Spanish territory differing from the Italian methodology, created by the ISTAT (Instituto Nazionale Italiano di Stadistica) (1996), and based on the approximation of the definition of industrial district and its basic characteristics. The Spanish researchers realized that this methodology could not be compatible with the identification of the Spanish Industrial District, as an industrial census was not available and there was no data on labour mobility between different municipalities. Ybarra (1991) is the promoter of studies on the ID in the Valencian territory, being the first to identify the crowds that traditionally had been formed, thanks largely to the resources of the area and the natural passage of time, which had led to the creation of links between organizations. In his studies, supported by the census by the Ministry of Industry (1975-1986) Industrial Movemen", Ybarra identifies 170 municipalities that meet the definition of Industrial District. Other authors like Soler (2000), Carpi (1997) or Giner and Santa María (2002) have studied this phenomenon.

But, as in other sections we have pointed out, what sets the Industrial District and the Cluster is the geographical and social tradition that an industry has in that territory. We talk about social tradition because of its importance to the community surrounding the industrial district, its population, institutions and other companies.

Before focusing on the ceramic industrial district located in the province of Castellón, it is necessary to create a chronology of the different types of industrial districts that have

been and are in Spain. As Ybarra noted, there three types of industrial districts in our country, differentiated according to time and their characteristics.

First those industrial districts whose historical characteristics have led carry out its activities in a particular territory, leading to specialization. Industrial District are treated with a productive geographical tradition; clear examples of it are footwear, toys or textiles in the Alicante area. Second, we must talk about industrial districts that had to adapt to one of the most important events, not only for the Spanish economy but for society in general: the entry of the Spanish economy in the competitive world with its opening to the outside. We should note that tradition and specialization was no longer enough to compete in foreign markets.

Finally we have the third Industrial Districts generation, that related to new technologies or more advanced processes that result in local production systems (LPS). As we have noted in previous sections, these LPS are the basis of the Spanish Industrial Districts, since one of their characteristics is their composition: they are formed by many small businesses, both those whose production process corresponds to the general activity of the Industrial Districts and auxiliary companies which provide to those producing companies, although also the supporting and auxiliary organizations.

This analysis will be studied in depth in later sections in order to attest that indeed there is a ceramic Industrial District in the province of Castellón. Its origins date back to the early eighteenth century. In Alcora, in 1727 the building of the Royal Factory of China & Porcelain was carried out. In the nineteenth century, industrialization began in Onda, becoming, in the first decade of the twentieth century, one of the major industrial centers of the Valencian Community.

Arabs had already devoted themselves to this industry in Onda. Factories “La Campana” and “El León” fire in their ovens 90,000 pieces per month, and export two million tiles to Latin America. The main export market for these products is Barcelona, following this Andalusia, the Americas and North Africa, whose ports of Casablanca and Larache receive a huge amount of mosaics. (Sarthou, 1913: 793-794)

Table 2: Factories, production and ceramic workers in 1983 in Castellon

Municipality	Factories	Annual m2 production	Workers
Alcora	53	31.171.000	2.459
Onda	39	28.105.000	2.341
Vila-real	14	24.236.000	1.808
Castellón	11	21.243.000	1.337
Almazora	8	5.091.750	525
Nules	5	3.650.000	319
Betxi	5	3.577.000	396
San Juan de Moro	6	3.285.000	500
Ribesalbes	11	1.898.000	240
Figueroles	4	1.788.500	224
Lucena	1	1.465.000	180
Burriana	1	1.465.000	250
Borriol	2	1.277.500	112
Vilafames	4	730.000	244
La Pobla Tornesa	1	657.000	37
Atzaneta	1	365.000	37
Fanzara	1	365.000	7
TOTAL	178	130.369.750	11.046

Source: Compiled from data by Membrado (2001: 339) and Andar per Ceramiche

As we read in the book *La industria cerámica de la Plana de Castelló*, by J. C. Membrado (2001), in the early 80s a "second industrial restructuring" is produced, whose main feature is the introduction of innovations such as mono-firing systems, thanks to which production time could be reduced, being more productive this way. Another of the major advances suffered by the industry was, first, segmentation and specialization that lived with innovations in production itself, such as pavements, opening to a more traditional market with old and artisan ceramics and coatings and sockets. Another change was the diversification of production, with the emergence of related and complementary industries such as glazes, moulds, designs or furniture. On the other hand, large business groups that coalesced all processes of the value chain of production and created economies of scale and made continuous learning innovation possible emerged.

Currently, the Industrial District identified by Ybarra (1991) of wall and floor tiles is the driving force of the economy of the province of Castellón, conglomerating more than 90 % of the national production. It encompasses 25 municipalities at 30 kilometers, where are 109 manufacturing companies are emplaced, among we should highlight Alcora with 33 companies and Onda with 27, being the two municipalities responsible for 55 % of the production of pavement and the highest number of sectoral services in the industry. It is a geographical area that not only brings together the companies responsible for production, but also the components needed for manufacturing and business associations, technology centres and institutions.

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Figure 6: Map of the ceramic industrial district in Castellón

Source: Instituto interuniversitario de Desarrollo local, Economy Department. Universidad Jaume I

3.2. Data from the Industrial District

According to the Spanish Association of Manufacturers of Ceramic Tiles (ASCER) in 2015, the Spanish ceramic sector produced 440 million m2 being the first European producer's total sales amounting to 3,095 million euros. Currently Spain is the first European exporter and the second largest Spanish economy assuming for 14,500 direct jobs and position itself as the third industrial sector that more surplus contributes to the country's trade balance. In the following table we can see the evolution that has taken the industry from 2011 to the present in both production and sales.

Table 3: Production and sales in the sector

	2011	2012	2013	2014	2015
Production	392	404	420	425	440
Domestic market sales	705	575	557	574	643
Export	1892	2082	2240	2328	2452
Total sales	2597	2656	2793	2902	3095

Sales in million euros and production in million square meters

Source: Compiled from data by ASCER (2011-2015)

To analyse the table we consider it important to make a brief introduction about the situation experienced by the sector during the economic crisis that began in 2007, year in which, according to the ASCER trade association, the sector of Spanish floors, occupied by 90 % in the Castellón province exported to 177 countries, producing 584.7 million square meters. This meant a drop of almost 10 % of production compared to previous years. In the following table we can see the evolution from before the crisis and during it:

Table 4: Figures in the ceramic sector from 2002 to 2010

	2002	***2003***	***2004***	***2005***	***2006***	***2007***	***2008***	***2009***	***2010***
Production	605,7	583,4	595,5	609,2	608,4	584,7	468,2	324,4	
Domestic market sales	1584	1379	1500	1609	1799	1871	1460	918	1747
Export	2582	1939	1977	2041	2183	2295	2211	1673	801
Total sales	4.166	3318	3477	3650	3982	4166	3671	2591	2548

Source: Compiled from data by ASCER (2002-2010)

As we can see, the effect of the crisis on the sector has been devastating. We must bear in mind that the main consumer of ceramic tiles is the construction sector, the hardest hit by this crisis.

According to INE data from the beginning of the crisis over 40,000 construction companies have closed and 30,000 of other promoters. The following table reflects the process:

Table 5: Number of enterprises by economic sectors

	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Total	590.756	732.767	746.644	685.688	740.544	708.159	647.394	632.178	608.924	603.853
Industrial	242.310	244.359	245.588	243.729	230.301	220.935	214.992	206.585	200.835	198.004
Construction	448.446	488.408	501.056	441.959	510.243	487.224	432.402	425.593	408.089	405.849

Source: Compiled from data by ASCER (2006-2015)

As we can see, there is a sharp drop in the number of companies engaged in industrial activity, many of them for the effects of the crisis that has forced many to move to other countries seeking to reduce costs, which has led to a relocation of the Spanish industry.

In the case of the ceramic industrial district located in the province of Castellón, this phenomenon has been isolated, partly because of the very existence of the District, since being located within it is a competitive advantage for companies that would lose the contact and the proximity which lead to tacit learning and innovation, as we have seen in previous sections.

Regarding foreign trade, the Spanish ceramics sector is present in 186 countries. As seen in the table 3, the exports have been increasing since 2011, having in 2015 with a value of 3,095 million euros, assuming 80 % of its global turnover, with the remaining 20 % of sales for the domestic market.

According to data provided by ASCER, the most important destination countries are:

Table 6: Spanish exports by geographical areas and countries

Areas	Fee
Europe	44,60 %
✓ European Union – EU28	36,50 %
○ EU 15	30,50 %
○ Eurozone	24,60 %
✓ Eastern Europe	6,80%
Middle East	21,70 %
America	12,70 %
✓ North America	7,90%
✓ Central America	2,50%
✓ South America	2,20%
Asia	25,40 %
✓ East and Southeast Asia	3,20%
Africa	16,40 %
✓ Maghreb	10,70 %
Oceania	0,90%

Source: Compiled from data by ASCER (2015 balance sheet)

As noted in the table, the main recipient countries are in Europe, specifically France is the country that more exports Spanish ceramic, and these exports have grown by 4 % compared to previous years. Markets where exports have reduced the most have been the Middle East and Asia, mostly due to socio-politic situations. With respect to previous years, we can see an improvement of 3 %-4 % in each year. It is pointed out in the following table as well as its evolution over territory.

Table 7: Exports by Spain (2012-2015)

Areas	2012	2013	2014	2015
Europe	1.029,10 €	1.041,50 €	1.078,40 €	1.088,70 €
✓ European Union – EU28	734,20 €	734,50 €	742,00 €	890,00 €
○ EU 15	627,70 €	618,30 €	664,10 €	737,40 €
○ Eurozone	544,00 €	530,00 €	552,20 €	601,70 €
✓ Este de Europa	262,20 €	277,40 €	248,60 €	167,00 €
Middle East	465,40 €	493,50 €	484,70 €	530,00 €
America	213,00 €	230,40 €	246,00 €	309,10 €
✓ North America	120,70 €	135,90 €	149,60 €	193,10 €
✓ Central America	37,80 €	41,40 €	45,50 €	61,30 €
✓ South America	54,60 €	53,10 €	51,00 €	54,60 €
Asia	536,50 €	574,90 €	565,50 €	620,30 €
✓ East and Southeast Asia	59,80 €	67,30 €	70,30 €	78,60 €
Africa	289,10 €	379,20 €	421,00 €	400,10 €
✓ Maghreb	190,20 €	263,30 €	284,10 €	261,00 €
Oceania	13,70 €	13,70 €	17,40 €	23,10 €

Source: Compiled from data by ASCER (2012-2015 balance sheets).

3.3. Productive process

In order to make an optimum analysis of the different agents and companies that carry out the production process, it is important to consider carrying out a description of the different stages that make up this transformation to finally be able to point the companies responsible for carrying it out.

According to the Spanish Association of Manufacturers of Ceramic Tile and the website Ceraspaña, the manufacturing process of ceramics at present is divided into several phases: first the selection and preparation of raw materials, secondly dry pressing using hydraulic presses, third enamelling, in which application methods used depend largely on the final product sought; these are: curtain, spray dry or discolorations. Finally we find the final stage of the production process, the firing. The most widely

used technique is quick firing by using mono-layer roller ovens. This methodology has allowed companies to reduce the cooking time to 40 minutes.

Once the treatment is completed, we can distinguish different types of ceramic tiles:

- ✓ Tiles: the usual designation of ceramic tiles characterized by a production process based on the absorption of a large amount of water, and dry and glazed pressing. We can talk about:
  - ⊙ Red paste tile.
  - ⊙ White paste tile.

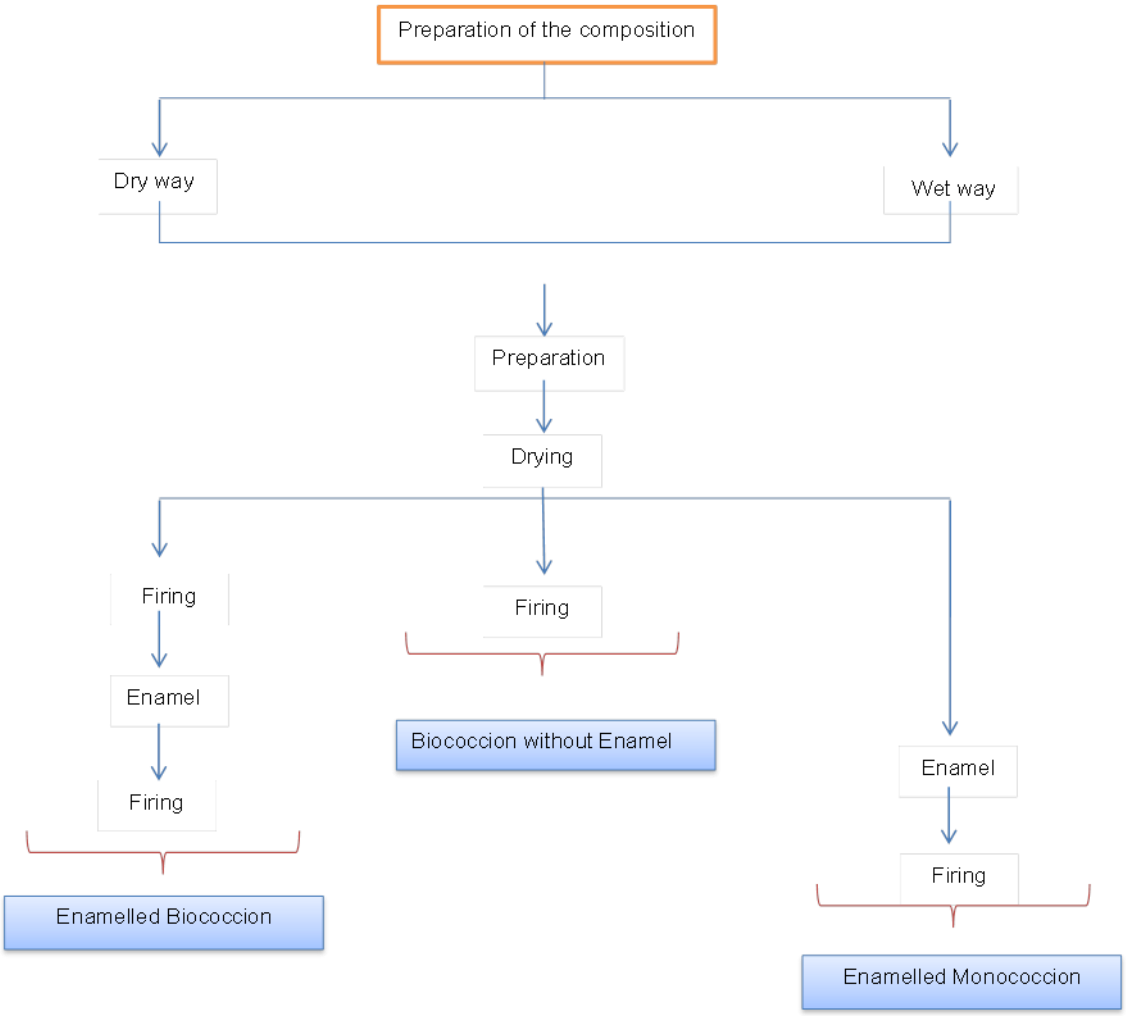
- ✓ Floor tiles: the most common grade for ceramic tiles, whose peculiarity is the low or low-medium absorption of water, dry pressed, glazed and produced by mono-firing. We can talk about:
  - ⊙ Glazed stoneware tile, red paste.
  - ⊙ Glazed stoneware tile, white paste.

- ✓ Porcelain tiles: ceramic tiles these differ from the previous ones by having a very low water absorption, dry pressed or lesser amount, extruded, glazed and unglazed or mono- manufactured by cooking. We can talk about:
  - ⊙ Technical porcelain stoneware (other)
  - ⊙ Technical porcelain stoneware (polished)
  - ⊙ Technical porcelain stoneware (natural)
  - ⊙ Glazed porcelain stoneware
  - ⊙ Extruded porcelain stoneware

These are the three most common types of ceramic tiles but other types such as:

- ⊙ Catalan tiles
- ⊙ Rustic ceramic
- ⊙ Earthenware
- ⊙ Mosaic

Figure 7: Stages of the productive process of ceramic tiles



Source: Institute of Ceramic Technology. Cerámica para la arquitectura (2015)

CHAPTER 4. Main actors of the ceramic industrial district

Introduction

In this section, I seek to carry out a description of the members of the Industrial District and show the reader how networks exist between these components, from private companies, manufacturers, mining and atomizing or machinery companies to public organizations and associations.

As we said before, the ceramic Industrial District in the province of Castellon comprises 109 manufacturing companies, but is not only made by companies of productive nature: we must remember that one of the most important Industrial District characteristics introduced by Becattini introduced in the *Rivista di Economia e Politica* Industriale in the article “Dal settore industriale al distretto industriale” (1979; V, 1: 7-21) was the importance of learning within the system and the various networks that formed in it, and at this point the auxiliary industry and the supporting institutions are the fundamental resource for this learning to occur within the Industrial District.

We find four different types of actors: first, final companies, which are those related to the activity that defines the district as floor and wall tiles; secondly we find the specialized companies, which are responsible for carrying out supply activities as third fire companies and decorative pieces, frits and ceramic glazes, ceramic machinery or atomized clay companies; third we study the local institutions, those institutions at local level, regional national supporting the district. Finally we find the integrated companies whose area focuses on activities that belong to other industries but are integrated within the district.

4.1. End companies

4.1.1. Tile, floors and ceramic tiles manufacturers

They are treated as the central enterprises in the Industrial District, as they are those who carry out the production process of ceramic tiles. According to data by ASCER and Tiles of Spain, in 2016 there is a total of 109 companies which account for 95 % of national production. Within this selection handcrafting companies are not included because of their small size, although they are a very important asset in the district.

Within this selection we must divide companies into subgroups, because not all of them carry out the entire production process. In order to know in depth the companies, we have developed the following tables depending on the location and specifications of each company.

- ✓ Almazora

Table 8: Manufacturers located in Almazora

Companies	Product Catalogue
Azulejera Alcorense	Tile Stoneware Porcelain stoneware
Pamesa Ceramica S.L	Tile Stoneware and porcelain Special and complementary pieces Constructive solutions
Terracota pavimentos de Gres, S.A.	Tile Stoneware
Thesize	Porcelain stoneware Constructive solutions

Source: Compiled from data by ASCER. Tile of Spain (2015)

As we can see, there are 4 companies engaged in production in Almazora. I would like to focus especially in Pamesa Ceramic S.L., as it is one of the most important companies in the sector being positioned as the first in the Ranking of Companies in the Ceramic Tile Manufacturing Sector by sales and number 541 in the National Business Ranking by sales.

Pamesa Ceramic S.L. reached in 2015 a consolidated turnover of 422 million euros, representing an increase of 7 % compared to 395 million euros in 2014.

Throughout 2015, Pamesa Corporate Group has hired many new employees, and it has an average workforce of 1,163 workers. Currently the number of employees amounts to 1,218 workers.

Table 9: Relationship years 2008-2015 Pamesa Group

Year	Average number of employees	Thousand s m2 sale	Investment million €
2008	775	21.581	2,1
2009	692	19.927	3,9
2010	718	25.733	24,7
2011	787	31.357	15,6
2012	802	36.224	9,3
2013	870	45.230	17,9
2014	1.037	26.150	39,7
2015	1.163	60.581	28,0

Source: Compiled from data by ASCER. Tiles of Spain (2015)

- ✓ Betxí

Table 10: Manufacturers emplaced in Betxí

Company	Goods
Exagres, S.A	Porcelain stoneware: extruded Rustic stoneware: Spalplatten, rustic stoneware Mosaic: ceramic glazed Special and complementary pieces Constructive solutions: systems for pools, systems for stairs, modular systems, compositions

Source: Compiled from data by ASCER. Tiles of Spain (2015)

In this case and as we can see, the company Exagres, S.A. not only it is responsible for the manufacture of ceramic tiles, but also for constructive solutions that incorporate ceramics into the system.

This company shows us one of the best examples we can see regarding the existing collaboration within the ID of ceramics in the province of Castellón, since early this year 2016 Exagres S.A. reached a strategic partnership agreement with the first ceramic marketer of our country, APE Ceramics S.L. present in more than 107 countries. The agreement estimates that its function will be to manage Exagres products in more than 70 countries worldwide. Thus they join forces to enter the global market with the competitive advantages of each of them coupled.

- ✓ Cabanes

Table 11: Manufacturers emplaced in Cabanes

Company	Goods
Tendencias Cerámicas S.L. (Manufacturer of special parts)	Complementary and special parts

Source: Compiled from data ASCER. Tiles of Spain (2015)

This company specializes in the manufacture of special and complementary pieces. This type of ceramic tiles aims at an aesthetic principle and has a specific function. As clear examples we have baseboards, railings, or pieces to cover the corners.

Many of the largest companies in the ID already produce complementary and special parts in their facilities, but there are a number of companies within the district such as Tendencias Cerámicas S.L. which have specialized in this product providing greater value to their parts.

✓ Castellón

Table 12: Manufacturers emplaced in Castellón de la Plana

Company	Goods
CE.VI.CA. S.L. (Manufacturer of special parts)	Complementary and Special Parts
Grespania, S.A.	Tiles Glazed stoneware and porcelain Mosaic Special and complementary pieces Constructive solutions Other products: urban pavements, tactile tiles, or rectified Products and sector services
Marazzi España	Tiles Stoneware and porcelain Special and complementary pieces Constructive solutions
Tau Ceramica	Tiles Stoneware and porcelain Mosaic Special and complementary pieces Constructive solutions
Oneker	Glazed stoneware Porcelain stoneware

Source: Compiled from data by ASCER. Tiles of Spain (2015)

One we have listed the producing companies in city of Castellon we consider it obligatory to mention two of the companies mentioned in the table 12.

First we will talk about Grespania SA, the number 8 in the in the Ranking of Companies in the Tile Ceramic Manufacturing Sector by sales and number 2,129 in the National Ranking of companies by sales. It is therefore one of by the most important companies in the sector, which is also reflected in the differentiation of their products and the number of employees and sales, being the latter 68.7 % exports:

Table 13: Average staff list - Grespania sales

Year	Average number of workers	Sales €
2013	445	71.211.402€
2014	385	73.967.680€
2015	380	75.560.000€

Source: Compiled from data by ASCER. Tiles of Spain España (2015)

Grespania S.A., while seeking specialization, has carried out an investment of 25 million euros in order to open a new production facility specializing in porcelain laminate of extra-large format, a dimension that, as experts say, is the future trend of the sector.

Secondly make a mention of TAU Cerámica recently acquired by the Pamesa group making the latter the first producer of ceramics in Europe bringing together about 15% of the total turnover of the Spanish ceramic sector, whose global sales stood at 3,000 million euros at the end of last year 2015.

- ✓ Lucena del Cid

Table 14: Manufacturers emplaced in Lucena Del Cid

Company	Goods
MOSAVIT	Glass mosaic
FABRESA	Tiles Special and complementary pieces
GRAYEN, S.L.	Tiles Glazed stoneware

Source: Compiled from data by ASCER. Tiles of Spain (2015)

- ✓ Moncofa

Table 15: Manufacturers emplaced in Moncofa

Company	Goods
ALTTOGLASS, S.A	Glass mosaic Ecological tiles

Source: Compiled from data by ASCER. Tiles of Spain (2015)

✓ Vall d'Alba

Table 16: Manufacturers emplaced in Vall d'Alba

Company	Goods
EMBEPLAST	Manufacturer of profiles and accessories

Source: Compiled from data by ASCER. Tiles of Spain (2015)

Continuing the analysis of the industry located in Alcora, Lucena del Cid, Moncofa and Vall d'Alba, of 34 companies the 36 % produce only one or two types of products, in the case of companies with a small size when compared with others in the same sector. And more than half of them have specialized in special products.

As we have discussed, in the case of companies emplaced in Alcora, the different territories in the tables 14, 15 and 16 are comprised of low production companies, although it is true that many of them are specialized in products such as constructive solutions, special and complementary parts, geometries and even new forms of ceramic tiles such as ecological ceramics. All this gives them great importance within the district because they are a support for larger companies.

We must bear in mind that if we compare the investment in technology and innovation in a totalitarian way, large companies provide more funding to these variables, but proportionately, and taking into account the sales volume, smaller companies invest more because they are more specialized. We refer to the case of companies like MOSAVIT, ALTTOGLESS, S.A. or UNICER.

✓ Nules

Table 17: Manufacturers emplaced in Nules

Company	Goods
KERABEN GRUPO, S.A.	Tiles: white paste Porcelain stoneware: glazed Mosaic: glazed ceramic Special and complementary pieces: constructive solutions
KEROS CERAMICA	Ceramic tiles: red paste Glazed stoneware: red paste pavement Other products: ecological tiles
STN CERAMICA	Tile: red paste Glazed and porcelain stoneware Special geometries: other product
VENUS	Tiles: red paste Glazed and porcelain stoneware Constructive solutions

Source: Compiled from data ASCER. Tiles of Spain (2015)

As we can see, production in Nules' area is characterized by companies with an average size of between 50 and 250 workers except for the company KERABEN GRUPO S.A., which has a staff of 544 employees and sales of 97,000,000.00 €.

One of the most important features of this company is that KERABEN GRUPO S.A. is classified in the list of economic activities NCEA 2009 as:

- ✓ 2320: Manufacture of refractory ceramic products.
- ✓ 232: Manufacture of refractory ceramic products.
- ✓ 23: Manufacture of other non-metallic mineral products.

Unlike other companies engaged in the manufacture of ceramic tiles that are in the list of economic activities NCEA 2009 as:

- ✓ 2331: Manufacture of ceramic tile.
- ✓ 233: Manufacture of ceramic products for construction.
- ✓ 23: Manufacture of other non-metallic mineral products.

The KERABEN group was acquired in 2015 by the US fund Tensile Capital Management like many other companies in the sector due to the situation of financial crisis in the sector to get foreign funds.

According to data provided by Vicente Chiva, general secretary of MCA-UGT in Castellón to an interview to the newspaper “El Pais”, in recent years big foreign organizations have bought companies in the industrial district, the case of the American Electronics for Imaging (EFI) was with Cretaprint in 2012, the Arab investment group Investcorp acquired Esmalgrass in 2012 and announced the purchase of Fritta or case Niro Malaysian group that in 2013 avoided and buying, closing the firm Zirconium.

These data confirms as the ceramic industry in the province is a focus of interest for foreign investors not only to the big business we have talked about, but also for many smaller organizations that were rescued by the intervention of international funds.

As Vicente Ortells says, representing Fecoma-CC.OO., in Castellón, it is a competitive improvement within the District, especially regarding US funds, since "although their goal is having a return on investment, I think it will be positive to boost the US market". This is a consolidation of the international presence of the members of the district.

✓ Alcora

Table 18: Manufacturers emplaced in Alcora

Companies	Product Catalogue
ALCALATEN, S.A	Enameled stoneware
AZTECA	Tiles Glazed and porcelain stoneware Special and complementary pieces
AZULEJOS ALCOR.	Tiles Special and complementary pieces
AZULIBER	Tiles Glazed and porcelain stoneware Special and complementary pieces Special geometries: regular hexagon Products and services sector
BESTILE	Tiles Glazed and porcelain stoneware Special and complementary pieces
CERACASA, S.A.	Tiles Glazed and porcelain stoneware Special and complementary pieces Glazed and porcelain stoneware Special and complementary pieces Mosaic Constructive solutions
CERAMICALCORA, S.A.	Tiles: red paste Glazed stoneware: Pavement red paste Special and complementary pieces
CERAMICAS APARICI, S.A.	Tiles Glazed and porcelain stoneware Special geometries: irregular hexagon Other products: recordable ceilings
CERAMICAS MIMAS, S.L.	Tiles Glazed stoneware

CERAMICAS MYR, S.L.	Tiles Glazed stoneware
CERAMICAS VILAR ALBARO, S.L.	Tiles: red paste
CERANOSA	Tiles Glazed stoneware Special and complementary pieces
COLORKER	Tiles: white paste Glazed stoneware and porcelain stoneware Special and complementary pieces: Special parts, complementary parts Constructive solutions Special geometries
ELFOS CERAMICA	Tiles Glazed stoneware
GUIBOSA	Tiles Glazed and porcelain stoneware
HALCON CERAMICAS	Tiles Glazed and porcelain stoneware Special and complementary pieces Constructive solutions
IBEROALCORENSE	Tiles Glazed and porcelain stoneware Special and complementary pieces Mosaic Constructive solutions
INALCO	Tiles Porcelain stoneware: glazed Constructive solutions: ventilated facades systems Other products: Urban Flooring
INCOAZUL	Tiles Glazed stoneware
LA PLATERA DISTRIBUCIÓN, S.L.	Tiles Glazed and porcelain stoneware

MAYOLICA AZULEJOS, S.L.	Tiles Special and complementary pieces
PLAZA CERAMICAS	Tile Glazed and porcelain stoneware Constructive solutions Other products: ecological tiles
PORCELANITE DOS, S.L.	Tiles Glazed and porcelain stoneware
PORSIXTY	Tiles Glazed and porcelain stoneware
SUPERCERAMICA, S.A.	Tiles glazed, porcelain and rustic stoneware Special and complementary pieces Constructive solutions
TECNICERAMICA, S.A.	Tiles: red paste
UNDEFASA	Tiles Glazed and porcelain stoneware
UNICER	Tiles: red paste Mosaic: glazed ceramic Special and complementary pieces
VIVES AZULEJOS Y GRES, S.A	Tiles: red paste Glazed and porcelain stoneware Special and complementary pieces Constructive solutions Special geometries: irregular octagon Other products: ecological tiles

Source: Compiled from data by ASCER. Tiles of Spain (2015)

As we can see in this picture, of the 33 companies that according ASCER engaged in production we can say that only 29 are actually engaged in the manufacture of ceramic tiles and the remaining 4 are treated by atomizing companies as we shall see in the next point.

These data suggest us that the industrial zone of Alcora is comprised of a large number of companies, when compared to other territories such as Castellón and Almazora.

Among their factories we can find large multinationals such as Cerámicas Aparici or Colorker, internationally recognized. In order to witness its importance we would put as an example the case of Cerámicas Aparici and its relations with other foreign companies as Prointer, Proyecta Interior. It is a 100 % Mexican company devoted to import and marketing of porcelain, ceramics, faucets and high-tech and design spas that also has strategic alliances with other Spanish companies such as Pamesa Cerámica or EMAC, a leading manufacturer of profiles and finials for floor and wall tiles, structural and expansion joints for large projects.

The remaining members have a smaller, more limited production and therefore less relevance in the international market, although these data do not imply less relevance within the district because many of them have come to joint agreements to optimize their resources and to compete against larger companies.

✓ Onda

Table 19: Manufacturers emplaced in Onda

Companies	Product Catalogue
AZULEV, S.A.	Tiles: white paste Porcelain stoneware: glazed Special geometrie
AZULINDUS & MARTI, S.A.	Tiles: red paste Glazed and porcelain stoneware Special and complementary pieces Constructive solutions
BALLESTER PORCAR, S.L.	Tiles: white paste Porcelain stoneware: glazed Special geometries Special and complementary pieces
CERAMICA CAS, S.L.	Tiles: red paste Glazed stoneware Special and complementary pieces
CERAMICA DA VINCI, S.L.	Special and complementary pieces

CERAMICA ESTILKER, S.L.	Special and complementary pieces
CERAMICA RIBESALBES, S.A.	Tiles: red paste Glazed stoneware Special and complementary pieces
CERLAT, S.A.	Special and complementary pieces
CERPA, S.L	Tiles: red paste Glazed and porcelain stoneware Other products
CRISTACER	Tiles: red paste Glazed and porcelain stoneware Other products
DECOCER, S.A.	Tiles: white paste Porcelain stoneware: glazed Mosaic: ceramic glazed Special and complementary pieces
DUAL GRES, S.A.	Glazed stoneware
EL BARCO, S.L.	Tiles: red paste Glazed stoneware
EL MOLINO	Tiles: red paste Glazed and porcelain stoneware
FANAL CERAMICAS, S.A.	Tiles: red paste Glazed and porcelain stoneware
GAYAFORES	Tiles: red paste Glazed and porcelain stoneware Special and complementary pieces Special geometries
NATUCER, S.L.	Tiles Porcelain and rustic stoneware Earthenware Mosaic Special and complementary pieces Constructive solutions Special geometries Other products: ecological tiles
ONIX MOSAICO	Mosaic Special and complementary pieces

	Constructive solutions Other products: ecological tiles
PERONDA	Tiles Porcelain and rustic stoneware Constructive solutions Other products: ecological tiles
REALONDA	Tiles Porcelain and rustic stoneware Special and complementary pieces

Source: Compiled from data by ASCER. Tiles of Spain (2015)

As we can see, the territory corresponding to the city of Onda, which with its 108.84 km^2, is one of the largest in the province. It is located within the province of Castellon and has the largest concentration of tile factories, together with Alcora, and companies related to the sector. We could ensure that it is in these two territories where the central nerve of the industrial district is, because it includes a larger number of businesses and, although it is true that none of them is among the largest in the district nor the most relevant within industry concentration, they primarily involve cooperation between organizations, secondly existence, as we shall see in later sections, of companies offering specialized or tertiary products in a single production phase, as is the case enterprise PULIONDA, S.L. This company focuses on sectoral services and products, polishing and grinding. Its distinction from other organizations gives it the opportunity to focus on innovation and improvement in only one stage of production, which the service provides, achieving greater ease to improve it.

✓ Vila-real

Table 20: Manufacturers emplaced in Vila-Real

Company	Goods
ARGENTA CERAMICA, S.L.	Tiles: Red pasta, white paste Glazed and porcelain stoneware
KERAMEX, S.A.	Tiles: red paste
MAINZU	Tiles: red paste Glazed stoneware Special and complementary pieces
NIRO CERAMICA ESPAÑA S.L.U.	Tiles: Red paste, white paste Glazed and porcelain stoneware

NOVOGRES	Tiles: Red paste, white paste Glazed stoneware
PORCELANOSA, S.A.	Tiles: white paste Glazed and porcelain stoneware Special and complementary pieces Constructive solutions Special geometries: irregular octagon, curvaceous base part Other irregular polygonal pieces Other products: ecological tiles
ROCERSA	Tiles: white paste Glazed and porcelain stoneware Special and complementary pieces Constructive solutions Special geometries
TODAGRES, S.A.	Glazed stoneware Special and complementary pieces Constructive solutions
TOGAMA, S.A.	Mosaic
VENIS, S.A.	Tile and glazed stoneware Special and complementary pieces Special geometries

Source: Compiled from data by ASCER. Tiles of Spain (2015)

To conclude this analysis of existing manufacturers of ceramic tiles in the ceramic industrial district of the province of Castellón, we have the town of Vila-real. This municipality is the third largest district core largely thanks to the location of one of the largest companies in the sector.

Porcelanosa Group is in position 2 of the Ranking of the Manufacturing ceramic tile sector, with a turnover of 156,534,785 € only behind Pamesa Cerámica S.L., but its importance lies in the international presence that this company has outside our borders. Given that 83 % of its production is destined for foreign markets we can get an idea of its importance. While it is true that the Pamesa is still the company with the most range

of foreign market, Porcelanosa Group has managed to create value through the use of communication and creating one of the most important commercial brands in the industry since its brand strategy is based on the, consumer providing an added value to the brand when using as sources or spokespeople celebrities like Isabel Preysler, the ambassador of the firm over three decades. The American actress Sarah Jessica Parker or the English Royal Family are among known faces of the brand.

On the other hand it has more than 400 shops on five continents and in major cities in each country, all this in order to focus on the consumer, and the brand is recognized worldwide.

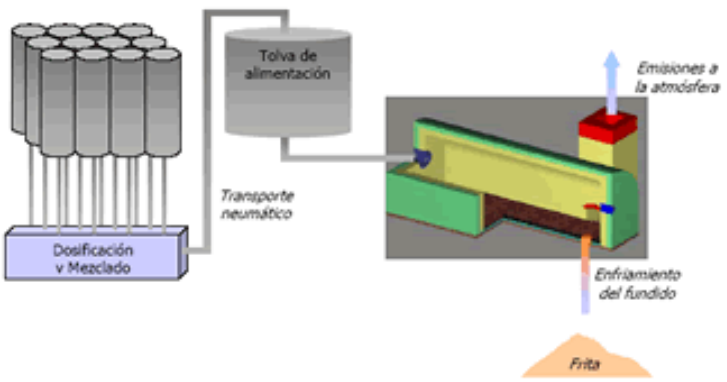
4.2. Specialized companies

4.2.1. Frits, glazes and ceramic colours

In this section I will continue with the same analysis methodology followed in the previous section, listing and categorizing the different companies related to this phase of production of ceramic tiles.

But before talking about the sector we must know which are products of this sector, since ceramic frits are within what is called chemical industry. First, a ceramic frit is, "a mixture of inorganic chemicals produced by rapidly quenching a melt, which is a complex combination of materials, turning chemicals into insoluble vitreous compounds presented in flake or granules shapes".

Figure 8: Frits productive process



Source: study on ceramic frits carried out by the Universitat Jaume I, promoted by ANFFECC.

The main application of ceramic frit is the manufacture of ceramic glazes. When glazes are applied on the surface of ceramic biscuits and then fired, they gain a decorative, impermeable and protective layer, providing the tile with its beauty and specific technical characteristics such as water resistance, hardness and scratch, to acids, abrasion or detergents resistance.

Finally colours are prepared with ceramic frits, ceramic pigments and various inorganic raw materials. Beside enamels, colours are the main components of the different surfaces applied to ceramic tiles.

As we can see from the description of the products they are all related to each other and it is an essential industry in the district.

This is one of the most innovative sectors of today and therefore the sector of frits, glazes and ceramic colours is the Spanish leader in the market thanks to strategic alliances with many of the aforementioned companies. Cooperation, teamwork and competitiveness have helped the following companies in drivers of major advances not only in the frits, glazes and ceramic colours sector, but in the ceramic tiles sector, hence its importance in from the sector.

One of its strengths that make it the leader in innovation is its innovation and diversification capacity. Many of them have opted for outsourcing their factories producing not only in Spain, but having production plants in countries like Italy, Brazil, Indonesia, China, Mexico, India, Morocco, etc.

According to data provided by the National Association of Manufacturers of frits, glazes and ceramic colours (ANFFECC), in the last year they reached sales figures of 1,194,786,756 €, exporting 71 % of them (853,770,828 €), with a total of 3,610 workers, when compared with previous year's data changes would be:

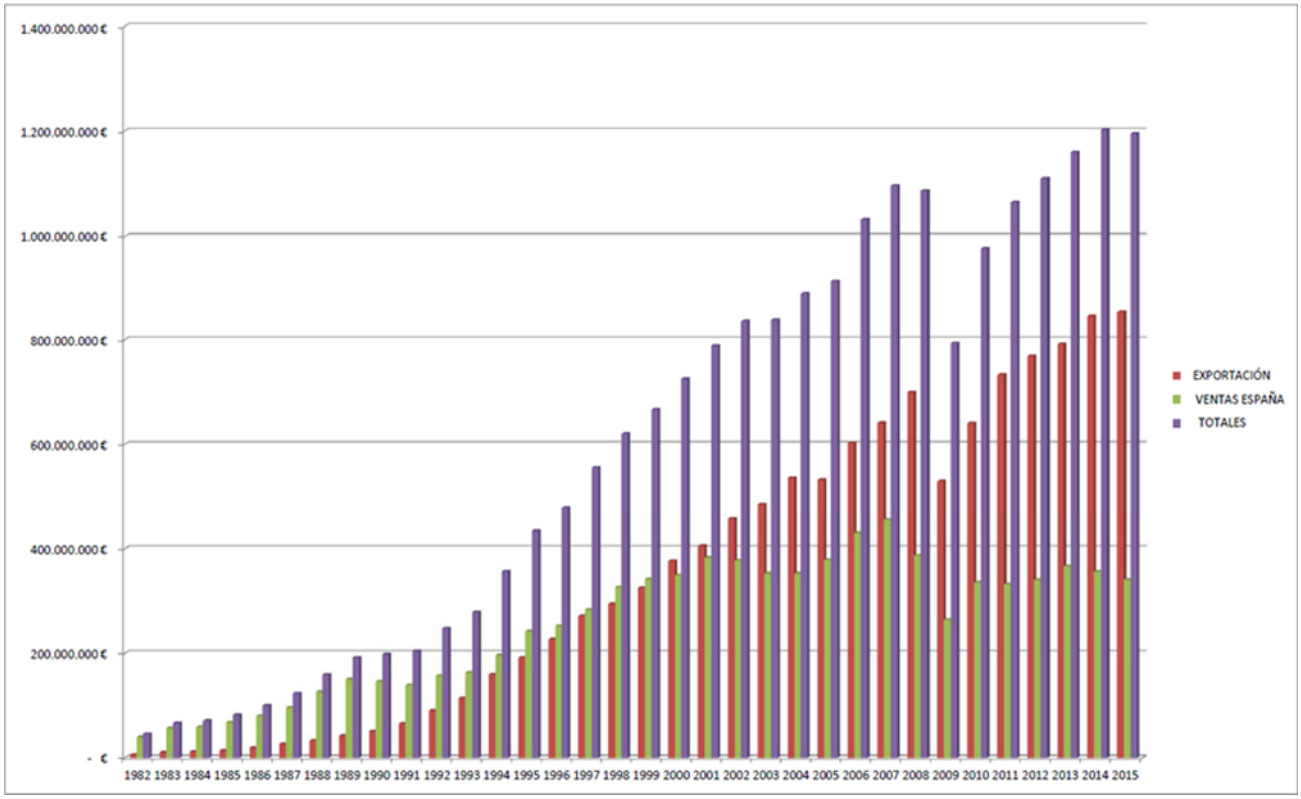
Table 21: ANFFECC 2014-2015 figures variations

	Change percentage regarding 2014
Total sales	-0,61%
Exports	0,96%
Workers	4,03%

Source: Compiled from data by ANFFECC. Sales history (2015)

As we can see in the chart provided by ANFFECC, except in the years 2003 to 2005 and from 2008 to 2009 periods in which there were downs both in export and sales in Spain due to financial crises in that period, the rest of years have followed an upward trend and forecast this year and next year 2016 will remain good; it is a booming sector.

Figure 9: ANFFECC sales evolution



Source: ANFFEC (2015). Sales history

All this is also reflected in the job creation capacity of the sector. Since its inception in 1982, where the number of workers reached 900 until now, whose number has risen to 3,610. Leaving aside the numbers, the most important aspect of employment in this sector is that more than 85 % of positions are specialized, with a high level of qualification and requirement. This is due to the characteristics of the sector represented in its dynamism, its continuous change and innovation as well as it is a highly competitive sector.

Among the companies that are specialized in this area it is necessary to emphasize the following:

Table 22: Frits companies in the Industrial District

Company	Town
CERFRIT, S.A.	Nules
KERAFRIT	Nules
AL-FARBEN, S.A.	Alcora
COLOR ESMALT S.A.	Alcora
TORRECID S.A	Alcora
ESMALTES S.A	Alcora
FRITTA S.L.	Onda
COLORES CERAMICOS S.A	Onda
QUIMICER S.A.	Onda
VERNIS S.A.	Onda
SMALTICERAM	Onda
COLORES OLUCHA SL	Onda
COLORONDA, S.L.	Onda
COLORIFICIO CERAMICO BONET S.A	Ribesalbes
COLOROBBIA ESPAÑA, S.A	Vilafames
ESMALDUR S.A.	San Juan de Moro
ESMALGLASS S.A.	Vila-Real
VIDRES S.A	Vila-Real
DEF MEDITERRÁNEO S.L.	Vila-Real
FERRO SPAIN, S.A.	Almazora

Source: Compiled from data by ANFFECC. Companies (2015)

As we can see in the table, 21 % of companies are in Alcora and 36 % in Onda, with these two populations being known as “centres of the ceramic industrial district of Castellón” due to the large number of manufacturers of yellow brick. Thirdly we find Nules and Vila-Real, what should not surprise us because, as we saw in the previous section there we can find two of the most important business groups in the sector: Keraben Group S.A. and Venus in Nules and Porcelanosa, S.A., what makes these two populations as an indispensable part of the Industrial District.

Among the innovations that we have seen in this sector, the introduction of graphene as a material highlights. This action was promoted by the General Secretariat of Science, Technology and Innovation [6] by creating a group, “Interplataformas de Grafeno”, in order to inform and encourage the use of this material in more traditional sectors.

Another innovation is the creation by Group Torrecid of a ceramic paste which reduces by 50 % the thickness of ceramic floor tiles, reducing the cooking time, pollution and improving storage capacity.

The creation of intelligent ceramic pieces and environment awareness has been the focus in recent years, but the company Fritta was the one which, after years of research, got a great innovation which make it deserve to win the Alfa de Oro in Cevisama 2004 to innovation, thanks to the creation of ceramic pieces focused on intelligent automation. From that moment all the companies in the sector followed suit.

This geographic clustering among manufacturers of ceramic tiles and specialists in frits, glazes and ceramic colours reveals the existence of the Industrial District, as they work jointly, following a continuous feedback and innovation based on the needs of their partners.

[6] It is a branch of the Ministry of Economy and Competitiveness. It specializes in scientific and technical research, development and innovation. Its functions include coordination of international relations in this area and the Spanish representation in programs, forums and international and European organizations within its jurisdiction.

4.2.2. Extractive and atomizing industries

Atomizing and extractive industry and has the function of supplying the raw material to companies to start production. The atomization process is based on the drying of this material through a suspension of water droplets which produce a solid product.

Figure 10: Spray drying stages

Source: Compiled from data by AINDEX (Asociación Nacional de Industrias Extractivas y Afines)

In the case of this sector, due to the large investment involved, not just at the beginning of the activity but due to large facilities and significant energy consumption, many companies have chosen first the creation of alliances between companies in order to form a company. This is the case of several companies of our community. Next we will list some examples that attest to this practice:

- ✓ Atomizadora S.A.: founded in 1984 by the companies Azulindus Martí, Peris y Cía., Hijos de Gaya Forés, Aszeder y Europea de Pavimento Cerámico, all of them ceramic floor tiles companies. Today the companies Azseder and Europea de Pavimento Cerámico have sold their stake and another, Novogrés, entered the company, currently being Azulindus Martí, Peris y Cía., Hijos de Gaya Forés and Novogrés the companies responsible for their management.

- ✓ Grupo Euroatomizado: created in 2008 thanks to the collaboration of Nuevos Productos Cerámicos, S.A. and Euroatomizado.

- ✓ Atomizadas de Alcora S.A., consisting of Azulejos Sanchís S.L., Azuliber1 S.L., Cerámica Gomezsa and Colorker S.A., among others.

On the other hand we have the case of large firms of ceramic tiles, as in the case of Pamesa or Porcelanosa Group. These companies create their own atomizers ensuring the supply of raw materials

In this case we can find:

- ✓ Ondagen, integrated into Pamesa Group.
- ✓ Porcelanosa Group uses a new method called cogeneration, which allows it to produce its own energy. This process involves the production of electricity and heat in the same process, leaving aside the use of water and dried. Thus atomized powder is obtained by reducing time, production costs and environmental impact.

This data is another demonstration of the existence and proper functioning of the Ceramic Industrial District of the province of Castellon, which show two basic characteristics appointed by Becattini: first exploitation by large companies of economies of scale, creating their own facilities; secondly cooperation between smaller companies to compete, joining and founding their own facilities to supply them with raw materials. In this way, information networks and bonds of trust, central to the effective operation of an Industrial District, are created.

4.2.3. Machinery construction

The ceramics machinery sector has less weight in the province because; there are few companies within the District who are responsible for providing such materials.

According to the Spanish Association of Manufacturers of Ceramic Tile 75% of the large machinery used by Spanish companies come from international markets, initially the Italian market, but thanks to innovations and lower prices, the Chinese market has also become a relevant market.

As we read in the book Análisis de estados financieros de los fabricantes mundiales de maquinaria para la industria cerámica, ladrillo y esmalte de color y los productores, published by the Department of Research of Acimac (Associazione Costruttori Italiani Machine Attrezzature per Ceramica), based on the study of 174 machinery manufacturers for the production of ceramic tiles. The importance of Italian producers remains a significant value but countries like China or the United States seeking to join the market.

In analysing the results using as a method of analysis EBITDA1, Earnings Before Interest, Taxes, Depreciation, and Amortization, financial indicator that measures the gross profit before the deduction of financial expenses, they have concluded that the best innovations and the best sales have been in the equipment for digital tile decoration: average EBITDA of 10.39 % and an average net profit of 4.76 % of sales.

According to a study conducted in collaboration between The Market Observatory of the Institute of Ceramic Technology and the Spanish Association of Manufacturers of Machinery and Capital Goods (ASEBEC) called, The sector of ceramic machinery in Spain in 2015, domestic sales grew 23 % in 2015 and the main destination countries remained the same: Algeria, Italy and Morocco.

One of the most revolutionary technologies in recent decades has occurred through innovation of a company in the industrial district of Castellón,

Within this section it is essential to deepen in a technology that, as we have seen in Chapter 3, related to innovation, has been a real revolution in the ceramic industry: Inkjet technology.

As we have argued in this section, members of the ceramic industrial district of Castellón specialized in machinery were as an auxiliary sector within the district. Their main functions were to meet the technical needs of enterprises of ceramic tiles and especially in conditioning the machinery imported from Italy, the largest exporter of ceramic machinery in the world, to the needs of the ceramic industrial district of Castellón.

In 2001 an innovative new technology comes to the market from the hand of one of the most important companies in the district specializing in digital decoration machinery for ceramics: Kerajet. Inkjet technology is a revolution in the industry, since it is a printing machine that by depositing ink dropwise is capable of printing at a speed of 50 meters per minute, without stopping the piece. Another feature is its ability to decorate any piece without having any contact with it. With this achieved, it first eliminates the possible effects caused by rubbing and second it has better resolution graphics when decorating, which produces improved competitiveness.

Finally, due to increased production capacity, costs reduce, but its importance lies not only in its improved productivity, but in its ease of use, since it requires no intermediary

tools and can print on a wide range of materials such as plastic, metal, glass, wood, cardboard or leather. This is a competitive advantage as the manufacturer can customize its pieces quickly and continuously.

The results of the introduction of this new innovation for the industry are impressive. According to the president of the ASEBEC trade association: "technology inkjet digital printing means 30 % of the machinery sector", which is a big leap, given that exports of Spanish machinery have increased greatly, being in 2007 17 % of its production. 2011 closed with more than 35 %, exporting the ceramics district machinery more than 50% of its production thanks to this new technology nowadays.

4.3. Auxiliary industry

Following the description of the companies within the ceramic ID of Castellón, we must not forget subsidiary companies. In this section we will study only those companies responsible for the manufacture of ceramic components such as the so-called third fire, those which perform special pieces and decorations of the collections, such as borders, skirting boards or wood strips.

First we will analyse subsidiary companies according to their activity and location; second, and as we have done in all sections of this chapter, we will see examples of how the interaction between the subjects of the ID has led to the creation of networks that improve the internal situation of enterprises.

Among the various auxiliary industries that can be found within the district are:

- ✓ Furniture manufacturers and exhibitors, such as INSCA Company, located in Almazora.

- ✓ Third fire companies in Burriana such as Alea and Fronti Cerámica S.L. in Castellón.

- ✓ Sectoral products and services such as ceramic cutting and netting, polishing and grinding or profiles and accessories, or white pasta biscuit or red paste. Within these categories are companies like Schlüter Systems, S.L., Pulionda, S.L. Levitile Iberica, SAU or Kaleydos Design, S.L., all located in the town of

Onda, the company Hermanos Llansola, S.L. in San Juan de Moró or Pavimbe in Betxi.

- ✓ Special and complementary pieces. Although it is true that many companies have already introduced this section in its production process, there are still companies that specialize in this area such as Estudio Cerámico, CE.VI.CA., S.L. or Cerámica Da Vinci, S.L.

This sector has been one of the hardest hit within the district since the decrease in production by the producers has led to the reduction of its own billing, as Jose Navarro pointed, coordinator of the Valencian Association of Ceramics (AVEC) in 2010: "marketing our selection of designs depends entirely on the ceramic tiles companies, as it is done through the global supply of the products that these firms release to the market".

4.4. Local institutions

Ceramic Industrial District of the Province of Castellón has its greatest advantage over other industries in the strong presence of public and private institutions created to help, encourage and improve cooperation between enterprises, innovation and cooperation.

Between support agencies can be found:

- ✓ Business associations
  - ⊙ Asociación Española de Fabricantes de Azulejos y Pavimentso Cerámicos (ASCER)
  - ⊙ Asociación Nacional de Fabricantes de Fritas y Esmaltes Cerámicos (ANFFECC)
  - ⊙ Asociación Española de Fabricantes de Bienes de Equipo para la Cerámica. (ASEBEC)
  - ⊙ Asociación Española de Ciudades da Cerámica (AeCC)
  - ⊙ Asociación Valenciana de la Ceramica (AVEC)
  - ⊙ Asociación Nacional de Distribuidores de Cerámica y Materiales de Construcción (ANDIMAC)
  - ⊙ Agrupación Empresarial Innovadora del Sector Industrial de Cerámica Estructural (AEI Cerámica)

These organizations carry out campaigns for the promotion, dissemination and innovation in the sector at national level, while it is true that, since the Industrial District of Castellón is the country's most important, the venues and actions tend to focus on it.

Among the actions we can find the CERURBIS Project, a European project that seeks to promote, encourage and promote the use of ceramics in urban areas through joint actions of the ceramic districts in the SUDOE space. The promotion by Tile of Spain, ASCER and ICEX (España Exportación e Inversiones) to promote ceramics in Russia with the creation of specialized seminars in distribution, channels, involving 10 companies in the Ceramic Industrial District of Castellón, Azulev. Azuvi, Saloni, Colorker, Dune, Grespania, Venus, Peronda and Porcelanite Dos.

Finally, I would like to highlight the LIFECERAM[7], project that ASCER has carried out, a project aimed at getting to "zero waste" in the manufacture of ceramic tiles. The most important factor in this study is that the findings were made available to manufacturers and producers of chips and waste managers. It is a clear example of participation, cooperation and joint innovation, seeking similar goals.

- ✓ Professional associations, such as partnerships, are essential for creating a knowledge network with which to spread information and knowledge. Among them we find:

    - Asociación de Técnicos Cerámicos (ATC)
    - Asociación de Diseñadores de la Comunidad Valenciana (ADCV). Although these are not deployed within the Industrial District consider that are of great importance for their actions, more on the most important fair of the sector in Spain, CEVISAMA, with offers like "See you in Valencia," focused on professionals sectors of ceramics, furniture, lighting, machinery and components for the timber industry in general and especially for professionals in the sectors of interior design, architecture, decoration and design, very important for competitiveness abroad.
    - Colegio Territorial de Arquitectos de Castellón. They are responsible for, given the demand for specialized positions for many ceramic companies work, organizing courses as 'Knowledge of ceramic products for architects', in order to encourage the supply of staff.

[7] http://www.lifeceram.eu/

- ✓ Technology centres, among them the Instituto de Tecnología Cerámica (ITC). Founded in 1969 and incorporated in the Universidad Jaime I of Castellón, since 1993 it has among its partners the leading companies of frits and glazes as well as floor and wall coverings

Among its most important projects there are:

  - The aforementioned LIFECRAM project.
  - The RE-THINK project, aimed at reducing costs in the production process.
  - Project for the development of new technologies for analysis and energy and environmental optimization of the manufacturing process of ceramic tiles.
  - Development and research on new technologies and printing materials for dry decoration for ceramic tiles.

- ✓ Training centers, from the Universitat Jaume I, Castellón.

- ✓ Vocational training centers, such as the School of Arts and Crafts, or the School of Ceramics of Alcora, which offer the senior ceramic technical titration.

4.5. Integrated companies

As we said at the beginning of this chapter, in this section we talk about companies that specialize in activities belonging to other industries but are integrated within the district such as:

- ✓ Industrial Services
- ✓ Supplies of ceramic components and relationships
- ✓ Technological services
- ✓ Road and maritime transport companies.
- ✓ Other (packaging, plastics etc.)

CONCLUSION

As we presented in the introduction, the main objective of this work was to analyse the concept of industrial district and its implications in the forms of business organization. In order to attest its importance, we have carried out an analysis on the ceramic industrial district of Castellón, one of the most important sectors for the Spanish economy, and specifically for the province.

After having analysed the beginnings of the industrial district, the innovation, and the analysis of the agents which are part of the ceramic industrial district of Castellón, we consider the importance that innovation has for competitive survival and inter-organizational relationships of trust and cooperation within the district as essential facts. The work has been divided into three main points: firstly a theoretical analysis of the concept of industrial district and its comparison with the model introduced by Porter (1947) in his book The Competitive Advantage of Nations. Thanks to this theoretical analysis we can conclude that the most successful concept when talking about the ceramic industrial district of Castellón was that coined by Becattini (1990: 39): “A socioterritorial entity characterized by the active presence of a community of people and a number of companies in a natural and historically limited area”.

Following the structure of the work, we reached the second block, focused on innovation and in how it affects the viability of the industrial district, specifically regarding the ability of the ceramic industrial district of Castellón to achieve a technological absorption, thus overcoming the technological discontinuity.

Finally we made a study of the members of the ceramic industrial district. We have seen how different agents interact with each seeking joint competitive advantages. Innovating and sharing knowledge, getting the ceramic industrial district of Castellón to be one of the most important at international level. We carried out an analysis of each of them paying attention to their characteristics and their relationships.

Among the recommendations or implications of the study I would argue the lack of institutional support from the State to the ceramic industrial district of Castellón. There is no economic nor market policy or that fits this district and we consider important its implementation given the importance of the district in the Spanish economy: there should be greater support for local institutions such as business associations or research centres in order they get to have the necessary resources to become a bridge between the district and the international markets. Furthermore, they should consider

giving a greater support to companies so they cooperate with each other and sharing knowledge by carrying out leading technology policies, as seen in the regions of Emilia-Romagna in Italy with the creation of so-called creation technological districts in order to create competencies and goods or services difficult to imitate by competitors. An effort to build bridges not only between small businesses that are forced to cooperate to survive, but also among large companies should be made, being innovation and technological absorption their joint target. A more global view of the ceramic industrial district of Castellón is required.

As for the limitations that we have had when developing this work, we must consider that it is based on a secondary sources' study, so finding internal information of the different agents forming the ceramic industrial district of Castellón has been difficult. We consider interesting for future research to conduct an analysis of two or more industrial districts: we would like to highlight the comparison between the Italian ceramic industrial district, located in the region of Sassuolo (Emilia Romagna) and the province of Castellón, which we studied in this work. These are two industrial districts with similar characteristics, with a high degree of specialization and geographic concentration, and mostly composed of small and medium enterprises.

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