

# UNIVERSITAT JAUME I

**THE CERAMIC INDUSTRIAL DISTRICTS OF CASTELLÓN DE LA PLANA AND  
SASSUOLO, A HISTORICAL AND ECONOMIC COMPARISON**

**AUTHOR: LUIS MELCHOR GARRIDO**

**TUTOR: FRANCESC XAVIER MOLINA MORALES**

**GRADO EN ADMINISTRACIÓN Y DIRECCIÓN DE EMPRESAS  
AE1049 – TRABAJO FINAL DE GRADO**

**CURSO 2019-2020**



## TABLE OF CONTENTS

<b>0 INTRODUCTION.....</b>	<b>5</b>
<b>1 Chapter one: Theoretical framework.....</b>	<b>6</b>
1.1. Alfred Marshall.....	6
1.2 Michael Porter.....	7
1.3 Examples of clusters around the world.....	8
1.4 Advantages and disadvantages.....	8
<b>2. Chapter two: Ceramic.....</b>	<b>9</b>
2.1. History of the ceramic.....	9
2.2 The ceramic term.....	9
2.3 Productive process.....	10
2.4 Typology of ceramic tile products.....	15
<b>3. Chapter three: The ceramic tile district of Castellón de la Plana.....</b>	<b>17</b>
3.1 Location of the district.....	17
3.2 Concentration.....	17
3.3 Infrastructure.....	19
3.4 History of the Castellón ceramic industry.....	19
3.4.1 18 <sup>th</sup> century “La real fábrica”.....	19
3.4.2 The industrialization of the 19 <sup>th</sup> century and beginning of the 20 <sup>th</sup> century.....	20
3.4.3 Technological development and territorial expansion (1900 – 1970).....	20
3.4.4 Second territorial expansion (1970 – 1985).....	22
3.4.5 1990 – 2000.....	22
3.4.6 2000 – 2019.....	23
3.4.7 Covid-19 news.....	23
<b>4. Chapter four: The ceramic district of Sassuolo.....</b>	<b>25</b>
4.1 Location of the district.....	25
4.2 Concentration.....	25
4.3 Infrastructure.....	26
4.4 Evolution of the industry.....	26
4.5 Structure of the value of chain.....	31
4.6 International markets.....	31
4.7 The Italian ceramic industry shut down by Covid-19.....	32
<b>5. Chapter five: The comparison.....</b>	<b>33</b>
5.1 Introduction.....	33
5.2 Situation and evolution.....	34

<b>5.3 District government.....</b>	<b>34</b>
<b>5.4 Internationalization .....</b>	<b>36</b>
<b>5.5 Concentration and interdependence</b>	

<b>6. Conclusion.....</b>	<b>39</b>
---------------------------	-----------

<b>7. Bibliography.....</b>	<b>40</b>
-----------------------------	-----------

**A. INDEX OF TABLES:**

<b>Table 1. Production of Spanish ceramic industry.....</b>	<b>18</b>
<b>Table 2. Factories, productive capacity and employees in Castellón in 1969.....</b>	<b>21</b>
<b>Table 3. Italian ceramic tile industry variation.....</b>	<b>30</b>
<b>Table 4. Exports during 2019 and 2020 to the United States of America.....</b>	<b>36</b>
<b>Table 5. Comparison of some aspects about both districts.....</b>	<b>37</b>

**B INDEX OF ILLUSTRATION:**

<b>Illustration 1. Spray drying process.....</b>	<b>12</b>
<b>Illustration 2. The firing cycle.....</b>	<b>14</b>
<b>Illustration 3. Single-layer roller kiln.....</b>	<b>15</b>
<b>Illustration 4. Historical evolution of exports share of tile production in Italy.....</b>	<b>27</b>
<b>Illustration 5. Evolution of the number of tile firms in Italy.....</b>	<b>28</b>
<b>Illustration 6. Evolution of tile industry employees in Italy.....</b>	<b>28</b>
<b>Illustration 7. Tile production in Italy (1979 – 1999).....</b>	<b>29</b>
<b>Illustration 8. The leading ceramic exporting countries.....</b>	<b>35</b>

## **0 INTRODUCTION**

The decision of developing my final degree work about the study and comparison of the ceramic industrial district of Castellón de la Plana and Sassuolo was my first option since the moment i saw it. My family have been working in the sector of ceramic their whole life and is something really attractive for me. Besides, I am going to do my external practices in “Aparici”, a ceramic firm which is located in Alcora so I was really looking forward to choosing this project and be able to learn a bit about the whole sector before starting to work there.

Between the different types of themes that i could speak about in the “Current and future challenges of the ceramic tiles firms” work, the comparison was the most interesting one for me. The theme is really important since I have analysed the two of the main ceramic districts not only of Europe but also of the world. Castellón de la Plana and Sassuolo are within the top 10 producing countries and as has been explained in the work two of the main exporting countries. Since I was a child, I listened how my father used to go every single year to the commercial fairs of Cevisama in Valencia and Cersaie in Sassuolo, and is something that has always been very curious for me and where unfortunately I haven't been able to go yet.

I have always liked the sector. Actually, I used to go with my father when I was younger to see how tiles where made. This work will really help me to introduce me to a world which I would really like to be part of in the near future.

I have developed the resource starting from the theoretical point of view of what a cluster is, basing this part directly on the work of Michael Porter and Alfred Marshall, clarifying the concept of cluster and industrial district and putting examples of some of the most important clusters around the world. The last part of the first section is an explanation of the advantages and disadvantages a cluster can have.

The second chapter has been really interesting since I have spoken about the history of the ceramic and explained what ceramic is. Later, and by the way one of the most interesting parts for me, there is an explanation of the productive process of the ceramic tiles and a brief part of the typology.

Later I started working with the third and the fourth chapter, which have almost the same structure and speak about the Castellon de la Plana and the Sassuolo districts respectively. Both parts are introduced by an explication of the location, concentration and infrastructure of the districts. These parts are followed by the evolution and the history of both districts and end with a brief explanation of how the sector has been dealing with the Covid-19.

Finally, the last chapter is the comparison between both countries. I could say that this part and the conclusion have all the important differences and most relevant aspects summarized.

## **1.THEORETICAL FRAMEWORK**

The world economy, specially in developed countries, is dominated by groups of companies (clusters) that interact in a very strong way with each other in technological and knowledge aspects to generate innovation, and whose result is manifested in growth and value generation for all of them.

In the last decade, a new way of studying industrial activity and the linkages that occur between the different phases of production processes, from which new policies could be defined, has been installed in business society and economic authorities. This industrial activity is dominated by what is known as industrial groupings or clusters.

The concept of "Cluster" was popularised by the economist Michael Porter in the 1990s, in his book *The Competitive Advantage of Nations*. Porter defined clusters as geographic concentrations of interconnected companies and institutions in a particular field which include suppliers of specialized inputs such as components, machinery, and services, and providers of specialized infrastructure. He said that the competitiveness of a region is based on the competitiveness of its industries, which in turn is improved if an industry is immersed in a deep network.

The present study of the clusters reviews the different contributions that have occurred since the first Marshall studies, concept and its application is not something new in the developed industrial world, until the studies of the local competitive advantage from the domain of resources and their application.

### **1.1 Alfred Marshall**

Alfred Marshall has been one of the most influential economists of all the times. He was born the 26th of July 1842 in London. He was a professor at the University of Cambridge (1885-1908). His most important book "Principles of Economics" (1890) dominated the British economics panorama for many years. The concept of industrial district was born thanks to Marshall in this book. The idea born thanks to Marshall's observation of the British economy during the 19th century, when he noticed that many firms which were concentrated on the manufacture of the same product, where geographically clustered.

In the nineteenth century, Alfred Marshall used the expression "industrial districts" while remarking that industries tend to concentrate in specific geographical areas. Marshall mentioned straw plaiting in Bedfordshire or cutlery in Sheffield, pointing out that geographical proximity provides specialized labour, nurtures subsidiary industries, stimulates innovative activity and enables technological spillovers

Although contemporary industries are often oligopolistic and technologically sophisticated, geographical proximity is no less important today than a century ago. Indeed, a popular writer such as Michael Porter ascribed the dynamics of national competitive advantage to the ability to create, sustain and develop clusters of firms that attain world excellence in specific industries. Writing from the perspective of a business economist, Porter stressed that competition between neighboring rivals and availability of sophisticated customers stimulates innovation and engenders positive feedbacks for all firms in a cluster.

So, answering at the question of “Are industrial districts the same thing as clusters? We could say that definitely they are, if we look at to the original writings of Alfred Marshall and Michael Porter. However, some authors have presented industrial districts as a peculiar path of economic development based on small family businesses that would preserve community values. By reaction, the word “clusters” is eventually preferred by those who focus on the more general phenomenon of firms agglomeration

## **1.2 Michael Porter**

Michael Eugene Porter was born the 23rd of may 1947 in Ann Arbor, Michigan, United States. Right now he is 73 years old. Porter is a well-known American academic known for his theories on economics, social causes and business strategy. He is the Bishop William Lawrence University Professor at Harvard Business School, and he has been among the founders of the consulting firm The Monitor Group.

From his point of view, many clusters also include government agencies and other institutions such as universities, study centers and trade associations.

Porter cites California wines as an important example, which includes 680 wineries, including thousands of independent wine producers as well as complementary industries made up of grape suppliers, teams that control the harvest, advertising agencies ... He also tells us about the Italian leather cluster, which ranges from celebrities such as Ferragamo and Gucci to specialized suppliers.

Porter talks about a paradox because in the current economy, companies tend to be globalised but cluster bases his strength on the proximity of the firms and on the immediate business environment outside companies that plays a vital role, overlooked for a long time. Clusters represent a new way of thinking about the role of location in the nowadays economy.

The firms inside the same cluster use the same marketing media and compete in similar customer segment creating a cluster image or cluster identity, the boundaries of this entity are defined by the linkage and complementarities across the firms and the institutions, like the universities, the government and the social around. Those factors are fundamental to create the competition and they also contribute to the growth of the cluster, so the boundaries are not defined by political or geographical factors and a cluster could extend itself over the national borders.

He tells us that although clusters are often structured within political limits, they can cross both provincial and national borders. All these companies forming the cluster, fueling competition and cooperation, all compete with each other to win and retain their customers. Without good competition, a cluster would be a failure. However, there is also cooperation, mostly vertical, and this cooperation involves companies from related industries and local institutions.

Inside the clusters “environment factor” is one of the concepts bases. Porter identified three ways of cluster’s influence over the competition, first of all, cluster system increases the productivity of companies based in the area, then it influences the innovation and finally, it stimulates the formation of new businesses.

For companies, being part of a cluster allows them to operate in a more productive way in obtaining inputs and in the way of facing and measuring things. To improve this productivity, clusters play a very important role in the ability of companies to continuously innovate.

### **1.3 Examples of clusters around the world**

As mentioned before, the California wine cluster is a good example. It includes 680 commercial wineries as well as several thousands of independent wine grape growers. In this sector, there are lots of complement industries which support not only the wine making but also the grape growing, including suppliers of grape stock, irrigation and harvesting equipment, barrels, labels...

Another important one can be the Italian leather fashion cluster, which contains well-known shoe companies such as Ferragamo and Gucci as well as a host of specialized suppliers of footwear components, machinery, design devices, molds, and tanned leather. It also involves several chains of related industries, also including the ones that produce different types of leather goods and different types of footwear.

### **1.4 Advantages and disadvantages**

As every type of industries, clustering may have lots of beneficial things that each company could obtain when joining it such as the following ones:

**High processing capacity:** combining the power of multiple servers, clustered systems can solve large and complex workloads. A customer is able to reduce the time to perform key engineering jobs from days to hours, shortening the time to market their new product.

**Consolidation of resources:** a single cluster can accommodate multiple workloads and vary the processing power assigned to each workload as required. This makes clusters ideal for consolidating resources and optimizing their use.

**Optimal use of resources:** Individual systems generally handle a single workload and must be adapted in size to accommodate the peaks in demands expected for that load. This means that they can generally perform well below capacity, but can fail if demand exceeds capacity, even when other systems are down. By sharing tremendous processing power across multiple workloads, clustered systems can handle a spike in demand, by temporally increasing processing sharing for that workload, obtaining like that the advantages of a non used capacity.

**Full availability with failover protection:** taking into account that processing system is spread across multiple machines, clustered systems are highly fault tolerant: if one system fails, the others will continue to function.

Having mentioned some advantages that companies can gain when forming part of a cluster, it could also have some drawbacks such as the following:

**Managing many interconnected machines** involve more attention and knowledge than managing a large machine with many processors.

There are no stable operating distributed systems on the market that are able to immerse the concepts of security and scalability in the clusters.



## **2. Ceramic tile**

Having mentioned what a cluster is and having put some examples, we are going to focus now on the ceramic in general but specially in the ceramic tiles.

### **2.1.- History of the ceramic tile**

The date of the first samples of ceramics applied to architecture cannot be exactly stated, but we know that the Egyptians used tiles more than 4,600 years ago, so we can get an idea of the time that humans have been using it.

Glazed ceramic tiles came to Europe through the Islamization of the Iberian Peninsula, being in the 13th and 14th centuries when the glazed clay acquired full development in Spain. More specifically, here in the Valencian Community it flourished during the XIV and XV centuries, with Valencian tiles being exported to places such as Venice, Egypt, Turkey ...

The Valencian ceramic tile industrial zone was consolidated at the end of the 19th century, growing even more in the early 20th century when production focused on Manises and Onda.

It is with the arrival of gas at the factories in 1981 when one of the most important technological changes in the ceramic tile sector takes place, since with its use, cleaner combustion gases are obtained. This process allowed direct contact of the gas with the product to be cooked.

This implementation, together with the new furnace material transport systems, was a key point in reducing cooking times, improving product quality, increasing production, saving energy... Larger formats were introduced, the first cogeneration plants were created and the enamelling industry achieved great global prominence. The cluster consolidated, and began to grow spectacularly, becoming the first product at European level and second worldwide, leading together with Italy the trade in ceramic tiles.

### **2.2.- The ceramic term**

The term "ceramic" comes from the Greek word "Kerameikos", which means "of clay". Ceramic products are "man-made" articles, which have been first molded or modeled using a large number of minerals and rocks, and then permanently heat-hardened (Adams, 1961).

The definition of ceramic product could be simplified as "an object molded with natural plastic raw materials and permanently hardened by heat" or as "the end product of an industrial process in which the starting materials are transformed and hardened"

It is a sustainable material both by its own nature and by the production process. The raw materials that make up the ceramic pieces are extracted from the earth, which together with the water and the cooking fire, make up a high quality natural product.

The quality of ceramics has increased a lot in recent years and this is largely due to the significant investment of the ceramic industry in R & D & I, achieving products of high technological rigor and high quality.

It is widely used in all types of buildings, facades, shopping centers, public spaces ... This is because it has certain unique characteristics such as great resistance to sudden changes in temperature, humidity, biological and chemical agents, or hardness and friction resistance. In the event of a fire, the ceramic does not release substances harmful to the environment or to humans, since it neither burns nor melts.

It is characterized for being very easy to clean and for its preservation capacity against dirt and any type of contamination. On the other hand, its electrical insulating capacity favorably to avoid the capture of electrically active environmental dust.

### A very competitive sector in Spain

The Spanish ceramic industry is one of the most competitive on the international scene, as it constantly bets on innovation and the development of new products and applications. The high degree of competitiveness of the Spanish ceramic industry can be seen in events such as the followings:

- First exporter by volume in the EU.
- Second largest exporter in volume worldwide
- Second producer in the world in 2015. It is currently in fourth place.
- Average annual turnover of around 3,500 million euros

As for the market, between 65-70% of sales are destined for foreign trade, taking into account that the sale of Spanish ceramic products is made in more than 180 countries, with the remaining 30-35% distributed nationally. Only 10% of the ceramics sold in Spain come from abroad, which shows the importance of the Spanish ceramic industry.

### **2.3.- Productive process**

Taking into account that this work focuses on the topic of comparing the ceramic clusters between Castellón and Modena, I find interesting to know how ceramic tiles are manufactured and therefore to talk about their production process.

The ceramic tile manufacturing process takes place in a few successive phases, these phases can be summarized as follows:

1. Preparation of raw materials.
2. Shaping of the pieces
3. Firing or firings, with or without enameling
4. Additional treatments
5. Classification and packaging

Depending on whether the product to be manufactured is enameled or not, whether it is manufactured by a single-firing, double-firing or third-fire procedure, in a certain process enameling will be carried out or not, or the sequence of the enameling steps will be modified and cooking in the proper way.

## 1.- Preparation of the raw materials

The selection of the raw materials that will make up the paste is the first step to be made in the ceramic process. These materials are mainly clays, feldspars, sands, carbonates and kaolins.

Traditionally these materials are usually used as they are extracted from the mine or quarry, or after having undergone a fairly light treatment. Its natural origin requires, in almost all cases, a prior homogenization that ensures the continuity of its characteristics.

### Dry or wet grinding

When a first mixture of the different components of the ceramic paste has already been made, it is when the paste is subjected to a milling process. Milling is the process that is done to the raw materials to obtain the desired size and can be dry via hammer mills or wet via continuous or discontinuous ball mills.

The material obtained after grinding does not have the same characteristics if it was made by dry or wet.

If the milling is carried out by the dry route, fragmentation occurs and both the aggregates and the particle agglomerates are maintained, so that the size of the resulting particles is greater than that obtained by the wet route.

Taking into account the important technical improvements involved, the wet process followed by drying the resulting suspension by spraying, is the one that has become the most prevalent in the manufacture of ceramic floor and wall tiles.

In the wet process, the raw materials can be partially or totally introduced into the ball mill, which is usually the usual procedure, or directly melt.

The material that remains after performing this process is called "Barbotina". A certain part of the water it contains is removed from the slip until it reaches the necessary moisture content for each process. The spray drying method is the most widely used in the manufacture of ceramic floor and wall tiles.

But what does the atomization process consist of? It is a drying process by which a suspension pulverized in fine drops, comes into contact with hot air to produce a solid product with a low water content.

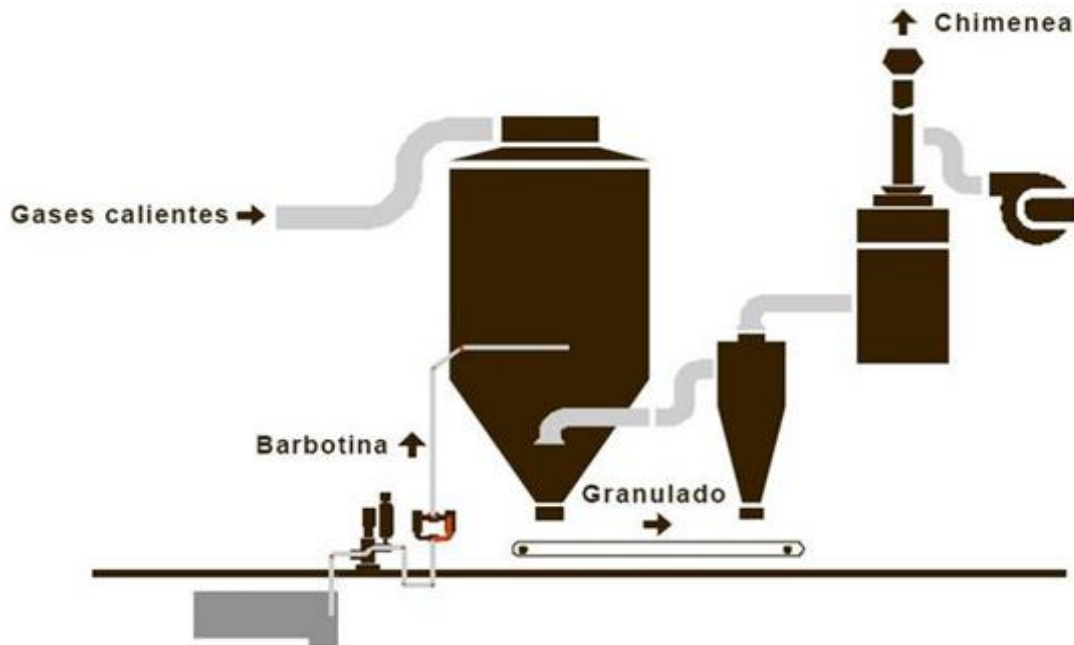
The moisture content found in the "Barbotina" is usually between 0.30 - 0.45 Kg of water / kg. of dry solid, this water content after the atomization process is reduced to 0.05-0.07 kg. of water / kg. dry solid.

This process can be seen in the following image:

- Pumping and spraying the suspension.
- Generation and supply of hot gases.

- Drying by hot gas-drop suspension contact.
- Separation of the atomized dust from the gases.

### Illustration 1. Spray drying process



Source:construmática2020

### Kneading

This kneading process consists of mixing the raw materials of the composition of the paste with water, obtaining a plastic mass that can be easily molded by extrusion.

### 2.- Shaping of the pieces and drying

#### Shaping of the pieces

The part forming process can be done by dry pressing or extrusion.

The most widely used procedure for shaping the pieces is dry pressing (5-7% humidity), using hydraulic presses.

This pressing system is based on oleodynamic presses which make a movement of the piston against the die by means of oil compression. They have a series of characteristics such as a high compaction force, high productivity, easy regulation ...

The forming of pieces by extrusion is about passing a column of paste, in a plastic state, through a matrix that forms a piece of constant section.

The equipment used has three main parts: the die, the cutter and the drive system. The propeller system is the most widely used propeller system.

### Drying or shaped pieces

Once it has been formed, the ceramic piece undergoes the drying stage. The objective of this stage is to reduce the moisture content of the pieces after they have been shaped until they reach low enough levels so that both the firing phase and the enamelling phase develop in the best possible way.

In the ceramic industry the most commonly used dryers transmit heat by convection, from hot gases to the surface of the piece.

The air used must be hot and dry enough, as it is not only used to remove water from the solid, but also provides the energy in the form of heat that water needs to evaporate.

Drying can be done in vertical or horizontal driers.

In the verticals, the pieces are placed on metal planes, forming different units that we call "baskets" between several planes. The temperature with which one usually works in this type of drying is less than 200°C and the drying cycles are usually between 35 and 50 minutes.

In horizontal dryers, the pieces are inserted in several planes inside the dryer and move horizontally above the rollers. In this type of drying, the temperature is usually higher than vertical drying and is around 350°C, with drying cycles lasting less than 15 to 25 minutes.

In general, the consumption of vertical dryers is greater than that of horizontal dryers, since the disposition of the pieces and the lower thermal mass in horizontal dryers is better.

### 3.- Firing or firings, with or without enameling

In non-enameled products, after the entire drying stage, cooking is carried out.

#### Enamel

Glazing is about applying one or more layers of glaze using different methods, which covers the entire surface of the piece. It has a thickness of between 75-500 microns in total.

The enameling is carried out to give the cooked product certain technical as well as aesthetic properties, providing the piece with impermeability, shine, color, greater resistance ...

#### Cooking the pieces

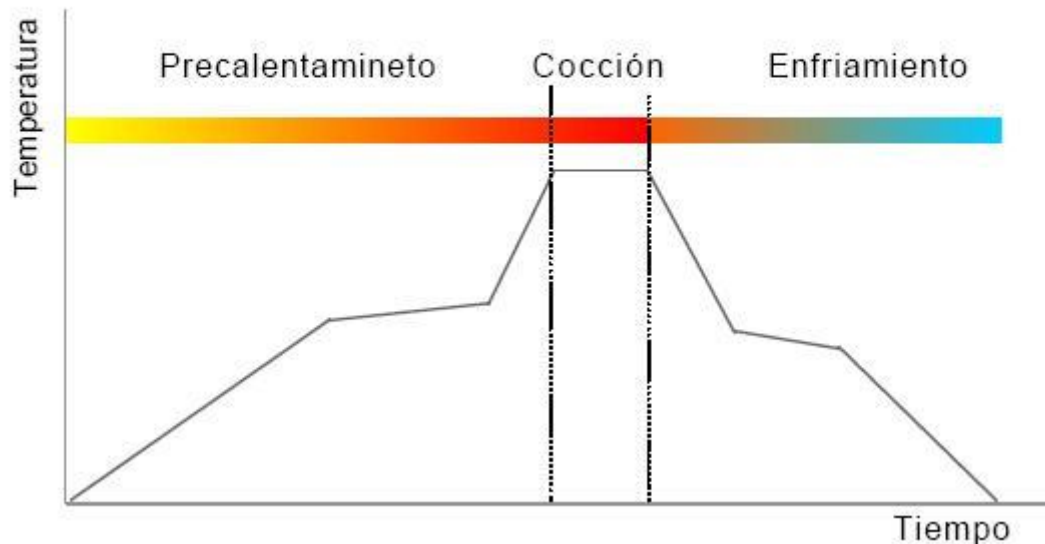
The firing stage is one of the most important in the ceramic product manufacturing process, since it is in the firing stage where a large part of the characteristics of the ceramic product such as mechanical resistance, resistance to chemical agents is determined, ease of cleaning, dimensional stability ...

Both the thermal cycle and the atmosphere of the furnace must be taken into account, since these must be adapted to the composition and manufacturing technology, depending on which ceramic product you want to obtain.

During the cooking operation, a series of reactions take place in the piece, causing changes in its microstructure and giving them the desired final properties.

## Illustration 2. The firing cycle

### Ciclo de cocción



Source: Construmática, 2020

Ceramic materials can be subjected to one, two or more firings. In the case of tiles that are not glazed they receive a single firing. On the other hand, tiles that have been previously enameled can be fired after having applied the enamel to the crossed pieces (single firing process), or first fired to obtain the support, to which it is applied. the enamel and then subject it to a second firing (double firing process). A third firing is also applied on certain materials, but at much lower temperatures.

Sometimes there may be additional drying after the enamelling stage of the pieces. This is done just before introducing it into the oven to reduce the amount of moisture in the pieces to low enough levels to be able to develop the cooking stage in the best possible way.

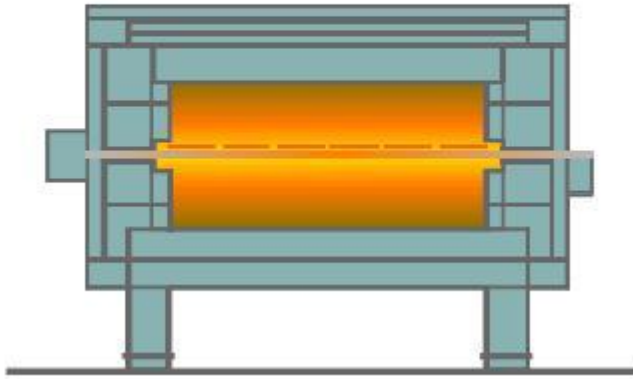
#### Fast firing

Fast firing is currently the most widely used by ceramic tile manufacturers, it is carried out in single-layer roller kilns, which have allowed the duration of firing cycles to be reduced to times that do not exceed 40 minutes. This has been possible thanks to the improvement of the heat transfer coefficients of the pieces and their flexibility and uniformity.

In single-layer furnaces, the pieces move above the rollers and the heat they need for their cooking is provided by natural gas-air burners, which are found on the walls of the furnaces. The main mechanisms of heat transmission present during this process are radiation and convection.

### Illustration 3. Single-layer roller kiln

Esquema de horno monoestrato



Source: construmática, 2020

#### 4.- Additional treatments

In some cases, particularly in porcelain stoneware tiles, a surface polishing operation is carried out on the fired pieces, thereby obtaining non-enameled, homogeneous shiny tiles.

#### 5.- Classification and packaging

Finally, with the classification and packaging stage, the ceramic product manufacturing process ends.

### 2.4.- Typology of ceramic tile products

The designations and descriptions that follow ceramic tiles take into account technical criteria, tariffs or the most used commercial terminology. There are no standardized or generally accepted definitions of the different types of ceramic tiles, so when using the proposed names it may be necessary to make the appropriate details, particularly in cases where this is noted.

Depending on its production, characteristics, appearance or more frequent use, we can differentiate different types of ceramic tiles.

**Tile:** Ceramic tiles with high water absorption, dry pressed and enameled. They are suitable for interior wall cladding.

**Stoneware flooring:** They have a low or medium-low water absorption level. It is the ideal pavement for interior floors, although they can also be used for cladding facades and exterior floors.

**Porcelain stoneware:** It has a very low absorption of water and is not enameled since it gets its color from the addition of dyes to its mass. They are used to cover both interiors

and exterior floors and facades. It is the most recent type of tile to appear on the ceramic market.

Catalan tile: Water absorption from medium-high to high, even very high and generally not enameled. Usually used for terraces, balconies and porches

Rustic stoneware: They are ceramic tiles with a low or medium-low water absorption level and are generally not glazed. It has particular characteristics making it suitable for cladding facades, exterior flooring and even public spaces.

Cooked clay: This denomination is applied to a great variety of tiles with very different characteristics since they only coincide in having a rustic appearance and in the high level of water absorption they possess.

Mosaic: They are generally small and square pieces. Currently there are three types of Spanish mosaic production: stoneware mosaic, enameled mosaic and glass mosaic.



### **3. The ceramic tile district of Castellón de la Plana**

#### **3.1.- Location of the district**

The province of Castellón is in the East of Spain since it is one of the 3 provinces that make up the Valencian Community, its capital is Castellón de la Plana.

Within Spain, the Valencian Community is one of the most important communities. It is a highly industrialized territory, it has a powerful tourist sector and a lot of influence in the agricultural sector, being the fourth most important economy among all the autonomous communities of Spain, generating 9.6% of the Gross Domestic Product (GDP) national.

Castellón is the smallest province in the Valencian Community behind Valencia and Alicante. It has 135 municipalities and a population of 579,962 inhabitants, representing 1.25% of the total population of Spain.

The geography of the province is mountainous in its interior, although it also stands out for having a narrow coastal area, which is where the majority of the population lives.

#### **3.2.- Concentration**

The DIC (Castellón Industrial District) is located in an area in the surroundings of the city of Castellón de la Plana, within a radius of about 30 kilometers, located on the Mediterranean side and made up of 25 municipalities that make up an urban area of about 250,000 inhabitants, it is here where we can find practically all of the tile manufacturing in Spain. It should be noted that it is in Castellón where most of the Spanish industrial sector is concentrated in the ceramic and tile industry, the most important towns being Vila-real, Onda, Alcora, Nules and Castellón.

Approximately 94% of national production originates from this province, where 80% of the companies in the sector are located.

This industry constitutes the central and most important activity of the DIC, both from the point of view of employment and billing. The district concentrates more than 95% of Spanish production, comprising approximately 240 companies.

According to the president of ASCER Vicente Nomdedeu "The tile sector represents the third Spanish industry that contributes the most trade surplus to the country and currently maintains an optimistic scenario, after years of severe crisis." (2017)

Below we can see a summary table with the main data on the sector at the national level, knowing that almost all of these data correspond to the production of the ceramic sector in the Industrial District of Castellón

**Table 1. Production of Spanish ceramic industry**

El sector cerámico en 2019					
<b>Producción</b> 510 Millones m <sup>2</sup>	<b>Exportación</b> 2.818 Millones Euros				
<b>Empleo</b> 15.800	<b>Ventas totales</b> 3.757 Millones Euros				
Producción y ventas del sector					
	2015	2016	2017	2018	2019
<b>Producción</b>	440	492	530	530	510
<b>Ventas mercado nacional</b>	643	746	824	870	939
<b>Exportación</b>	2452	2570	2686	2727	2818
<b>Ventas totales</b>	3095	3316	3510	3597	3757

Source: ASCER, 2020

As we can see in the table above, the ceramic sector has produced a total of 510 million square metres in the last year, employing almost 16,000 people and producing total sales of 3,757 million euros. The sector has continued to grow until reaching this last year 2019 its highest value both in national sales, exports and total sales in recent years.

The distribution of companies within the sector includes companies of complete cycle, of greater size and that have the different phases of the production process. The number of workers is at a minimum of about 40, although the average is close to 150 employees.

Alongside these companies are others, generally of a smaller size and intended for the manufacture of other ceramic products called special and third-fire pieces. Within this second group, there is even artisanal production and through small workshops.

It is worth noting the importance that these more artisanal cutting companies have to expand the final product offer in the industry, which combines the production of large companies with other pieces obtained from this activity segment.

#### Ceramic tile machinery and equipment sector

It constitutes the weakest part of the Spanish ceramic sector and is where the greatest degree of dependency is shown with companies outside the district. Specifically, the construction of ceramic machinery in Spain is small and most of it is imported from Italy.

This weakness of the DIC, regardless of the degree of internationalization of machinery companies and collaboration in some phases of design and construction, leaves the Spanish sector in a clearly improvable position. It should be noted, however, that we cannot speak of an absolute technological dependence on the Italian industry, since the degree of collaboration between ceramic and machinery companies requires adaptation to the end customer that involves their participation in the design and the inclusion of some improvements.

### **3.3 - Infrastructure**

In the province of Castellón, you can find different roads and motorways that connect the city with the outside, there are also many different secondary forms that cross the city.

The main road is the AP-7 (Autopista del Mediterráneo) that connects the entire Mediterranean coast from France to Guadiaro. Then we also find the N-340 (Carretera Nacional del Mediterráneo) which is a road parallel to the AP-7. The N-340 crosses the entire province and many of the coastal municipalities such as Benicasim, Peñíscola or Vinaroz. Another very busy road used for transportation is the CV-10 (Autovía de la Plana), an autonomous street in the Valencian community that connects the north with the south of the community. Apart from these, we can cite more secondary streets that are important to the district because they connect companies and businesses from different parts of the supply chain, such as CV-13, A-23, N-225, or the A-68.

The transport of all ceramic products is carried out mainly through trucks, making this type of road to communicate the important companies in the sector. The railways and the port of Castellón, which keeps the province connected with the rest of Spain, are also of great importance.

Finally, there is also an airport in Castellón, which was built with the intention of promoting and linking provincial tourism. It cost more than 150 million euros and despite having been officially opened in March 2011, it was not until 2014 when it received all the permits to operate. At present it is not very crowded so it is not of great importance for the transport of goods.

### **3.4.- History of the Castellón ceramic industry**

At the end of the Middle Ages and the beginning of the Renaissance is when the production of tiles acquires a technical and aesthetic quality of a high degree.

Until the Renaissance, tiles were only used in flooring, and during this time Italian tile was introduced to Spain

#### **3.4.1. 18th century “La real fábrica”**

In 1727 the first factory was born in order to industrialize Spain, it was called Real Fábrica. It was thanks to the Aranda's conte investment in Alcora since it had certain family ties there. In Alcora, good conditions could be found for this since there was tradition, clay, firewood for the ovens ... Most of the workers were from the town, although some specialists came from other countries.

When Buenaventura conte died, the factory was inherited by Pedro Pablo conte, and it was here that porcelain began to be produced and there were certain technical innovations such as two mills and two ovens for gilding the piece. Both production and operators began to grow a lot in the coming years, and the material began to be stored in different parts of Spain and even exported to America through the ports of Andalusia.

The Royal Factory also started producing tiles, although in small quantities and by prior order.

When Pedro Pablo died, a period of decline began, some of the factory operators began to create their own pieces and small autonomous workshops began to appear that were popularly known as “the factories”

Finally, the factory came into the hands of the Gerona family in 1858, some Catalan businessmen who ended all royal ties. They try to regain the prestige of the past by hiring operatives from England in the Staffordshire region as it had the highest concentration of ceramic industry at the time. However, it is not possible to reach the level of the past either.

The Factory changed ownership again in 1895 at the hands of Cristófol Aircart, an Alcora lawyer. Alcora's population increased or decreased in tune with the trajectory of the Factory. After the civil war, the factory closed in 1944, and its site was occupied by small tile factories.

### **3.4.2 The industrialization of the 19th century and the beginning of the 20th century**

Tiles have been produced in Onda since the Middle Ages since their geographical situation is similar to that of Alcora and it benefited greatly from the clay deposits in the area. During this century, many new companies were created and grew, even receiving awards for product quality.

At the end of the 19th century and the beginning of the 20th century, new companies appeared in Onda, who knew how to benefit from and make the most of a railway known as "La Panderola" that communicated with Vila-real and the port of Castellón. Two important factories of the time such as “La Campana” and “El León” began to export millions of tiles to Latin America. The main export market for these products was Barcelona, followed by Andalusia, the Americas and North Africa.

During the first decade of the 20th century, Onda was one of the most important industrial centers in the Valencian Community. However, in Castellón de la Plana, the capital of the province, the industrial tradition was very low. Thanks to the new socio-economic values, the port and good land communication, new factories began to open, reaching 11 companies in 1919.

The end of the 19th century marked the definitive takeoff of the tile industry in La Plana, with foreign markets and a minimally developed economy of scale. The railroads and the ports of Castellón and Burriana, helped to consolidate the sector.

### **3.4.3. Technological development and territorial expansion (1900-1970)**

Technological change greatly encourages the entry of new factories and entrepreneurs, many of them came from the agriculture of the orange trees. This is how the first expansion through “La Plana Baja” begins, especially in the city of Vila-real.

It is at the end of the 19th century when the different ceramic industries began to become independent, with tile industries providing the most innovation. The production process is the one previously explained in the section on ceramic tiles, although it should be mentioned that it is in the late seventies when a great change occurs in the production process with the appearance of industrial kilns, which increases much more production and product speed.

Onda led the production of Spanish ceramics during the first half of the 20th century. It didn't take big investments to create a new factory since most people worked in the ceramic sector so it was relatively easy to get employees. In 1925 the "Onda Ceramic School" was created, where all the technicians in the sector were trained both in production processes, technology, chemistry... This school worked until the start of the Spanish Civil War (1936).

In the following table you can see the number of factories there were, their productive capacity and the number of workers in the province of Castellón in 1969.

**Table 2. Factories, productive capacity and employees in Castellón in 1969**

<b>Town</b>	<b>Firms</b>	<b>Annual production square metres</b>	<b>Employees</b>
<b>Alcora</b>	<b>60</b>	<b>7.839.211</b>	<b>1.680</b>
<b>Onda</b>	<b>33</b>	<b>7.602.133</b>	<b>1.863</b>
<b>Vila-real</b>	<b>6</b>	<b>2.539.000</b>	<b>327</b>
<b>Castellón</b>	<b>9</b>	<b>2.240.505</b>	<b>492</b>
<b>Ribesalbes</b>	<b>10</b>	<b>1.442.401</b>	<b>477</b>
<b>Bechí</b>	<b>3</b>	<b>1.349.600</b>	<b>165</b>
<b>Almazora</b>	<b>5</b>	<b>1.202.752</b>	<b>246</b>
<b>Figueroles</b>	<b>4</b>	<b>429.624</b>	<b>123</b>
<b>Sant Joan de Moró</b>	<b>6</b>	<b>205.000</b>	<b>76</b>
<b>Others</b>	<b>2</b>	<b>470.265</b>	<b>122</b>
<b>La plana</b>	<b>138</b>	<b>25.320.491</b>	<b>5.571</b>

Source: Own elaboration from Membrado (2001:208)

It is worth noting the appearance of new factories in agrarian municipalities such as Vila-real, Bechí and Almazora. This appearance could also have been caused by two strong frosts in 1946 and 1956 that greatly affected the agricultural economy, so people began to look for other alternatives that they found in the ceramic sector.

#### **3.4.4. Second territorial expansion (1970-1985)**

After the 1960s, characterized by a significant improvement due to rapid industrial growth and the acquisition by citizens of greater economic power thanks to the opportunities given by the Stabilization Plan for Spain (1959), the economy experienced a restructuring and technological improvement. It was during these years that many factories appeared when the Spanish Association of Ceramic Tiles and Pavements (ASCER) was created.

The growth of the tile industry was constant and underwent a major change between 1969 and 1983 as 40 new factories were opened. This triggered a massive increase in workers in the sector as it went from 5,571 to 1,1046 workers.

The factories expanded by the large extensions of land that were in the surroundings, building warehouses for production, warehouses, raw material areas ... National Highway 340 was the main road used to transport all materials, since it was a relatively small area with just over 1000 square km and maximum distances of 60 km.

It was in the early 1980s that another "industrial revolution" took place with the introduction of more modern single-firing systems, thus reducing manufacturing processes. On the other hand, in 1980 the gas pipeline arrives at La Plana, for which the fuel is exchanged for natural gas, allowing many companies to take advantage and start electric cogeneration systems which would produce significant economic benefits.

#### **3.4.5 1990-2000**

The nineties represented a great growth in both production and income, which allowed the Industrial District of Castellón to compete internationally with the cluster with the highest production in those years, that of Modena-Sassuolo.

During these years, a large number of support industries also appeared, manufacturing products such as enamels, baths ... All the advantages of an economy of scale that offered a territory of less than 1,000 square kilometers, where everything was produced from raw materials to most of the components necessary for the production process, made the sector reaffirm internationally with the appearance of companies such as Porcelanosa, Pamesa, Taugrés or Vives

The geographical concentration of companies, the diversification of production and the entry into the international market were the three great achievements of that time. The number of companies remained stable in the group of pavements and coatings. The number of job sites also grew, especially in the area of management, innovation and marketing.

The cluster of La Plana represented 75% of Spanish companies and 99% of Spanish ceramics were produced in La Plana. In 1999 Castellón exported its production worldwide, mainly in countries of the European Union (45.15% of its export). Outside the EU, the two main markets were the United States (11.57% of exports) and the Middle East (10.59%).

### **3.4.6 2000-2019**

At this stage there was a great change from 2007 with the arrival of the greatest crisis that could have been experienced since the crisis of 1929. This crisis affected most of the sectors in the most developed countries, obviously including the ceramic sector of the Castellón area.

Before the arrival of this crisis, Chinese ceramics appeared as a competition, since they could produce practically the same product that was produced in Europe, but with much less costs. This was partly due to energy consumption as China did not respect the Kyoto agreement on the environment. During these years, China dominated the market and produced more than 30% of world production.

Spain began to focus more on product quality in order to compete with China, but in 2007 the crisis came. This crisis greatly affected the construction sector and therefore the ceramic sector, so the national demand for ceramics decreased greatly. To try to solve the problem, factories began to export more in order to find new markets and get out of the terrible crisis they were in, so that export began to increase from 2010.

Tiles were the most affected during the crisis since they were highly dependent on the construction sector. However, the fired, enamels and machinery sectors recovered as their exports increased and in 2012 the same situation was achieved in the sector as before the crisis, something that has not yet been possible for ceramic tiles.

Neither the 1975-1981 crisis nor the 1990-1993 crisis could be compared with that of 2007. There was no precedent to think that there would be a drop in ceramic sales of almost 40% in two years, since it went from selling 628 million square meters in 2007 to 382 million in 2009. The impact was devastating, not only in sales, but also in employment, production, stocks, closure of companies ...

The financial debt went from being 2.3 times the Ebitda to 5.2 from 2006 to 2011, which meant that dedicating all the benefit of a year of the company to pay the contracted debt, the companies would take more than 5 years to pay it .

### **3.4.7. Covid19 news**

Due to the current crisis that is being experienced by the Coronavirus, thousands of workers in the ceramic sector are being affected by temporary employment regulation, as companies are turning to ERTE to try to safeguard the survival of many societies and the maximum of Possible employment when the storm ends.

The sector has stopped producing and exporting material worth around 250 million for two weeks of hiatus. In addition, the industry must face millionaire expenses in wages and taxes with a liquidity that is not arriving.

As we have already seen, the ceramic sector is one of the main economic engines of the province of Castellón and of the Valencian Community, with an important role in the foreign trade balance. Some 16,000 employees and quite a few SMEs and freelancers depend on it, whose economy revolves around tile.

A two-week stoppage means for the ceramic sector to stop manufacturing around 21 million square meters, which would be about 138 million euros. Taking as reference the export data for March 2019, the industry stops entering almost 128 million euros.

Both the ASCER tile and the ANFFECC glaze and frit tiles as well as the ASEBEC ceramic machinery tile show their concern about the effects that this stoppage may have, both in exports and in the domestic market.

Something that is clear to all employers in the ceramic sector is the need for liquidity to reach companies because the first treasury tensions are already beginning to appear when it comes to having to pay wages and face taxes.



## **4. The ceramic district of Sassuolo**

### **4.1.- Location**

The Italian ceramic industry is located mainly in the Sassuolo district, an industrial city of 41,641 inhabitants located in the province of Modena and in the Emilia-Romagna region in north-eastern Italy.

The Emilia-Romagna region is a densely populated area, considered one of the richest regions in Europe and the third Italian region by GDP per capita. Industry is one of the most important sectors along with tourism. The ceramic sector is concentrated in Faenza and Sassuolo.

A special feature of the Emilia-Romagna economy is its great focus on the social economy, with 8,000 cooperatives existing today. Two out of three people in the region work in one of these cooperatives and the per capita income is 50% higher than the Italian national average.

### **4.2.- Concentration**

The Italian ceramic district is to this day one of the world leaders in tile production; in fact, it manufactures more than 80% of Italian ceramic production. 90% of Italy's tile production capacity is located in the Emilia-Romagna region, with 80% being concentrated in 80Km<sup>2</sup> of ten municipalities around Sassuolo in the province of Modena.

According to Confindustria Ceramica, in 2018 there were a total of 137 ceramic tile manufacturing companies operating, with a workforce of 19,692 employees. Total production was 415 million square meters and sales were 410.1 million square meters. This brought the total turnover of ceramic companies to 5,400 million euros, of which 4,500 million come from exports and 834 million euros from national sales.

In the Sassuolo area we not only find the final sellers but we can also find the entire supply chain, from obtaining raw materials to obtaining the final product. All these companies are located in an area of a radius of about 20 km in Sassuolo, where 160,000 people live.

This district has been to date one of the world leaders in the manufacture of ceramic tiles, standing out above all in ceramic flooring. This has been made possible not only by the aesthetic results of the products, but also by the entire effort of the industry dedicated to research and innovation.

The innovation process refers to all aspects of the traditional industrial process, from grinding and atomizing the suspensions, through the differential loads of the presses, the development and application of enamels, to the firing processes. All these characteristics are what have led the Italian district to optimize the cost of production and improve the quality of its products.

From the beginning of the XX1 century, the market position acquired by the Italian ceramic industry has been significantly affected by the appearance of increasing international competition. During this period, the increase in Spanish ceramic production

was of great importance. While the Spanish production was mainly based on the manufacture of tiles, the Italian production was based more on the ceramic flooring, which usually has a higher price and was a great advantage from the point of view of income.

#### **4.3.- Infrastructure**

Logistics and transport are key competitive factors for a sector which handles more than 20 million tonnes of raw materials and finished products in Italy alone. It has been calculated that between 4.000 and 6.000 trucks enter and leave the area every day, without counting those which are used for small journeys between companies located in the area.

This can be very important since we have to take into account that both, raw materials and finished products are transported from and to very distant locations. For example, many raw materials come from countries such as Ukraine, Turkey, Germany or France while finished products are exported to more than 180 countries all around the world.

80% of the production is concentrated in the Sassuolo district, this area is just of a few square kilometres where intercompany transport, the prevalent use of road haulage, the policy of multiple pick-ups adopted by road hauliers and the presence of more than 22.000 employees all contribute to severe traffic congestion.

Strategic routes of communication such as the Campogalliano-Sassuolo link road (connecting the tile manufacturing area with the motorway system) are particularly important for the transport of freight and products destined both for Italy and abroad.

Clay from Germany and France is transported almost all of it by rail. Clay from Ukraine, sand from Sardinia and feldspar from Turkey are shipped by sea, transiting the ports of Livorno and Ravenna.

Speaking about finished products they are sent to Italian and European markets mainly by road. There has been an increase in rail traffic for products bound for Northern Europe. Rail transportation is just the 30% of the total and containers bound for the main ports for overseas shipment are also transported by rail.

Why is that happening? The most important cause is probably the lack of adequate road and rail infrastructures for the requirements of freight and human transport in the district. The Italian tile business "Assopiastrelle" has played a leading role in negotiations with local and national public administrations and has already done some meetings. These committees have not yielded concrete results yet.

#### **4.4 - Evolution of the industry**

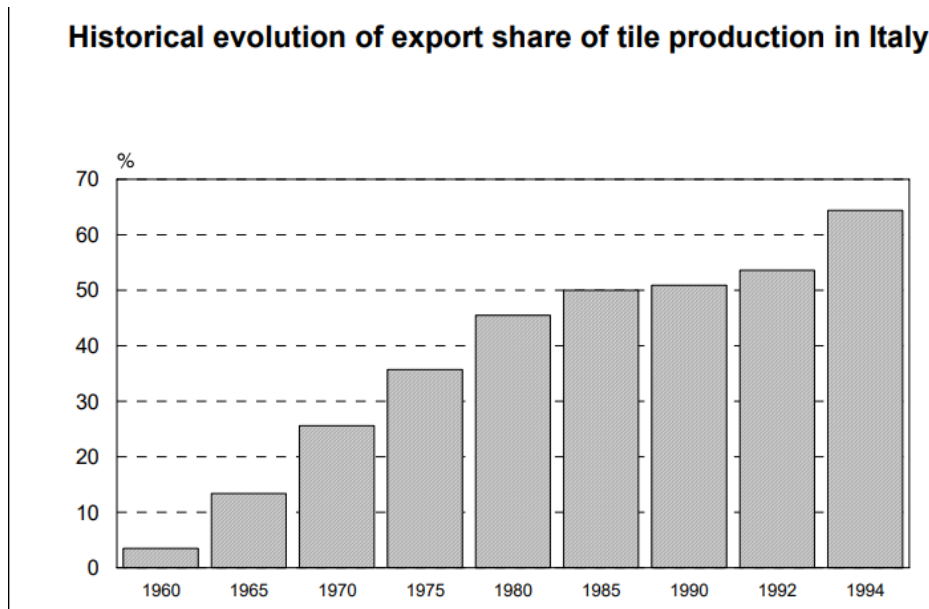
In order to understand the evolution of this industry since 1960s, it is very important to mention that this region was also a host to many metal engineering firms and workshops.

These firms were the ones which started to drive technical progress in tile manufacturing. They came up with innovations such as continuously moving kilns, innovation which developed in an improvement in product quality, reduced production time from days to

hours, and thus reduced costs. In the 1960s and 1970s major technological innovations included not only the roller kiln but also the heavy presses.

From 1970s until the 2000, Italian firms started systematically to explore exports markets

#### Illustration 4. Historical evolution of exports share of tile production in Italy



Source: Bursi, 2001

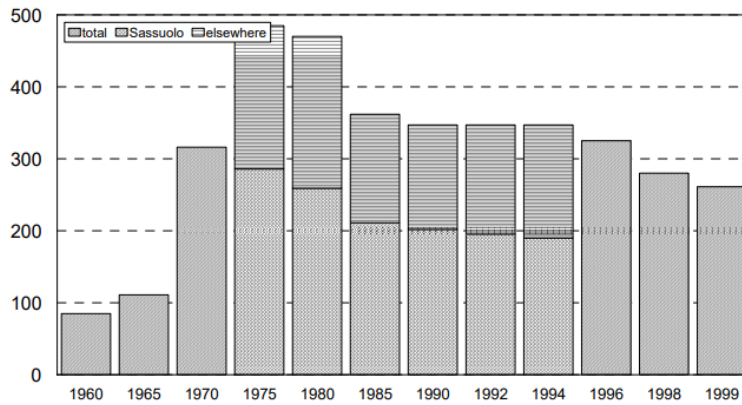
Leading firms such as Marazzi, put a huge effort in order to create a brand identity in other countries, but it was mainly the tiles from Italy label the ones which made the difference, they had a different appearance and more diversified sizes than tiles which were produced locally in target markets.

Tile manufacturers started to collaborate with external designers and artists with the aim of creating innovative designs. Italian industry was able to have a clear leadership position by combining a superior production technology and efficiency with the superior production design and marketing effort, driving traditional competitors as Germany firms out of the market.

In order to understand the evolution of the industry it is useful to look at the evolution of the number of firms and the number of employees as it can be seen in the following graphics.

### Illustration 5. Evolution of the number of tile firms in Italy

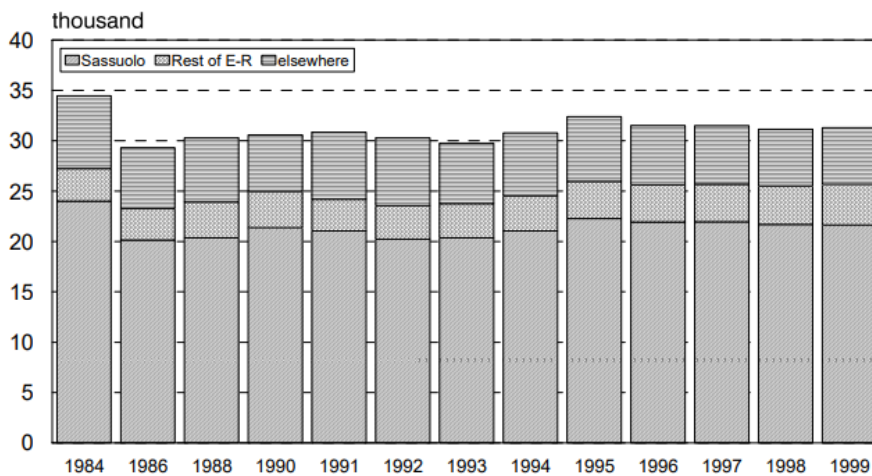
Evolution of number of tile firms in Italy



Source: Bursi and Assopiastrelle, 2001

### Illustration 6. Evolution of tile industry employees in Italy

Evolution of tile industry employees in Italy



Source: Assopiastrelle, 2001

The number of firms kept growing until the end of the 70s, although later started to decrease until the S.XX1, whereas the number of employees has been more or less the same during.

Behind this is the fact that since 1980s the industry has been going through a process of concentration, without new tile manufacturers joining the area and some producers being taken over by other firms.

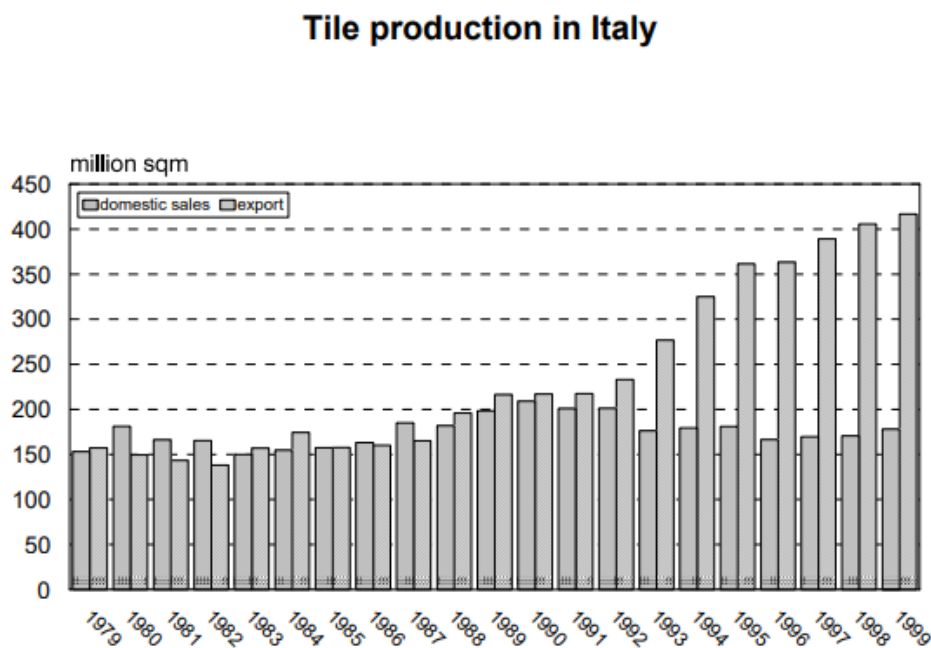
In terms of sales and marketing, the effort to have a strong presence and create a brand name in many important countries was a major reason for the concentration process which has marked the industry since the 1980s.

As it can be seen in the table below, the ten largest groups in 1999 accounted for more than the 60% of the total production. (Table 6)

There were two typical patterns of concentration. On the one hand, there were frequent minority cross holdings between firms which at some point in time were transformed into more ties, creating a holding. On the other hand, basically most of the firms were family owned, and many times families opted for selling the firm rather than going through the trouble of an intra family management succession.

In 1990s exports were much bigger than in the previous decades. (Figure 10)

**Illustration 7. Tile production in Italy (1979 – 1999)**



Source: Assopiastrelle, 2001

Firms argued that there were minimum size requirements in order to be able to present in several export markets, which are due to production capacity and size of the sales force. Internationalization of products was still a quite rare phenomenon but an early mover in this respect was Marazzi firm, which set up factories in other countries like Spain or the United States of America during the 1980s. Other companies such as “Iris” kept all its production in Sassuolo.

A major competitive advantage of Italian tile manufacturers appeared thanks to two factors. First, stocks were deliberately kept large; they amount to about 3 months of

production. Second, there was also upgrading in terms of distribution where manufacturers created systems which allowed them to deliver lots of tiles to any place in Germany within 4 to 5 days. Germany was by the moment the main export market for Italy.

During the first years of the millennium, the aim of the districts was the internationalization of the firms. Due to the expansion within new markets, firms had to compete with new and more aggressive competitors on a large scale.

Later during the crisis in 2007, the situation got really tough and difficult for the Italian producers and the production decreased a 30% while sales made it a 20%.

From 2009 on, things started to change for good until a point where in 2016 sales volumes in Italy had finally turned the corner and gone up to 82.8 million square metres (Which was only half of the size of the market before the financial crisis). There were 16 foreign-registered subsidiaries, belonging to nine Italian ceramic groups, employing up to 3.283 people and producing 85 million square metres of tiles.

**Table 3. Italian ceramic tile industry variation**

<b>ITALIAN CERAMIC TILE INDUSTRY: Var 2016/2015 %</b>				
	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>Var. %</b>
<b>Companies (number)</b>	<b>150</b>	<b>150</b>	<b>147</b>	<b>-2.0%</b>
<b>Employees (number)</b>	<b>19,430</b>	<b>19,143</b>	<b>18,956</b>	<b>-1.0%</b>
<b>Production (million sq.m)</b>	381.7	394.8	416.0	+5.4%
<b>Total Sales (million sq.m)</b>	394.6	396.9	414.5	+4.5%
... of which Italy	80.8	80.3	82.8	+3.2%
... of which exports	313.7	316.6	331.7	+4.8%
<b>Investments (million euros)</b>	286.2	351.3	400.4	+14.0%
<b>Total Revenues (million euros)</b>	4,914.0	5,117.0	5,417.1	+5.9%
... of which Italy	804.0	799.0	828.8	+3.7%
... of which exports	4,109.0	4,318.0	4,588.3	+6.2%

Source: Confindustria Ceramica Research Centre, 2017

As it can be seen in the table above, the variation of the number of companies, employees, production... has been growing during the last years and recovering after the financial crisis.

#### **4.5.-Structure of the value chain**

The first part of the value chain of the Sassuolo cluster is the delivery of clay, most of it is white, which has to be imported from other countries such as Germany or Ukraine. Getting access to the clay does not seem to be an important issue for the Sassuolo cluster.

Processing of the clay, atomization and preparation of the biscuit are usually activities made by each tile manufacturer. Actually, there are some large firms which are selling atomized clay to smaller businesses.

An important type of specialized firms are the ones which design, they have special designers working for them who develop design concepts and entire collections of tiles.

Another type of specialized firms are those active in sales, in particular tradings. The Italian cluster does not have their own sales chains (with the exception of two large groups in their U.S. operations), and not all of them have their own sales reps in target markets.

#### **4.6.- International markets**

The Italian ceramic tile industry exports all its products to more than 180 countries all around the world and in 2006 generated export revenues of almost 3.9 billion euros. It holds the largest share of international trade in this product, represented by the 38%. During the first years of the 1990s, the sector exports had reached more than 70% of total sales and since then it has continued to rise steadily until 2020.

An enormous effort in this area is showed by Confindustria Ceramica. Its activities include providing continuous support and information to members and lobbying on behalf of its represented sectors through a presence on the committees of institutions of every type of levels and kinds, either through European federations or directly.

This association conducts its activities in many different areas although there are some of them which are particular important and worth it to mention:

-WTO multilateral commercial negotiation

With the aim of the consolidation of the Italian ceramic industry in the first position, it is very important to guarantee access to markets and try to eliminate or reduce barriers to trade. The Italian tiles export opportunities are affected by the presence of some tariffs in various countries and particularly in areas of large potential consumptions.

During the previous GATT Talks, the Association accomplished the elimination of tariff peaks, in particular it secured a commitment that import duty in the USA would be gradually reduced over a period of a decade with the objective of reaching a level of 50% of the tariffs applied at the beginning of the talks.

-Technical export barriers

The obstacles of free movement of goods include barriers of a technical nature, which has a clear impact in Italian exporter companies due to unclear legislation that often makes reference to discordant sources.

To try to solve this problem, Confindustria Ceramica works closely with the competent Ministries and the ICE and makes use of the technical support of the Italian Ceramic Centre in Bologna. This association's effort involves providing information to some represented companies and conducting parallel activities in order to eliminate or at least try to reduce these barriers.

-Safeguarding Italian products

Italian origin is an important added value for ceramic tiles, as it can be appreciated by the popularity of the aesthetic and technical qualities of the Italian products in every market. It is imperative to safeguard this competitive advantage.

#### **4.7.- The Italian ceramic industry shut down by Covid-19**

According to the Prime Ministerial Decree of 22 March aimed at containing the coronavirus spread, all non-essential production activities in Italy have been closed, including the ceramic tile production and the upstream sector of ceramic machinery manufacturing. The shutdown was extended to the 13th of April.

Confindustria Ceramica's Chairman Giovanni Savorani said that they have been extremely worried because decisions taken by the government to stop the coronavirus spread are posing a threat to the competitiveness of the sector. This fact has not only been damaging their companies, which are losing turnover and market share, but also causing harm to the entire country.

The Italian ceramic industry had complied with all the measures required to guarantee the health and safety of the workers and transporters, while office staff are continuing working from home.



## **5. The comparison**

In both areas, the productive tradition of the territory plays a fundamental role in explaining both the settlement process and the expansion of these activities. The existence of an artisan ceramic activity in both areas played a very important role in defining the current business location of the ceramic districts.

However, the evolution of both countries has led to significant differences in competitiveness at certain times. Spain started from a level of development higher than Italian until the mid-thirties. However, from that moment on, the Italian industry manages to overcome the Spanish leadership and place itself at the world head. Why?

In Spain, industrial policy during the Franco period (from 1940) was characterized by the lack of a strategy for small and medium-sized companies, since it focused most of its policies on large companies, as well as for isolation from the international market. Due to these measures, the technological and productive evolution of the Spanish ceramic sector was practically stagnant.

For its part, the Italian sector began to train specialist technicians to attend to and try to improve traditional technology. The definitive configuration of the district's industrial structure, starting the Italian specialization in flooring and cladding or starting to gain strength in the foreign market are some of the reasons why the expansion of subsequent years can be explained.

### **5.1.- Situation and evolution**

Comparing both districts, the Sassuolo district was the leader since the artisanal production to the industrial manufacturing, becoming the world leader. However, Castellón was able to reduce the difference between both districts, even overtake the Italian district in some aspects at the end of 1990s. For example, comparing the production data, while Spain only had a half of what the Italian district was producing in 1990 (225 millions of square metres against the 447 millions of Italy), at the beginning of the following decade, the number of squared metres produced by Spain was bigger than the Italian ones.

According to ASCER and as mentioned above in the Castellón district, production in 2019 has been of 510 millions of square metres, with total sales of 3.757 millions of euros, exporting 2.818 of the total sales and employing 15.800 people. Speaking about Italy, according to ASSOPIASTRELLE during 2018 (taking into account that the data of 2019 has not been published yet) the production was of 415 million square metres, with total sales of 82.4 millions square metres, exporting 327.7 million square metres and employing 19.692 people.

Although in both cases the production of ceramic paving and cladding is the main activity, other important productive activities have been developed.

In Sassuolo, apart from products, inputs and complementary services, the most relevant activity is the one of the subsector of machinery and equipment.

In Spain, the most relevant factor about productive activities within the district is the subsector of frits and ceramic glazes. Some of the reasons are the following ones: Firstly, the cost advantage in labour and less environmental controls. Secondly, the existence

of a well-integrated network of research institutions and besides and more important the innovative effort of companies and their process of internationalization.

Although Italy and Spain compete most of the times in the same markets and segments, it exists a certain specialization between both countries. Traditionally, Spain has been focused on cladding, while the Italy industry has been more focused on paving. This fact has facilitated the development of specific technologies. In Spain, the porous single cooker technology was developed to overcome the problems about the most demanding cladding in the calibre and shine. On the other hand, although Spain entered in an aggressive way in the production of red body, Italy has been specialising in the production of porcelain, a stronger and higher segment product.

It is true that during the last years the difference of product and quality between Spain and Italy is almost the same. We could also probably say that speaking about design, Spain is one step behind to Italy.

## **5.2.- District government**

In Castellón, the district is receiving an important support from local and regional authorities. There are relevant activities by the business associations ASCER (ceramic pavement and cladding), ANFFECC (frits and glazes) or ASEBEC (machinery and equipment). Many organisations such as Universitat Jaume 1, develop some activities of investigation, education and specific formation of the human resources. Other relevant institutions are the commercial fair CEVISAMA which is held in Valencia or the international congress QUALICER.

Cevisama has 38 years of experience as a monographic event of the ceramic sector. It is an international showcase of reference in ceramic coatings, bathroom equipment, nature stone, frits and ceramic colours, tiles and bricks, materials and tools, and ceramic machinery. Consolidated as an annual key appointment for professionals of the sector, the fair receives professionals from 140 countries every year

In the Italian district the support can be considered more limited and less specific from public authorities. There are strong business associations, a higher-rated human capital in business design and management, an educational system more focused on vocational training and less university presence, an environment with particular skills in companies in design and commercial aspects. These associations are ASSOPRIASTELLE (pavement and cladding), CERACOLOR (frits and glazes) and ACIMAC (machinery and equipment). Other relevant institutions could be the Bologna and Modena university or the well-known and probably most important fair of ceramic CERSAIE.

## **5.3.- Internationalization**

Both countries are now occupying a leadership position in the international markets. However, it is true it can be appreciated how the brand of "Spanish tiles" is less recognised than the Italian one. Why is that happening?

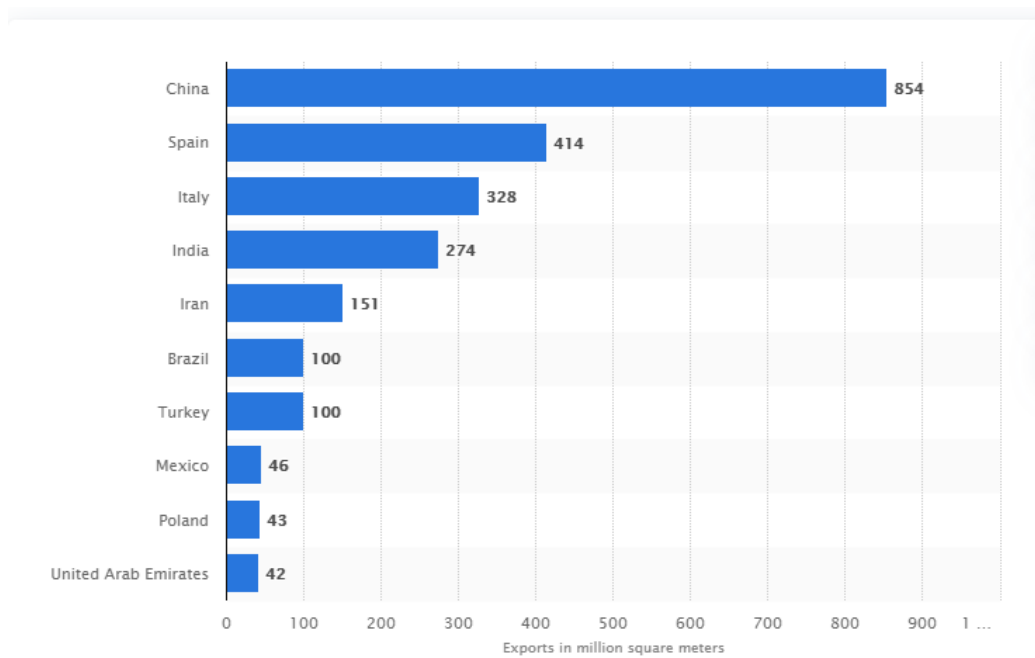
This is probably because when you compare the Italian tiles with the Spanish one, we could say that in design, trade, marketing and customer service Italy has a better position around the world. The collective identity of the Italian industrial district enjoys a strong brand.

Spain is the world's third biggest exporter of ceramic tiles, with international trade rates of between 15 and 18%. Although Spain's ceramic tile industry is made up almost entirely of SMEs and family-based businesses, for many years Spain has been the world's second biggest producer, and currently ranks fourth with 5.8% of the world's total production.

Italy exports to 5 continents and over 180 countries around the world for a value of almost 3.9 billion euros. Italy covers the largest share of international trade with a 38% and exports in the sector have reached more than the 70% of the total sales.

The leading ceramic tile exporting countries worldwide in 2018 can be seen in the following graphic.

**Illustration 8. The leading ceramic exporting countries**



Source: statistica.com, 2019

As it can be appreciated, both Italy and Spain are at the top of the table, only behind China which was the leader by far exporting 854 millions of square meters. In the second place we have the Castellón district exporting 414 millions of square meters followed by the Sassuolo district with 328 millions of square meters.

In the following table we have the example of exports during the first quarter of this year and the past one to the United States of America:

**Table 4. Exports during 2019 and 2020 to the United States of America**

<b>Country of origin</b>	<b>Jan-March 2019 (sq.m)</b>	<b>Jan-March 2020 (sq.m)</b>	<b>% Var. 2020/2019</b>
Mexico	9,477,297	7,620,293	-19.6%
Spain	7,311,453	7,376,562	0.9%
Italy	6,850,664	7,178,196	4.8%
Turkey	2,860,179	5,314,226	85.8%
Brazil	3,831,435	4,586,621	19.7%
India	646,919	3,346,080	417.2%
Peru	1,537,499	936,386	-39.1%
Malaysia	25,114	393,814	1468.1%
Vietnam	6,464	326,160	4945.8%
Colombia	303,176	324,247	7.0%
Portugal	232,086	237,939	2.5%
China	11,443,231	227,574	-98.0%
<b>All Countries</b>	<b>46,137,618</b>	<b>39,257,574</b>	<b>-14.9%</b>

Source: Ceramic World Review, 2020

As we can see Spain has been exporting during the first quarter of the year more than Italy, occupying the second and the third place respectively only behind Mexico. Spain's exports remained virtually unchanged in terms of volumes but increased in value by 5%, while Italy posted a good +4.8% in terms of exported volumes and +2.7% in value.

This numbers also confirm China's comprehensive exit from the market (-98% in both volume and value compared to the first quarter of 2019).

As we can see, Spain and Italy are both at the top of the exporting countries so this makes us appreciate the importance that both districts have in the ceramic tile sector.

#### **5.4.-Concentration and interdependence**

One thing that has to be taken into account is the fact of a high concentration of the production in the ceramic industry of both countries. Contrary to what happens in all the others sectors where there is no a single location of almost the whole production, in the areas of Castellón and Sassuolo we can find that more than the 90% of the total national production takes place there.

There are many similarities between the two territories. First of all, the Valencian Community and Emilia-Romagna are two leading regions in their national context for GDP creation, taking into account that in Spain the Valencian Community GDP represents a 9.6% and in Italy, the Emilia-Romagna GDP represents a 6.85%.

These results can be achieved thanks to the entrepreneurial spirit of both regions, knowing that in these two districts, ceramic is not the only industrial agglomeration. In the Valencian Community there is a lot of shoe and leather goods, games and toys, wood

and furniture, textile and clothing industry, organised within cluster or industrial district. The same can be said about Emilia-Romagna, where we can highlight the presence of important Italian districts such as the luxury cars one.

A difference in both territories can be seen in how they have spread. Castellón's district is contained in a radius of 30 Km and it just covers one province. Sassuolo's district is bigger and besides it covers two provinces, Modena and Reggio-Emilia, with a radius of 40 Km. Despite the Italian district is bigger than the Spanish one, the concentration of the enterprises is similar due to the higher number of firms in Italy. A large part of the production in both districts is handled by the major competitors due to mergers and acquisition, this phenomenon has been strong in Sassuolo during the last decade where there has been 30 cases.

Both districts have a huge contribution in the production, managing the majority of their national production (94% for Castellón and 80% for Sassuolo). We could say that within Spain there is a higher geographical concentration while in Italy the concentration is more referred to the production shares.

Finally, another distinguished aspect refers to their interaction and mutual influence knowing that the evolution of one district has conditioned the other one. An example can be seen in the absence of a powerful machinery and equipment subsector in Spain, which in part, has been a consequence of the strong Italian subsector but also has provided Spain the opportunity of focusing their district on other activities such as the frits and glazes.

In the following table we can compare some of the aspects mentioned above

**Table 5. Comparison of some aspects about both districts**

<b>Castellón</b>	<b>Sassuolo</b>
<b>Existence of ceramic craftship</b>	<b>Existence of ceramic craftship</b>
<b>Production of 510 millions of square metres</b>	<b>Production of 415 millions of square metres</b>
<b>Exports of 414 millions of square metres</b>	<b>Exports of 328 millions of square metres</b>
<b>Its powerful subsector is frits and ceramic glazes</b>	<b>Its powerful subsector is machinery and equipment</b>
<b>Traditionally focused on cladding</b>	<b>Traditionally focused on paving</b>
<b>A lot of support from ASCER, ANFFECC or ASEBEC</b>	<b>Limited support from ASSOPIASTRELLE, CERACOLOR and ACIMAC</b>

<b>Less recognised brand</b>	<b>More recognised brand</b>
<b>More than the 90% produced in the same territory</b>	<b>More than the 90% produced in the same territory</b>

Source: own elaboration

## **6. Conclusion**

The main target of this work has been to do a comparison between the two industrial districts of Castellón de la Plana and Sassuolo. Having finished the work, I have arrived to the following conclusions.

Both districts have been historically known because of the existence of handmade ceramic activity during the past, so we could say that thanks to the past, they are nowadays really into this sector.

The geographical proximity of every single company conforming the cluster is really helpful for the sector and contributes to its expansion. We could say that they have both created a district identity. This proximity is crucial for the logistics departments, as trucks transporting every type of materials can be much easier to manage, saving not only money in expenses such as the fuel or the hours spent, but also reducing the contamination and being more environmentally friendly. Repair shops of the machinery has also an important role in the proximity since firms which are not in the district may have more difficulties when finding a repair shop for its machinery.

There is a high presence of small and medium enterprises which are crucial in the innovation process

Similarities between the two districts have seem to be very important in order to achieve what both districts have accomplished. The Valencian Community and Emilia-Romagna share characteristics such as the creation of GDP for their countries or the ceramic culture between families around the district. Both districts have been growing during the last decades and are willing to keep growing.

Another important point which can be appreciated looking at the structure of the two districts is the presence of the main activity, which is the production of tiles, supported by two subsectors, the frits and glazes in Spain and the machinery production in Italy. As said before, Italian subsector of machinery is more powerful than the Spanish one, but this doesn't mean that our subsector is not good. Actually, we could say that we import mainly kiln and press from Italy, but we don't need to import glaze machinery since we have companies such as Kerajet which produce it.

From my point of view, it has not been as easy as I thought finding information and articles about the ceramic tile industry of both countries and even more an updated one. I want also to point out that from my point of view the Assopiastrelle webpage has more information than ASCER, since it has been easier to take information from the Italian cluster from their webpage.

Finally, I think that Italians have been able to sell their brand better than us, since it always seems that Italian tiles have a better brand and are of a better quality than the Spanish ones. I could say that this is not only happening in tiles, since I believe that they know how to sell every type of products better than us, involving that their marketing departments seem to be better. These examples can be seen in Italian wine or oil, since our product is the same or even better but when you travel abroad, people tend to believe that the Italian one is better. I have some close familiars working in the sector and they have always told me that it is true that Spain has always being one step behind in the design of the tiles, but not in all the other factors which involve the tile manufacturing.

## **7. BIBLIOGRAPHY**

Ascer, (2020). Available at: <https://ascer.es/> [Accessed 17 march 2020]

Budi, V. (2008). El distrito de la cerámica en Castellón [pdf]. Available at: <https://www.publicacionescajamar.es/publicacionescajamar/public/pdf/publicaciones-periodicas/mediterraneo-economico/13/13-227.pdf> [Accessed 27 april 2020]

Ceramic World Web, (2020). Available at: <https://www.ceramicworldweb.it/cww-en/news/tiles/the-italian-ceramic-tile-industry-shut-down-by-covid-19-what-about-spain/> [Accessed 21 april 2020]

Confindustria ceramica, (2020). Available at: <http://www.confindustriaceramica.it/site/home.html> [Accessed 17 march 2020]

El mercado artesano, (2020). ¿Qué es la cerámica? El mercado artesano. Available at: <https://elmercadoartesano.es/que-es-la-ceramica/> [Accessed 11 april 2020]

Fioretti, G. (2005). Agent-Based Models of Industrial Clusters and Districts. [pdf] Available at: <https://econwpa.ub.uni-muenchen.de/econ-wp/urb/papers/0504/0504009.pdf> [Accessed 26 april 2020]

Gabaldón ,D; Tortajada, E and Fernández, I. (2005). Distritos industriales: estructura e innovación. Una aproximación empírica a los distritos cerámicos español e italiano [pdf]. Available at: [https://digital.csic.es/bitstream/10261/10438/1/AC79\\_1\\_ALTEC%2520Distritos%2520Industriales.pdf](https://digital.csic.es/bitstream/10261/10438/1/AC79_1_ALTEC%2520Distritos%2520Industriales.pdf) [Accessed 27 april 2020]

Galán, E. and Aparicio, E. (2006). Materias primas para la industria cerámica [pdf]. Available at : [http://www.ehu.eus/sem/seminario\\_pdf/SEMINARIO\\_SEM\\_2\\_031.pdf](http://www.ehu.eus/sem/seminario_pdf/SEMINARIO_SEM_2_031.pdf) [Accessed 25 april 2020]

Llop, G; Stoyanova, T; Barrachina, E; Notari, M.D; Nebot, I. and Carda, J.B. (2014). La industria cerámica en España: retos y oportunidades en tiempos de crisis [pdf]. Available at: <http://www.qualicer.org/recopilatorio/ponencias/pdfs/67%20PON%20ESP.pdf> [Accessed 27 april 2020]



Meyer-Stamer, J; Maggi, C. and Seibel, C. (2001). Improving upon nature. Creating competitive advantages in ceramic tiles clusters in Italy, Spain and Brazil. *Inef*, [Online]. Available at: <http://edoc.vifapol.de/opus/volltexte/2013/4552/pdf/report54.pdf> [Accessed 21 april 2020]

Molina, F-X. and Martínez, M. (2004). Distrito industrial, capital humano disponible y desempeño. *El sector cerámico de Castellón* [pdf]. Available at: <http://www.revistaestudiosregionales.com/documentos/articulos/pdf780.pdf> [Accessed 21 april 2020]

Molina, F-X; Vallet, T. and Marques, A. (2008). El distrito cerámico, evolución y posibles alternativas futuras. Una comparación Italia y España [pdf]. Available at: <http://www.qualicer.org/recopilatorio/ponencias/pdfs/0813111s.pdf> [Accessed 27 april 2020]

Mosconi, F; Solé, F. and Chantiri, A. (2001). Política industrial y tecnología. *Politext*, [online]. Available at: [https://books.google.es/books?id=OiU8Lia0YD4C&pg=PA93&lpg=PA93&dq=distrito+ceramico+sassuolo&source=bl&ots=Di17Y\\_FU-i&sig=ACfU3U3DsWMC2npHA2215UMMIJhEATvX3Q&hl=ca&sa=X&ved=2ahUKEwifkPu0bDpAhVBA2MBHRVEDSkQ6AEwBHoEAsQAQ#v=onepage&q=distrito%20ceramico%20sassuolo&f=false](https://books.google.es/books?id=OiU8Lia0YD4C&pg=PA93&lpg=PA93&dq=distrito+ceramico+sassuolo&source=bl&ots=Di17Y_FU-i&sig=ACfU3U3DsWMC2npHA2215UMMIJhEATvX3Q&hl=ca&sa=X&ved=2ahUKEwifkPu0bDpAhVBA2MBHRVEDSkQ6AEwBHoEAsQAQ#v=onepage&q=distrito%20ceramico%20sassuolo&f=false) [Accessed 21 april 2020]

Ortells, V. (2005). La Indústria ceràmica a la Plana de Castelló. Tradició històrica i mundialització actual. *Treballs de la Societat Catalana de Geografia*, [online], 2005, p. 35-66. Available at: <https://www.raco.cat/index.php/treballsscgeografia/article/view/157384> [Accessed 17 march 2020]

Porter, M. (1998). Cluster and the new economics of competition. *Harvard Business Review*, [online]. Available at: <https://library.aru.ac.uk/referencing/harvard.htm> [Accessed 17 march 2020]

Statista, (2018). Available at: <https://www.statista.com/statistics/939628/global-leading-ceramic-tile-exporting-countries/> [Accessed 21 april]