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MASTER THESIS

"Industrial development and economic welfare : The case of the tile industry in the regions of Emilia Romagna(Italy) and Castellon (Spain)".

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I would like to gratefully acknowledge the support of my parents and particularly thank my fiancé for his endless patience during the period of my thesis conduction.

ABSTRACT

Tile industry is a vital source of economic growth for both Italy and Spain but mainly for the regions of Emilia Romagna in Italy and that of Valencia, in Spain. In 2012, 267 ceramic tile, sanitary ware, tableware and refractory materials manufacturing companies operated in the Italian tile industry, produced 367,2 million square meters of tiles and reported a total turnover of 6.60 billion euro, 79% of which was generated by exports. Investments continued to grow and reached 255.5 million euro (up 2.83% on 2011), equivalent to more than 5.5% of annual turnover. On the other hand, the Spanish ceramic tile industry, was the first European producer and the sixth globally for 2012 by producing 404 million square meters of tiles. The total sales of the sector for 2012 reached 2.656 million € and rendered Spain the second biggest tile exporter in Europe and third in the world (2011). It's worth mentioning that the ceramic sector is the second sector that brings more trade surplus to Spain (2.000 million Euros in 2011), and the first in commercial coverage. The competitive advantage of both industries has mainly been driven by their particular type of organisation as an industrial district (Sassuolo-Italy and Castellon-Spain). Firms organized in clusters are shown to generate important comparative advantage and encourage innovation.

Calculation of the regional Index of Sustainable economic Welfare revealed that aggregate indicators like ISEW have potential value if they are used with others indicators to inform debate and stimulate questions about the nature of the development process. GDP has been proved to be constantly higher than ISEW in the regions under study although it follows a parallel evolution to ISEW through the years.

I. INTRODUCTION

1.General Information

With regard to organizational competitive advantage, the research of industrial clusters, territorial agglomerations of firms and regional economic growth have received much attention in literature. Many studies have argued that industrial clusters play an important role in the global economy. An increasing agreement that firms within industrial clusters can develop their competitiveness and gain a better position in the global market by sharing resources, knowledge and competencies (Antonelli, 2000), exists. Whittington et al. (2009) supported that physical proximity creates benefits of scale and of information. Porter (1998) suggests that clusters affect firms' competitiveness in three ways: cluster members share information, resources and technology, differentiation and rivalry enhance innovation and clusters encourage new business venturing activities which can lead to clusters' expansion.

Porters' five competitive forces model (1980, 1985) based on organizational analysis has been valued as one of the most important contributions in the strategy formulation with the aim of developing and sustaining competitive advantage. This model focuses on the external environment of companies. Another approach, the RBV, shifts the attention to the firms' internal environment in order to explain differences in performance.

The concept of industrial district has also been studied and analyzed as another term that describes clusters. Becattini (1990, p.39) defined this concept as "a socioeconomic entity characterized by the active presence of a community of people and a population of firms within a natural and historically bounded area".

In this study, an effort to approach the basic concepts of clusters, industrial district and regional welfare has been made, by conducting an extended research in the recent literature and a comparative analysis for the ceramic tile industries of Emilia Romagna in Italy and of Castellon, in Spain. The purpose of this study is to identify the underlying characteristics of both industrial districts that shape their competitive strategies and explain which factors affect their performance and regional growth. After constructing the theoretical framework of this study, an in-depth industrial analysis of both districts has been made with the use of both statistical and empirical data.

Tile industry is a vital source of economic growth for both Italy and Spain but mainly for the regions of Emilia Romagna in Italy and that of Castellon-Valencia, in Spain. In 2012, the Italian ceramic industry consisted of a total of 267 ceramic tile, sanitary ware, tableware and refractory materials manufacturing companies, produced 367,2 million square meters of tiles, employed a workforce of 36,001 people and reported a total turnover of 6.60 billion euro, 79% of which was generated by exports. Investments continued to grow and reached 255.5 million euro (up 2.83% on 2011), equivalent to more than 5.5% of annual turnover. On the other hand, the Spanish ceramic tile industry, was the first European producer and the sixth globally for 2012, producing 404 million square meters of tiles. The total sales of the sector for 2012 reached the 2.656 million € while about 14.400 employees contributed to render Spain the second biggest tile exporter in Europe and third in the world (2011). It's worth mentioning that the ceramic sector is the second sector that brings more trade surplus to Spain (2.000 million Euros in 2011), and the first in commercial coverage. The competitive advantage of both industries has mainly been driven by their particular type of organization as an industrial district (Sassuolo-Italy and Castellon-Spain). Firms, by operating in clusters, are generating important economies of agglomeration and a high rate of innovation.

The growth of the above mentioned industries, their significant progress and their obvious contribution to the development of their region of activity combined to my professional experience in the sector as employee of one of the leading groups of the Italian tile industry, urged me to undertake the responsibility of conducting such a study.

The aim of this analysis is to further investigate the concepts of industrial clusters and regions and to clarify the mechanisms, the relationships and correlations that characterize the industries that operate in them.

Thus, the aim of this study is to provide answers to important questions. Which are the main characteristics of the two leading tile industries globally and which factors influenced their development and success during the last years? Which are the main differences between these industries? What is their contribution to the development of the national economy and how did they influence the economic welfare of the regions?

2.Importance and Necessity of the study

Tile industry has always been an interesting segment of the manufacturing industry as it is connected to the construction industry and hence depends on the demand in the real estate market. During the last years, the technological advances in the field, the innovative products and the international competitiveness created two remarkable tile industries in Italy and Spain, industries leaders in the global market which "form" the trends and "control" the worldwide tile production. Furthermore, the Index of Sustainable Economic Welfare has been calculated for many countries, but rarely at local level. Therefore, I thought it would be very important as well as interesting to conduct a study that attends to investigate the existence of a relationship between the development of the tile industry and the economic welfare in the heart of tile industry, in Emilia Romagna(I) and Castellon-Valencia(S).

With an extended review of past literature and a comparative industrial analysis of the two districts, an effort to provide a better understanding of the linkages between industrial clusters, competitive strategies and regional growth has been made. Porter's (1980, 1985) has proven to be very insightful for the pursued objective. The potential contribution of this study is that it is an initial attempt to explain which dynamics of an industrial cluster can lead to better performance and how can influence the economic welfare of the region, by comparing two important examples of industrial districts in the tile industry, and interpreting the statistical and empirical data with the use of theoretical and conceptual frameworks.

This study provides an insight for further investigation. It reinforces the need for continued research on the concepts of industrial districts, competitiveness and welfare for example, by conducting comparative analysis of districts at the same industry in different countries and of different industries.

II. Literature Review

The purpose of this section is to approach and to expand the meaning of the concepts and terms under study, while investigating their relationships with the aim of creating a useful and complete theoretical framework on which this empirical study is based.

1.The five forces model

Five basic competitive forces determine the competition that exists in an industry and affect the profitability in terms of return on invested capital (Porter, 1980). Porter's competitive theory has provided a significant group of insights in conducting industrial analysis. In his study, he refers to the need of distinguishing the large number of factors that can affect competition and profitability from the underlying characteristics of the industry that shape its structure. The structure of an industry can be analyzed if the strength of these five forces is examined and measured.

Porter (1980) has recognized five substantial forces that jointly determine how intense the competition is in the industry, how profitable that industry can be and how strategy is formulated. The five forces that were introduced by Porter (1980) are the threat of entry, the power of suppliers, the power of buyers, the rivalry between existing competitors and the threat of substitutes.

- Threat of entry

New entrants to an industry can affect the profitability, cause reduction in prices and huge inflation of costs. New firms desire to gain a market share and can change the map of the industry and provoke the existing players to evaluate their strategies and even to shape new ones. The existing firms must react effectively in order to deter new competitors. Some common reactions are keeping down their prices or boosting their investments. If a potential entrant expects a forceful retaliation that will make increase its cost to stay in the industry, may decide not to enter. The threat of new entries depends on the height of barriers that exist in the industry and the capability of the existing firms to react in the appearance of new competitors.

- Power of suppliers

Suppliers can increase prices, shift costs to industry participants, reduce the quality of products or services provided and all these give them ability to limit the profitability margin in the industry. The number of companies in a supplier group and the level of concentration can affect the power of suppliers. The existence of few suppliers can influence price, quality and trading terms. Moreover, switching costs can enhance the power of suppliers as when they are high the industry participants will find it hard to intimidate their suppliers with the probability of choosing others. Last but not least, differentiation of products that suppliers offer limits buyers' options in playing one supplier off against another, while the threat of forward integration limits the industry's ability to improve the terms on which it purchases.

- Power of buyers

Buyers are recognized as a competitive force because they can influence pricing strategies, quality of products and number of complementary services provided by playing competitors off against one another. A group of buyers has power if:

1. There are few, large volume, buyers in the industry.
2. The products are not differentiated then buyers will have always alternatives for their purchases.
3. There is a prospect of backward integration. If there is a threat of manufacturing in house the buyers gain a significant bargaining power.

Buyers are price sensitive when the industry's product they purchase is regarded as a large fraction of its cost, when they face pressure to limit purchasing costs, the quality of the product has little impact on their quality and when the product doesn't affect in a significant way the other costs.

- Rivalry among existing competitors

Rivalry in an industry occurs because one firm feels pressed or sees an opportunity to improve its position. Price competition, new product introduction, advertising battles and increased customer complementary services are some of the main tactics

competitors use in order to improve their position. These moves have significant impact on competitors and the rivalry as a whole has an impact on industry's profitability. The intensity of the rivalry grows as the number of competitors grows or their size and power are almost equal. Other factors that affect the intensity of the rivalry are the slow industry growth., high exit barriers and high commitment to a business.

- Threat of substitutes

The firms in an industry always compete with industries that produce substitutes, which can appear to serve the same customers' need but in a totally different way. Substitutes can limit industry's profitability because it determines the highest price the firms can sell. The rivals must differentiate their product from substitutes through performance, marketing or other means. The threat of substitute becomes more crucial when substitutes offer a more attractive price performance than the industry's product or when buyers switching costs are low.

2.Industrial analysis

When conducting an industrial analysis is important to identify the strength of the five competitive forces which characterize the underlying structure of the industry and distinguish these forces from the substantial factors that can influence industry's performance and profitability (Porter, 2008).

- Basic steps in Industry Analysis

i. Define the industry. Products of the industry must be identified and whether are part of another industry, the geographic map of competition must be drawn. A common mistake is to define the industry too broadly or too narrowly.
ii. Identify the participants, in other words buyers, suppliers, competitors, substitutes and potential entrants.
iii. Determine which forces are stronger and which are weaker.

iv. Describe the overall industry structure and see if the results are consistent to reality. In that step, profitability is in the center of attention.
v. Examine possible changes in each force. It is important to make scenarios and calculate the outcomes of these whether they incorporate positive changes or not.
vi. Define the structure that is more likely to be influenced by the groups of participants.

3.Resource based view (RBV theory)

The competitive advantage of companies has been in the center of attention in literature for many years and it has been approached from different perspectives. Researches, analytical models and theories were constructed in order to explain why some firms perform better than others while the competitive environment is the same. Porter's (1980, 1985) five competitive forces model stays amongst the most important contributions in the field of competitive advantage development. Despite the importance of this model, researchers have shifted their attention to the firm's internal environment trying to identify factors and strategic assets to explain differences in performance. This approach is well known as "resource based view" or RBV.

Developing competitive advantage and positioning a firm by identifying its strengths and weaknesses can be found in the works of Ansoff (1968) and Andrews (1971). This basis remained at a conceptual level for a long time and without deeper analysis or development of analytical tools. RBV acknowledges the existence of different capabilities and resources at any firm. These different assets lead to different performance potentials. Some of the researchers focused in this approach were Wernerfelt (1984), Barney (1986, 1991), Teece (1986), Rumelt (1984, 1991) Teece et al. (1997), among others. Barney (1991) suggested that the differences between firms exist due to the fact that they do not share the same history, assets, capabilities, organizational culture and experiences.

In an effort to identify the strategic nature of resources, three main categories have been formed (Penrose,1959; Barney,1991):

a. Physical resources. This category includes raw materials, plants, land, equipment and all the natural resources needed for production.
b. Human resources, including all the people that are involved in the operation of a firm of every level or department.
c. Organizational resources. This category refers to the way that physical and human resources are coordinated in a productive way.

Resources can be tangible or intangible. “Tangible” are the resources that can be observed or touched like physical resources, while “intangible” are those that cannot be quantified easily or directly been seen such as the reputation of a firm, the organizational culture and the know- how. As Wilk and Fensterseifer mentioned “resources and capabilities can be defined as strategic when they are valuable, rare, inimitable, non-substitutable, or still, ambiguous to competitors and can be used as a basis for the achievement of competitive advantages (2003, p.997). Pateraf (1993) described heterogeneity, imperfect mobility , ex ante limits to competition an ex post limits to competition as the four factors that must exist in order to consider a resource “strategic”:These elements are mentioned to be “the cornerstones of competitive advantage”.

4.Clusters – Theoretical Background

In this section, an effort to approach the concept of clusters is made through a thorough investigation into the recent literature. Many economists have focused their attention on the concept of clusters and their capability to achieve high levels of productivity and innovation leading to high levels of prosperity in the regions they belong to.

Many economists have tried to define clusters and to provide an insight about their vital role in companies’ competitive advantage. A cluster is defined as a group of companies and institutions which are located in a specific geographic region and meet high levels of interdependence in order to provide related groups of products and services (Solvell et al.,2008). Porter defines clusters as “geographic concentrations of interconnected companies and institutions in a particular field” (Porter, 1998, p.78). Clusters may include suppliers of specialized machinery and components, specialized

service providers, manufacturers of complementary products, governmental and other institutions such as universities and trade associations. This group of players provides companies who operate in cluster a unique opportunity to innovation and competitive success in many fields. Becattini (1990:30) defined industrial district as a "socioeconomic entity characterized by the active presence of a community of people and a population of firms within a natural and historically bounded area".

Clusters according to Solvell (2008) can be classified by the type of products or services they produce, their development stage, the territorial dynamic or the business environment. The information technology in Silicon Valley, the financial clusters in NY and London, the fashion clusters in Italy, the ceramic clusters in Spain and Italy are only few of the many examples of successful clusters.

5.Importance of clusters and competition.

The importance of clusters is easily identified by the economic benefits they create. Porter suggested the benefits of a cluster (1998a):

i. Companies that operate in clusters in contrast to those isolated, have access to more specialized assets and customers, have shorter reaction times and operate in a higher level of productivity and efficiency. Cluster members develop unique capabilities that can lead to profitability, by specializing in technology, information and resources (Barney, 1991).

ii. Companies that operate in a cluster enjoy benefits of positive location externalities such as knowledge spillovers, proximity to customers, other companies and institutions. These externalities can lead to new ideas and high levels of innovation. Rivalry within the cluster enforces firms to develop dynamic capabilities (Teece et al., 1997) which enhance innovation, while differentiation enhances learning and innovation.

iii. The level of business formation tends to be higher in clusters. New business venturing activities which support further expansion of the industrial cluster are encouraged. Costs of failure can be reduced.

Cooperation and competition coexist within clusters. Firms, in a cluster, compete intensely in order to gain new customers and retain their existing ones (Porter, 1998)

while there is mostly vertical cooperation which involves firms in related industries and institutions.

Porter (1998) also suggested that firms within a cluster can perform in a more productive way. He identified the main factors that can boost productivity and lead to better performance within a cluster. These factors are:

a. Better access to employees and suppliers. A company within a cluster have a better access to an "existing pool of specialized and experienced employees" (Porter, 1998: 81). Performing in a cluster gives the advantage to limit the cost of recruitment and to attract talented people from other locations because there is a low risk of relocation for employees. Except from the employees, firms within a cluster have access to specialized local suppliers which minimizes the transaction and importing costs, the cost of inventory and the delays.
b. Access to specialized information. There is a significant flow of information in a cluster due to cooperation, personal relationships, institutions and associations.
c. Complementarities. With the term complementarities, the type of linkages between cluster members is described. The firms in a cluster are mutually dependent and one's performance affects the performance of the other. A common form is when other complement products are needed in order to fulfill customer expectations and needs. Other forms are the coordination of activities across companies, joint marketing mechanisms all leading to better results and optimization of collective productivity.
d. Access to institutions. Investments by the government or other public or private institutions such as training programs, infrastructure and research programs can enhance a company's productivity.
e. Motivation and measurement. The competitive pressure and the rivalry between local firms are highly motivating. Even between firms that are not considered as competitors, the desire to have a good reputation is a strong incentive to compete and show a better performance. What is more, in a cluster the measurement of performance is easier due to sharing circumstances and environment.

Tallman (2004) underlined that clusters based on traded interdependencies or on no-traded interdependencies can develop competitive advantages. Traded

interdependencies “exist in the economic sphere and involve formal exchanges of value for value” (Niu, 2010:396). They include licensing, acquisitions or technological know- how where formal exchanges exist (Tallman *et al*., 2004).Non traded interdependencies exist outside the economic sphere and are grounded on shared knowledge (Storper, 1997). They include institutions, cultures, customs and beliefs and reflect the knowledge that exists within the industry and can be shared by the firms. These characteristics can help to reduce the cost of transactions related to traded interdependencies and consequently result in lower production costs, specialized labor pools, overflows of technological know-how (Tallman et al., 2004; James, 2005). The importance of proximity in sustaining these advantages was reduced overtime due to emerge of globalization and researchers focused their attention to non-traded interdependencies.

6.Innovation

Clusters enhance innovation and provide “a better window on the market than isolated competitors do” as Porter stated (1998, p.83). Companies within clusters develop relationships with other entities and players and that gives them the advantage to gain access to information and knowledge about emerging technology, new techniques, marketing strategies and opportunities. A firm in a cluster can be more flexible and act rapidly to changes as changes and opportunities are more visible. Suppliers, partners and institutions are involved in the innovation process.

Scott (1988) suggested that the main factors that can lead to the success of the Industrial District model are network-based organizational structure, specialization and flexibility, vertical and horizontal cooperation and participation of institutions. As Capasso and Morisson (2013) suggested that the innovation prospects of the ID model builds on four main factors:

a. A network-based organizational structure. Firms show specialization in stages of the value chain and some functions are outsourced.
b. Flexibility. Small and medium-sized enterprises are characterized by high levels of flexibility as they can react rapidly to external threats and opportunities.
c. High level of specialization.

d. The existence of a supportive institutional environment. This environment along with a shared culture and other elements enhance the collective efficiency (Becattini, 1990).

Firms in a cluster may develop competencies and can enhance their efficiency and performance but they still face significant threats as they perform in a constant changing external environment. Some of them are the increasing international competition, the rapid changes in technology and its complexity and the segmentation of demand. Capasso and Morisson (2013), tried to identify the determinants of innovation in an Italian district in order to understand how firms react in changes occurred in both local and external environment. They focused on three specific characteristics of firms to identify which matters the most for innovation: firm size and degree of vertical integration, outsourcing strategies and market segmentation and product differentiation. Their findings, showed that all these factors matter for innovation but to a different degree. They suggested that size is positive but not significant at firm level but at a section level size plays an important role in particular activities within the firm. Outsourcing seems to affect innovation at a section level in a negative way, as firms disinvest in their development by outsourcing auxiliary activities. In their study, they found significant evidence supporting the idea that flexible specialization promotes innovation, as network structure enhances flexibility and firms with high level of vertical integration show lower tendency to possess new machinery. Product differentiation and quality upgrading are strictly related to innovation" (Capasso and Morisson, 2013, p.1243).

III. METHODOLOGY

In this study an effort to identify the underlying dynamics of the ceramic tile industry in two of the most important industrial districts in the world has been made. The aim of this analysis is to further investigate the concepts of industrial clusters and regions and to clarify the mechanisms, the relationships and correlations that characterize the industries that operate in them.

The industrial districts of Emilia Romagna in Italy and Castellon in Spain were chosen as case studies in order to fulfill the purposes of this study. According to Godfrey and Hill (1995) qualitative methodologies and case studies are of great value, especially when trying to investigate the unobservable factors that become sources of strategic value for firms. After constructing the theoretical framework, a comparative analysis of the two industrial districts is conducted. The main characteristics of the industry are presented based on Porter's theory in industrial analysis. Each industrial district is examined separately at the first part of the analysis. After identifying the basic characteristics of each district, a conceptual analysis comparing the two regions follows in order to underline their differences and similarities, their strengths and weaknesses that shapes their competitive strategies based on Porters Porter's five forces model and the RBV approach. Objective quantitative data were obtained from annual reports and publications from institutions connected to each industrial district (ASCER, ITC, Confidustria Ceramica etc.).

This work was not exempted from limitations. Due to data and resource limitations this work is mostly empirical. Based on the theoretical framework and past literature with a combined use of quantitative data, the conclusions of this study may be used as insights for further investigation. Due to a fast changing and evolving environment, the validity of the results may be constrained as circumstances and external factors change rapidly.

IV. COMPARATIVE ANALYSIS

In this section, an effort to conduct an industrial analysis of the two regions of Emilia Romagna (Italy) and Castellon-Valencia (Spain) has been made, in order to examine their differences and similarities and to outline the dynamics that can lead to a better performance and a competitive position in the world market. The purpose of this study is to identify the underlying characteristics of both industrial districts that shape their competitive strategies and explain which factors affect their performance and regional growth. At first, an overview of the industry is presented. In line with the theoretical framework the products of the industry and the geographic map of competition are described with details for each region. With the use of Porter's five forces model an effort to identify the underlying structure of the ceramic tile industry has been made. The industry analysis includes determination of the main participants (buyers, suppliers, competitors, substitutes, potential entrants) and the strength of each force. Some main indicators are examined such as production volume, exports etc. while some other aspects are presented such as government involvement, presence of institutions, innovation and technology. Quantitative data are used in order to compare the two regions' performance. From a different perspective an effort to identify the strengths and weaknesses irrespectively has been made based on the RBV approach.

An overview of the main characteristics of each industrial district is presented. Firstly, the region of Castellon and its dynamics are presented. An analysis of the region of Emilia Romagna follows. The section is completed with a comparative analysis of the two regions. Their main characteristics and their dynamics are compared in an effort to identify their strengths, their weaknesses and the forces that lead to different performance.

1.The Ceramic Industrial District of Castellón, Spain

Ceramic tile industry plays an important role in the Spanish economy, as it is one of the most dynamic sectors in Spain having the second position as a large contributor to the country's trade balance and being amongst Spain's 12 top exporters. It is considered to be one of the most innovative and important sectors of the country, with an important position in the global market based on constant technological development, design and high standards of service. Exports represent the 65% of industry's global turnover, while the rest come from the domestic market

Sector structure

The competitive advantage of Spain's ceramic sector has been driven by its type of organization as an industrial district. The industrial district of Spain is in Castellon. More than 80% of the firms are located in the province of Castellón. The Castellón cluster, mentioned in several empirical papers (e.g. Molina, 2002; Giner & Santa Maria, 2002; Russo, 2004) has been recognized as an industrial district (Benton, 1992; Molina, 2002) due to the high degree of geographical concentration of firms . The cluster is shaped by an area of approximately 30 square kilometers (area bordered to the north by Alcora and Borriol, to the west by Onda, the south by Nules and the east by Castellón de la Plana).

One of the principal features of this sector is its commitment to innovation and constant investment in R&D&I. Major efforts are being made to consolidate ceramic tile products, efforts that have been rewarded with a rise in the use of ceramic tiles in non-residential projects and less traditional spaces including urban elements. The firms that are located in this province are not just ceramic tile manufacturers but also machinery manufacturers, ceramic coloring agents, design studios and firms in the related service sector.

The world ceramic tile consumption is rising and the Spanish ceramic tile sector, with a high degree of internationalization and a constant focus on high quality products and innovation, despite the challenges is keeping an important position in the world market considered as one of the most competitive world players.

Firm size has been relatively stable over the years with the majority of firms having between 25 and 100 employees (Molina-Morales, 2010). Increase in production and

sales rate came along with increases in employee's productivity. The sector is characterized by intense internal rivalry.

History of ceramic tiles

It is common knowledge that tiles were used by the Egyptians more than 4,600 years ago. Muslims brought glazed ceramic tiles to Europe with their conquest of much of the Iberian Peninsula. Floor tiles known were used in Andalusia as early as the 13th century.

Glazed clay was commonly used in Spain during the 13th and 14th centuries. Ceramics had seen growth in the Valencia Region during the 14th and 15th centuries, and the Valencian tile makers exported their products to Venice, Egypt, Syria and Turkey, and Italy which was their largest market. Manises became the main supplier of floor tiles to the Vatican, for the decoration of the papal palace during the 15th century.

In the 16th century, polychromy and other innovative techniques were introduced by craftsmen who brought knowhow and inspiration from Italy. From this period, the centre of tile production was based in Valencia. This is when Valencia's Baroque, Rococo and Classic tiles, started to flourish and remained fashionable until the mid 19th century. Valencia became a center of industry in the late 19th century, while in the early 20th century production in the region was centered in Manises and Onda, towns which have been the site of training centers since 1916 and 1925 respectively.

The arrival of natural gas in factories in 1981 brought important technological changes in the sector, resulting in saving energy and increase in production rates. Larger format tiles could be produced, the first cogeneration plants were created, and the glaze industry achieved a worldwide reputation. Operating as a cluster led to extreme growth. Spain and Italy were leading the industry in ceramic tile design, quality and trade, with the first, becoming the biggest producer in Europe and second on the world market.

Historical data for the development of region

After many years of very slow growth, during the 70's Spanish ceramic tile industry adopted progressive and up to date firing techniques which resulted in the enrichment

of production with new range of products. One of the most significant changes occurred during the 1980's when production almost doubled and export's skyrocketed from 17% to 42%. At the same time employment decreased by 13%, and the sales to Europe and North America showed a significant increase which covered the loss of the share in Middle East.

Significant increase in ceramic tile production showed the firms in the Valencia region and in particular in the provinces of Castellón, de la Plana Baixa, Alcatén and de la Plana Alta. In these provinces the 80% of Spanish ceramic tile firms are located. In particular, all the biggest firms are located in Castellón and Villa-Rea (ASCER).

Spain's ceramic tile industry is characterized by the operation of SMEs and family-based businesses which form the majority of located firms. Some important factors initiated changes in the sector and explain the performance of the industry for the years to come.

Political changes resulted in local development policies that helped small and medium size firms (see Benton, 1990). In 1981, arrival of natural gas in factories with the completion of the natural gas pipeline in the province of Castellón brought significant technological changes in the sector. These technological changes made it possible to minimize the cost of energy and increase production rates. The big technical changes were accompanied by organizational by the birth of new firms. The organizational changes occurred inside the ceramic tile firms in order to adjust to the new conditions and the competition inside the district. The new firms appeared in the scene due to expected high rates of returns on investments in the ceramic tile industry. The owners of these firms were mostly entrepreneurs with previous experience in other industrial sectors. The 1980s witnessed a high birth-rate and death-rate among companies; moreover, control and ownership of several firms became more concentrated

Another factor which played a significant role in the district's performance was the presence of abundant red clay with low organic substances. Hence, the firms operating in the district acquired a great competitive advantage for the production of good quality single-firing floor tiles. New technology was introduced by Italian machine producers who started selling their products in Spain, offering technical assistance and establishing affiliates in the Castellón area in order to offer

maintenance services. Furthermore, the presence of suppliers of coloring substances and auxiliary activities assisted to the expansion of tile production in the area.
Another factor that gave a strong stimulus to the development of the sector was the increase of domestic demand, especially in the period when Spanish demand showed better increase rates the average for the building industry in other EU countries. The expansion of domestic demand was result of two national government plans which favored public housing (1981-1983 and 1984-1987) and of the rise of tourist activity.

Products

Ceramic tiles are made from clay, silica, fluxing agents, stains and other raw materials. Their use is mostly to cover floors, walls and façades. Red or white firing clays may be used for the tile body. Floor and wall tiles are normally thin, flat, ceramic pieces made from a clay body with a glass coating (ceramic glazes). There is a wide range of ceramic products in the market which are basically categorized by their use. There are two main types of ceramic applications:

- Floor tiles. This includes interior house floors, floors for exterior places, paving, floors for public buildings etc.
- Wall tiles. This type refers to interior and exterior facing (for buildings, houses, bathrooms, kitchens etc.)

Single firing process and double firing process are the two basic methods used in manufacturing tiles. In the first, glazing happens directly on the raw body and they are fired together. In the second the pressed body is firstly fired, then glaze is applied and a second firing follows in order to have the final finish. The process of production is a two-stage process. The first stage includes the preparation of the mixture transforming clay into fine powder, which is then moistened and pressed into tile shape. The tiles are then fired to produce what is known as “biscuit”. Then the product is glazed and in the case of double firing is fired again.

Performance

Spain's ceramic tile industry is considered to be one of the most competitive in the world. Its outstanding degree of competitiveness is based on the commitment to innovation, the constant investment in R&D and of course by its type of organization as an industrial district.

According to ASCER (2005), world-wide production of ceramics is basically concentrated in a few countries. China with the 32,5% of the world market share (2005 data) entered the scene forcefully, acquiring first position, followed by Spain (9,5%), Italy (8,7%) and Brazil (8,4%). The world's ceramic tile industry is also dominated by clusters. Spain leads the European production (regarding production of square metres) and is the largest world consumer per capita with 8,2 square meters per inhabitant. In 1998, almost 92 % of the total national production came from Castellón providing employment for 21.700 workers.

In 2010, around 94% of Spain's total production came from this province, home to 81% of the companies operating in the sector (ASCER). The Spanish ceramic tile sector is estimated to provide direct employment for around 16.200 workers, mainly in small and medium-sized enterprises

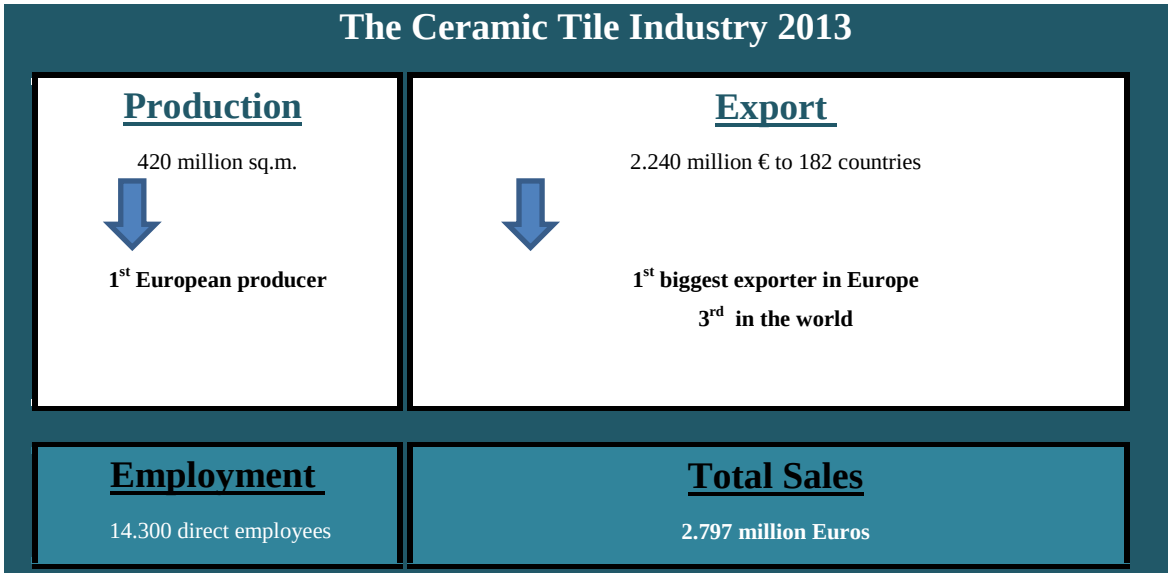
In 2011, the Spanish ceramic tile industry's turnover was 2.597 million euros, 72,85% of which were earned in exports to 182 different countries. The industry holds the third position as a sector that brings more trade surplus to Spain (estimated 1.892 million Euros in 2011), and the first in commercial coverage. According to ASCER in 2011, Spanish production of wall and floor tiles was 392 million m^2 and grew by 7,1% making Spain the second largest producer in Europe and seventh in the world market (as of 2010). At the same time imports represent 7% of domestic consumption. 55% of the year's exports were addressed to EU, which makes Europe the main marketplace of Spanish tile manufacturing industry. The market of the Middle East represent 20,3% of total sales while the market of Africa 10,4% showing a rise of 21,1% and 4,5% respectively from 2010. In 2014 production of ceramic wall and floor tiles was 425 million m^2 (estimated +1%). Employment levels in the sector have remained stable. Sector exports for the period between January and November 2014

(data by ASCER) reached €2.152 million, showing a 3,6% rise compared to the same period in 2013. Exports addressed to 182 different countries.

Europe remains the natural market for Spanish ceramic tile sector, receiving 47% of the total exports in 2014 (35% to the European Union) while, the Near East received 20,5% showing decline of 3,4% for the same period in 2013 and exports to Africa grew by 12,5. Exports to the USA (+ 11%) represents 4,4% of the total sales while Asia represents 23,8% of sales. The value of imports between January and November 2014 was €70,6 million euros, 21% higher than in 2013. The main importing countries were Italy (+31%), Portugal (+8,3%) and China (-13%).

Today, Spain is the world's third biggest exporter of ceramic tiles, with international trade rates of between 15% and 18%. Today, foreign trade represents 65-70% of the sector's total sales, with the remaining 30-35% corresponding to the domestic market. Spain's ceramic tiles are sold in more than 180 countries, while imports represent less than 10% of the ceramic tiles sold in Spain. It is important to note that Spain is the world's biggest consumer of ceramic tiles per capita, consumption that is largely covered by domestic producers.

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. Average annual turnover for the sector over the last ten years stands at almost 3.500 million €.



TILE INDUSTRY SALES (in million €)					
	2009	2010	2011	2012	2013
Production	324	366	392	404	420
Domestic Sales	918	801	705	575	557
Export	1.673	1.747	1.892	2.082	2.240
Total Sales	2.591	2.548	2.597	2.656	2.797

Source: Ascer

Institutes and organizations

Local institutions play an important role in the expansion of the industrial district and its degree of competitiveness. Some of the most important institutions that create additional value to the firms operating inside the district are: Jaume I University, Institute Of Ceramic Technology (ITC), Association for Ceramic Technology (ALICER), Trade Associations (ASCER, ANFEEC,ASEBEC).

The local university and other academic institutions provide specialized training and offer degrees and qualifications that are mostly needed in the district's firms. There are also numerous courses, offered by other institutions in the district. ITC, plays a significant role in district R&D activities (optimization of the ceramic process, technological transfer from other industrial sectors, controls of productive, quality and environmental systems, development of new components etc.) and upgrades the local labor force with training, participation in University programs, conferences and mobility between ITC and firms.

ASCER (Spanish Ceramic Tile Manufacturers' Association) represents almost all Spain's ceramic tile manufacturers (it has approximately 135 members). Non member companies represent less than 3% of the total production and exporting activity. These companies are mostly small firms that use traditional methods in production. ASCER (Spanish Ceramic Tile Manufacturers' Association) was founded in replacing and increasing the activities of the National Syndical Group of Tile Industries (ANSIA), which exists since 1959 and is officially recognized by the Group of Tile Manufacturers.

Firms in the district

The types of firms operating inside the district were described and divided into groups by Molina-Morales (2002):

- Final firms (Brusco, 1990). The main activities of these firms are pressing, glazing, firing.
- The second group carries out the atomized clay process.
- Decoration firms. These firms usually deal with the additional tile firing.
- Ceramic machinery firms. These firms provide machinery and technological services.
- Frit and glaze manufacturers who supply the firms with all the important components required for firing and glazing.
- Component suppliers who supply materials and components for the production process.
- Raw material suppliers.
- Firms providing general services such as consultancy, travel agencies etc.

2.The Ceramic Industrial District of Sassuolo, Italy

The Italian ceramic tile industry is considered as an important player in the market with a leadership position, accounting for 9% of world and 40% of the European Union's tile production. There are 195 companies operating in the sector, the employees are accounted to be 26.364 and the production output has reached 513 million square meters. 80% of total Italian production is district-made, with a further 10% produced in the rest of the Emilia-Romagna region. 5,5% of turnover were invested, confirming the Italian ceramic industry's commitment to innovation and high quality product development. The Italian tile industry exports are accounted for 70% of its total sales generating more than 4 billion euro and together with domestic sales bring total turnover to more than 5,52 billion of euro.

Industry Structure

The Italian ceramic tile industry is characterized by the concentration of a large number of companies in limited geographical areas. The factors that led to the development of industrial ceramic districts are:

1. Tradition in the use of clay to produce floor and wall covering materials.
2. The availability of skilled workers and capital (in the early 50's).
3. The increasing demand for products which occurred due to post-war reconstruction and the appearance of new large suburban areas.

Sassuolo is the most important ceramic tile district in Italy and has become the center of superiority in the machinery production for working ceramics, the management of auxiliary services and of course in the field of R&D. The cluster is shaped by an area of 145 square kilometers in the heart of the region of Emilia Romagna and is recognized as the center of innovation in the production of quality tiles.

In a report of ERVET (2001) is mentioned that in the whole district 499 local units were operating, with main activity the manufacture of machines and mechanical tools employing 4.389 people. Another industry flourished has been that of glazing and varnishing tiles with a total of 50 local units, employing 1.161 people. The Sassuolo district is considered the world sector leader for years with a total turnover of about 2.600 billion in 1997.

In the last forty years, the number of firms and workforce has decreased with a simultaneous increase in production rates and labour productivity. Since the middle of the 1980s the overall increase in production was a result of new productive methods and technological change. Single- firing was introduced and affected the production rates. The majority of ceramic tile firms have had less than 100 employees. The main products are: single-firing, twice-firing, porcelain gres.

Italian firms are exporting medium-high price ceramic tiles (European Foundation for the Improvement of Living and Working Conditions). The industry is characterized as a highly energy- intensive industry.

The type of the Italian ceramic sector's organization as an industrial district creates competitive advantage as through synergies and internal rivalry, innovation and development of new products and techniques are promoted. In the district, ceramic tile manufacturers, suppliers of raw materials, product technologies and services and

other partners coexist all playing a crucial role in manufacturing activities and in the development of the district. The internal rivalry along with cooperation and sharing knowledge, human resources and technology set the basis for development, performance of excellence and competitiveness. The Italian district model has been extensively studied. Porter (1980) defines the Italian industrial ceramic district as a "cluster" that owes its success to the complexity of its interactions.

Historical data for the development of region

Tile production in Sassuolo has its roots to the crockery industry which traces back to 13th century. After the World War II only a small number of ceramic tile manufacturers appeared in Sassuolo covering the needs of domestic market. The reconstruction of Italy after the War resulted in a constant increasing demand of ceramic tiles. In 1955, 14 Sassuolo ceramic tile companies were operating while in 1962 the number reached 102. At first, most Italian producers used raw materials and technology from other countries. Near Sassuolo red clay deposits existed but white clay was the main raw material used for the production of tiles at the time. Tile producers had to import raw materials from other countries such as United Kingdom. Tile manufacturing machinery was also imported. Germany, America and France were the main suppliers for kilns and presses. Italian producers acquired the knowledge and started modifying imported equipment to adjust to local circumstances: use of red clay instead of white and natural gas instead of heavy oil.

In the period 1960-80, the production showed a phenomenal increase from 37.8 million m^2 in 1960 up to 355 million m^2 in 1980 (Assopiastrelle,1983). The main reason for the increase in the ceramic tile production was the increase in both domestic and international demand. Domestic demand was increased basically due to changes in the Italian housing legislation of the early 1960s, and secondly by technological changes. By the mid 60's Italy had the highest per capita tile consumption in the world. There was an allowance for building non-luxury houses while the amount of ceramic tiles used was criterion for the classification of houses. The building of new factories and the expansion of existing ones, in a very limited area in the provinces of Modena and Reggio Emilia also triggered a significant increase in the production. The main factors that contributed to the development of

ceramic tile production according to European Foundation for the Improvement of Living and Working Conditions were:

4. access to raw materials (different kinds of clays) in the mountains in that area.
5. an overflowing labor force due to the depressed conditions in that area during the 1950s.
6. long and medium term credit facilities (until mid1970s), for new firms in depressed areas.

The interrelationships developed between ceramic tile firms and producers of machines for the ceramic tile industry, located all in Sassuolo, resulted in technical change that played crucial role to the success of the Italian ceramic tile firms in the world market. By the 70's Italian market had matured and firms tried to focus on exports and internationalization.

Exports increased from 3,5% in 1960 to 45% in 1980. New firms entered the market in the 1960s and 1970s (up to 509 firms by 1976) due to low entry barriers. The low initial investment for starting a factory of minimum size and the easy access to knowledge and know-how encouraged the entry of new firms especially until the beginning of the 70's.

Single firing technology introduced at the end of 70's was rapidly adopted by several firms in order to reduce production costs, especially after the energy crisis in 1973. New technology forced firms into an internal organizational and technological restructuring and became the main reason for the decrease in the number of operating firms at the end of the 70's. With single firing process, the hardening step, material transformation and glazing all happened in one pass through the kiln (Enright and Tenti, 1990). That practically meant that with double firing process 225 employees were needed while with single firing only 90 and the cycle time downsized from 20 hours to 50-55 minutes.

The economic crisis of the 1970s, forced ceramic tile firms to form groups based either on reciprocal shareholding or trading links. In 1973 no more than 15% of the ceramic tile firms in the provinces of Modena and Reggio Emilia were operating in 5 groups. In 1979 almost 50% of the firms were operating in 12 groups. The strategy of

increasing size by formation of groups is giving the advantage of exploiting economies of scale and uses all the economies of overall size, diversification and vertical integration control from raw material to sales organization. By 1970, Italian machinery producers became world leaders exporting their red clay equipment.

During the 1980s the number of tile manufacturers has decreased, while production is constantly showing increase. At the same time new countries entered the global market of tile manufacturing and international competition became intense. One of the tendencies is concentration and formation to groups.

Machine producers, faced a reduction in domestic demand and focused in export markets. In the mid 80's 200 Italian equipment manufacturers existed and more than 60% of them were located in the Sassuolo area. They tried to react in the intense international competitive environment by diversification and innovation.

Products

The industrial district of Sassuolo has considered as an industrial scale laboratory for evaluating the nature of clays (Dondi, 1999). The production of wall and floor tiles is one of the core activities of the firms that operate in the cluster. Local clays are recovered from different geological units and can be categorized in two types: "marly clays" and "red shales". These local clays seems to supply only 40% of the demand. As Dondi suggests (1990) 2 million tones/year of clay materials are used in colored bodies. Floor and wall covering materials can be classified according to three basic criteria. A first criterion is "nature" of the materials and their different characteristics. The second criterion is application of the materials. Structure and composition is the third. Ceramic tiles are slates with various sizes. Their sides can vary from few centimeters to more than one meter and about 5 mm to 20-25 mm in thickness. They are produced from different mixes of clay, sand and natural substances fired at very high temperatures, and this makes their nature. Some of the properties of ceramic material are according to Confindustria Ceramica:

- Hardness. Hardness results from reactions during the firing phase and represents the resistance of tile to breakage.
- Rigidity. Is ability to support weight without bending or changing form.

- Fragility. This property describes the behavior of tiles in case of impact
- Inertia. Ceramic tiles are inert, which means that are insoluble and unalterable in contact with most chemical substances.

Tiles produced in the industrial district of Sassuolo can be glazed or unglazed, with porous or compact body tiles, they could vary in shape and size and special technical characteristics. Tiles may, for example, be colored or white and that depends on the raw materials that are used and the type of firing procedure. Another way of categorizing tiles is their usage: floor tiles or wall tiles, for indoors or outdoors.

Ceramic Tiles Of Italy. The Brand.

For more than thirty years, the Ceramic Tiles of Italy label represents quality, tradition along with innovation and creates the image of Italian Ceramic tile industry needed to be promoted to the global market. Creating and sustaining a reputation that can give a competitive advantage to the industry is one of the most important roles of the label. Through trade shows, advertising campaigns and institutional events, it promotes the Confindustria Ceramica member companies and their products giving them the advantage of being acknowledged in the international markets. Ceramic Tiles of Italy embodies the will of the Italian ceramic tile industry to differentiate its products and position them to the buyers mind as sophisticated products that can add value to the projects they are used.

Performance

After many years of leadership in 2008 the Italian ceramic tile industry faced a decrease in production and sales. According to the National Association of Ceramic Tiles Producers (Confindustria Ceramica), production in 2008 downsized to 513 million square metres, with reduction of 8.3% from the 559 million square metres in 2007. Glazed porcelain tile retained its leadership position with 45% of total production, followed by unglazed porcelain tile (26%), single fired tile (18%) and double fired tile (8%). In 2008, about 30% of Italian production addressed to local market while the other 70% was exported. The total sales value in both the domestic and international markets did not decrease as fast as total sales volume.

Table-Ceramic Tile Production (million square meters)

	2004	2005	2006	2007	2008	Share of EU production
Ceramic tiles	5.461	5.548	5.663	6.425	5.313	49,2%
Unglazed	1.445	1.452	1.478	1.540	1.272	67,9%
Glazed	4.015	4.096	4.185	4.886	4.041	45,2%

Source: Eurostat Prodcom

According to Confidustria Ceramica in 2013, total production decreased to 363,4 million square meters of tiles (- 1,05%) while sales accounted for 389,3 million square meters with a decrease of approximately 1,85%.

80%of Italy's ceramic tile production is concentrated in the region of Emilia Romagna, around Sassuolo, with a total workforce of 29,084 direct employees in ceramic tile production and approximately 6.000 employees in related industries (Assopiastrelle, 2005). In 2005, 20 glazing firms with a workforce of 1.700 workers and 171 tile equipment manufacturers with 6.500 workers were operating in the district (Asimac, 2005).

By the end of 2008, 195 ceramic tile companies were operating in Italy. The total workforce was accounted 26.364, showing decrease of 3,11% in comparison to 2007. The number of factories decreased by 10 reaching 290 and the same tendency showed kilns accounted 578 (63 fewer than 2007). During 2008 investments totaled 303,8 million euro, corresponding to 5,51% of turnover. The average size of an Italian ceramic tile company is now 135 employees and the average number of factories per company is 1,49. In 2013, there were 156 ceramic tile manufacturers operating in Italy when in 2012 the number was 159. The companies' workforce is estimated around 20.537 people.

In 2008 sales dropped to 506,24 million square meters. Direct sales fell by 6,73% to 85,09% of the total, while sales by ceramic producers outsourced to other Italian companies dropped to 7,55% (-23,34%). Sales in domestic market (151,1 million square meters) accounted for 29,9% of the total showing a decrease of -9,92%. Exports represented the remaining 70,1% (355,1 million square meters).

Table-Consumption of ceramic tiles 2004-2008 (million square meters)

	2004	2005	2006	2007	2008	Share of EU consumption
Ceramic tiles	**2.054**	**2.250**	**2.147**	**2.889**	**2.012**	**24,5%**
Unglazed	441	409	327	322	72	6,5%
Glazed	1.613	1.841	1.820	2.567	1.940	27,2%

Source: Eurostat Prodcom

At the end of total turnover was 5.517 million euro, with a decrease of 4,63%. Domestic sales accounted for 1.473 million euro (-8%) and exports 4,044 million euro (-3,34%).

In 2013 an important increase of 4,76% in exports took place resulting in 302.7 million square meters and total turnover was 4,73 billion euros after an increase of 3.16%. This was a result of an increase in exports reaching 3,87 billion euros (+5,66%) and a simultaneous decrease in from domestic Italian sales (-6,84%, 856 million euros). 5% of annual turnover were invested, with investment value of 225 million euros. In 2014, exports reached 310 million square meters showing an increase of 3% but domestic sales showed a further fall of 6,9% reaching 80 million square meters. The geographical areas where Italian exports showed a better performance were Western Europe (+4,5%), driven by Germany, and the Far East (+6,3%). The North American market was quite stable (-0,3%) following two years of strong growth. In Central and Eastern Europe with the exception of Russia, an increase of 3.8% occurred. Production returned to positive results, with an increase of 4,5% to 380 million square meters. This was a result of the growth of exports and the selling warehouse stock.

Italian ceramic tiles enjoyed an increase of 0,8% in total sales in 2014, but the growth rate was lower than 2013. For 2015, is forecasted a growth for both sales (+2,2%) and production (+2,3%). This trend is a result of a good export performance balancing the domestic market crisis. The level of capitalization, reduction of inventory and improved quality of trade receivables are considered the most positive aspects that will result in better performance.

Institutes and organizations

In the region of Emilia Romagna, public institutions and private associations play an important role in the development of ceramic tile industry, promoting innovation and

internationalization. The interrelationships of ceramic tile industry with institutes, organizations and societies create an advantage for the firms in the regions and promote the competitiveness of the industry. Some of the most important institutions and organizations are Centre of Ceramics of Bologna (CCB), Assopiastrelle (the ceramic trade association), University of Modena and Reggio Emilia, University of Bologna.

Confindustria Ceramica links firms to universities and research centers in order to promote innovation in production, while it coordinates relationships with bodies that certify quality and set technical standards. Furthermore, Confindustria Ceramica is involved in training and specialization of new employees through courses organized by the University of Modena and Reggio Emilia, the Centro Ceramico in Bologna, IFOA and Cerform.

Association through Foncer makes efforts to guarantee a supplementary pension to workers in all segments of the industry making safety, union protection and social security important aspects of the district's development.

CerEnergia is a consortium set up in order to secure competitive benefits in the matter of energy, and with this Confindustria Ceramica supports its member companies by supplying energy resources. With Cargo Ship and Cargo Clay the support expends in the field of raw materials logistics.

Confindustria Ceramica organizes Cersaie, an important ceramic sector trade show held in Bologna every year, and participation at Coverings, the sector's most important exhibition in the American continent. Italian ceramic tile manufacturing companies are promoted at international events and initiatives by the Ceramic Tiles of Italy mark. This is the institutional image of the Italian ceramic industry and symbolizes the quality and innovation of Italian ceramic tiles.

3.World market

World tile production.

In 2012 Asian countries increases their share of world production (reaching 68,7%) at the expense of the industry in Europe. China produced 46,6% of the world's ceramic tile. Indian companies improved their performance by 12% and with production exceeding for the first time their local demand the chance of exporting aroused. Iran has doubled its production from 250 million square meters to 500 since 2007. Growth was reported in Thai and Taiwanese industries. The European Union seemed unstable showing a decrease in a period of global growth. Spain showed an increase recovering from 2009 when reached the lowest point in production. Italy showed the most disquieting decrease of almost 8%. These results seemed to be explained by the internationalization effort by Italian ceramic groups. Poland on the other hand elevated its production by 8,3% becoming a success story. Turkey turned to be a strong player with great potentials, recovering from the effects of global financial crisis and enhancing its output by 7,7%. Russian tile industry has been growing over the past decade but Russian firms seemed unable to meet local demand. Three quarters of the ceramic tile production of Central and South America came from Brazilian firms.

In 2013 world tile production reached 11.913 million m^2, showing an increase of 6,4% (2012). This growth trend occurred all over the world with an exception of a very small number of countries that maintained the levels of 2012. Asia produced 8.315 million m^2 showing an increase of 8% from 2012 resulting to a share of 69,8% of world production. Europe faced an increase in production of 4,5%, making up 15% of world production. In greater detail, the European Union showed only 0,7% increase in production comparing to 2012 while production in non-EU European countries elevated by13% due to growth in Turkey and Russia. Central and South America increased their production by 1,8%, while North America remained stable. Africa's production rose from 349 to 359 million m^2 (+2,9%). In 2013 Brazil maintained its position as the second world's largest producer and consumer country following China. Production has been increasing steadily for over 20 years and reached 871 million m^2 in 2013 while domestic consumption increased by 4,2%, India was once

again the world's third largest tile producer and consumer country in 2013, Production increased by 8,5% while domestic consumption rose to 748 million m^2 showing an increase of 9,8% (Appendix I-Table 1).

World tile consumption

As Stock mentions in his article, ceramic tile consumption is mostly concentrated in 30 countries with China representing the world's biggest market. In 2012 Asian buyers represented the 2/3 of ceramic tile sales. China purchased 4,25 billion square meters during the same period, accounting for 38,9% of global sales. India and Indonesia also showed a significant increase in consumption. Indian consumers acquired 681 million square meters of mostly local production, while Indonesian increased their consumption to 340 million square meters. France seemed to be the leading consumer of ceramic tiles in EU in 2012, despite the fact that domestic market was shrinking at the time. Italian and Spanish buyers reduced their consumption (>15%). Financial crisis and household indebtedness were the main reasons for that deterioration. Italian market continued to shrink following five consecutive years of decrease in consumption. Turkish local market was considered to be very strong keeping the consumption at high levels, while Russia increased its consumption to 213 million sq. m.

In 2013 Asia maintained its 66,5% share of global demand, with an increase of 6,4% up on 2012, less than the growth in production. China and India showed the biggest increase in consumption followed by Indonesia, Iraq, Malaysia and the Philippines.

Demand in the European Union, dropped from 890 to 854 million m^2 , showing a decrease of 4% after the 5,8% fall in 2012. Consumption in non-EU Europe increased by 10,3%, driven by strong growth in Russia and Turkey. Just as in 2012, the highest percentage growth in 2013 was in Africa (+13,4%). In 2012, the growth of African market was driven by the significant increase in demand in Nigeria accounting almost for 50%. Demand in Central and South America rose by 4,2%, with Brazil as one of the top consumption countries. (Appendix I-Table 2).

World exports

In 2012 world exports increased by 8,4% while in 2013 only by 5,5% (from 2.539 million to 2.678 million m^2) . In 2012 more than 70% of shipments came from five dominating countries: China, Spain, Italy, Iran and Turkey. Saudi Arabia and Nigeria were the most important consumers of Chinese ceramic tiles while important growth showed the consumption in USA, Thailand, Indonesia and Philippines. Spain became the 2nd largest exporter, establishing a very good reputation in Africa and Asia, areas representing more than 50% of Spain's exports. Spain's exports increased significantly in Russia and Nigeria in 2012. The Spanish exports within EU are mostly destined to France and United Kingdom and smaller amounts to German, Italy and Portugal. Italian exports represented 79% of 2012 production with most popular destination EU and USA. Exports to EU declined reaching 2/3 of sales. The most important EU markets for Italy are Germany, France and Austria. 16% of Italian earnings came from North America, where consumers think highly of high quality and expensive products. Turkey exported considerable amounts to Asia and EU.

In 2013 an increase in exports occurred in all continents except from Africa which showed a decrease of -29%. Asia exported 1,490 million m^2 with an increase of 7% on the 1.393 million m^2. of 2012 (55,6% of total world exports). The European Union representing 29.5% of world tile exports was the second largest exporting area. 789 million m^2 (+5,2%) were exported as a result of a further recovery on the part of Spanish and Italian exports. Exports from non-EU Europe increased slightly, almost 4.1% while exports from Central and South America remained stable. North America faced an increase of 19,4% accounted for 86 million sq. boosted by the growth in Mexican exports.

The three biggest exporter countries - China, Spain and Italy - accounted together for 66,1% of world exports in 2013(Appendix I-Table 3) . Italy held the first position considering export share and average price. The export share of Italy in 2013 was 83,5% of production when that of Spain was 75,7% and that of China 20%. Italy's average export price is 12,8 €/ m^2 providing its world leadership position, with a great difference of 7 €/m^2 of Spain, the 5.2 €/ m^2 of China and Turkey and the 4,6 €/ m^2 of Poland.

For many years there was a strong belief that tile tends to be produced close to the place of consumption. More than half of export volume consists of exports shipped within the same geographical area as that of production. 80% of South America's exports stay in South America, 75% of North America's exports remain within the NAFTA area, 60% of Asian exports are destined to other Asian countries. Only The EU is an exception because 50% of its exports are shipped to non-EU countries.

World imports

In 2013 the top 10 importer countries imported a total of 960 million m^2 of tiles (Appendix I-Table 4).Imports seem to cover more than half of domestic consumption in all countries apart from Russia and Thailand, while in Iraq and Nigeria they covered 100% of demand. The rankings of the top importers have changed since 2012, now led once again by the United States with an increase of 15,1% which equates to 69,6% of domestic consumption. The growth in demand caused a bigger rise in imports than in domestic production, which amounted to 70 million m^2 - partly controlled by Italian groups. Import volumes from the four biggest supplier countries increased accounted 17% for China, 9% for Mexico, 15% for Italy and 26% for Spain. Imports of Turkish tiles in volume increased by 29% while Brazil's remained stable. Saudi Arabia was the world's largest importer country in 2012, with 87,4 million m^2 arriving from China and 32,3 million m^2 from Spain. In 2013 fell in the second position maintaining its level of imports at 150 million m^2 .

France and Germany are the most enthusiastic importers in the EU and represent a valuable market for Italian tile exporters. While Germans are attracted more by the Italian products, French consumers prefer Spain's products. In 2013, domestic demand decreased (France 116 million m^2 and Germany 110 million m^2 depressing imports (France 96 million m^2 and Germany 83 million m^2).

Russia in 2012 showed an increase in imports by 25%. In 2013 its domestic demand grew to 231 million m^2, showing an increase of 8,5% accompanied by an increase in domestic production of 7,8% and a rise in imports by 14,3%.

4.Comparing the two industrial districts

In this section of the study, the two industrial districts are compared in terms of performance and competitive strategies. Based on the theoretical framework and with the use of qualitative data, a comparative analysis is conducted in order to reveal the factors that affect their performance and the formation of competitive strategies. The analysis was mostly based in the insights of Porter's five forces model and the RBV approach. An effort to identify the differences and similarities of these two districts and their weaknesses and strengths has been made in order to underline the factors that can change their competitiveness.

Porter's five forces model

- Threat of entry.

Porter (1980) suggested that if an industry is characterized by economies of scale, an entrant will face barriers. The new entrant may have to come in at large scale and risk intense and forceful reaction of existing competitors or may have to face a cost disadvantage. This barrier becomes more intense if the companies in an industry are diversified or vertically integrated. Sharing operations or functions and joint costs can provide advantages to firms that can use them efficiently. Economies of scale and sharing operations do exist in ceramic tile industry even with a high presence of small businesses, which means that there are important barriers to potential entrants. Oliver et al. (2008) suggested that Sassuolo district faced a process of concentration over the years with the formation of groups of companies while Castellón followed the model of mutually dependent forms that cooperate. In both cases, the organization of the district sets barriers to new entrants.

Another factor that makes entry difficult is product differentiation. Although inside the district differentiation of product is difficult to exist, this factor changes when it comes to a regional level. Both Spain and Italy by establishing a certain reputation of their products and having different price policies and marketing strategies have managed to differentiate their products. That creates barriers to international entry. Another important factor is distribution channels.

- Suppliers.

This category consists of raw material suppliers, machinery suppliers, service suppliers, workforce etc. Both districts were near clay deposits and that initially allowed the first industrial development. Sassuolo clay deposits could support only the 40% of demand and with product evolution quality of raw local materials wasn't enough. Local raw materials were gradually replaced by imports from Germany which today is one of the most important origins. Castellón has the advantage of being located near the raw materials needed for the production of ceramic tiles. Italian ceramic industry is known for the quality of equipment and machinery in ceramic production. At first, Italy was buying equipment mostly from Germany but today Italian machinery manufacturers are considered to be the best. The knowledge was transferred to Spain as Italian manufacturers and agents located in Castellón to provide services.

Both districts are characterized by the concentration of the firms in a small area which caused the concentration of high-skilled workers and generally workforce in the same area. There is an easy access to human resources as well as mobility between firms. As far as energy concerns, Sassuolo is considered to be a district where energy is more expensive in other competitive countries.

- Buyers.

Italian tile industry's exports represent 70% of its total sales. Italian tiles account for 35% of all international trade in ceramic tiles. Europe is the main market for Italian ceramic tiles, with France and Germany being the most important buyers. USA is considered to be one of the most important destinations for Italian exports especially when it comes to high standards , expensive products. Italian tiles also enjoy a strong presence in Central and Eastern European markets in Latin America, in Asia, Africa and Australia, establishing the reputation of high quality and impeccable design products.

In 2013 Italy faced a slight decline in production accounted for 1%. Domestic sales continued to fall (-7,2%), generating a turnover of 856 million euros (-6,8%) while exports increased in volume and in value with a rate of 4,8% and 5,7% respectively.

Exports to Western Europe, accounted for 48,8% of total Italian exports showing stability while in other geographical areas sales performance increased.(Appendix I-Table 5)

In meanwhile, Spain held the position of the second largest exporter in the world in 2013. Africa and Asia were the most important buyers, representing the 50% of Spain exports. In EU the Spanish tiles performed well in France and United Kingdom. Domestic demand continued to fall reaching a decrease of 6,4% while sales increased in all export markets (United Arab Emirates, Iraq, Portugal, Greece and Kuwait, Saudi Arabia) and average price remained stable at 7 €/ m^2. (Appendix I-Table 6)

Today exports represent 65-70% of the sector's total sales, with the remaining 30-35% being absorbed by the Spanish market. Spain's ceramic tiles are sold in more than 180 countries. Less than 10% of the ceramic tiles sold in the domestic market had been imported, fact that confirms that Spanish consumers prefer Spanish products for their quality and diversity. Data provided by ASCER shows that annual sales of Spanish products headed for the domestic market exceeded 1.000 million euros/year over the last decade.

It is important to note that what had initially driven the development and the expansion of both regions is domestic demand. During the last years, economic crisis and local legislation caused domestic market in both Italy and Spain seems to shrink. The local market recession combined with the global competition, has rendered exporting activities of vital importance for the survival and recovery of the two important players in tile industry. The world tendency is exporting in destinations that are closer to production due to transportation and supply chain costs. Domestic market sales still remain a significant factor for increasing sales revenues.. As Russo (2004) claimed, China’s tile industry development was driven by the growth of the domestic demand and its expansion could be attributed to the adoption of cutting edge machinery produced in the district of Sassuolo. Chinese producers keep copying the manufacturing procedures and knowledge of the Italian producers of Sassuolo and so Italian design of products.

It is interesting the fact that each district focuses on different export markets, especially outside EU. Different target markets' strategies lead to absence of intense

competition and result in product diversification according to each market's needs, style and preferences . For example, Russia, whose production cannot cover domestic demand, has become a target market for Italian producers. Various types of glazed porcelain tiles with marble aspect have been produced in order to cover in particular Russian clients' taste. On the other hand, Spanish producers are trying to better understand the tendency of northern African and Arabian market.

- Competitors.

The industry is considered to be an intensively competitive industry. Both Italy's and Spain's largest proportion of tile production is destined to foreign markets. Italy and Spain are accounted as strong competitors, as due to geographical proximity and buying potential, European Union is one the most important markets for both. Italy is the biggest competitor of Spain and vice versa. The fact that the companies are located so close to each other , promotes healthy competition and leads to investments on innovation and research. Furthermore, as domestic market for both industries has lowered its demand, new competition along with the internationalization has emerged. China became one of the strongest and most important global competitors. As Russo (2004) mentioned China is competing on costs, technological issues and on marketing strategies becoming the new leader in production and exports. New competitors from distant markets have arrived such as India, Turkey and Brazil. These competitors are becoming stronger, increasing their production in order to meet local demand and hence increasing their market share.

- Threat of substitutes.

As trends change in internal and exterior decoration there is a large number of substitutes for wall and floor covering. Designers and internal decorators, architects and consumers take into consideration the latest fashion trends, ecological guidelines, and costs having an enormous range of materials. Some of the most known substitutes are:

• Natural Stones (marbles, granites)

• Bonding materials (plasters, screeds)

• Composite materials (conglomerates with rock fragments)

• Polymeric materials (vinyls, linoleum, rubber)

• Organic material of animal or vegetable origin (wood, cork, wallpaper, fabrics)

• Metallic materials

Given that both districts are quality oriented, substitutes may considered to be ceramic tiles of lower quality and lower price. The cost is an important factor and substitutes can be a serious threat.

RBV approach

RBV acknowledges the existence of different capabilities and resources at any firm. These different assets lead to different performance potentials. In this section, an effort to track the strategic resources of the two industrial districts has been made.

- Natural resources

A basic difference between the two districts is their access to natural resources. Italy's competitive advantage is its advanced quality machinery and equipment and kind of "breakthrough" design. Even if Spain and other countries are for years trying to copy Italian machinery manufacture, the variety, sophistication and quality of Italian know-how exceeds that of its competitors. On the other hand, Spain has the advantage of using local raw materials. As Russo et al. (1998) correctly mentioned that production cost in Spain is significantly lower than in Italy because of lower labor cost, lower costs of raw materials and energy costs. Spanish firms largely use national raw materials, whereas, Italian producers import raw materials mainly from Germany and Ukraine.

- Human Resources

In both regions the number of employees per firm has been reducing while the production rates has been rising. A company within a cluster has a better access to an

"existing pool of specialized and experienced employees" (Porter, 1998: 81). Firms operating in districts of Sassuolo and Castellón can limit the cost of recruitment and attract talented people from other locations because the risk of relocation for employees is lower.

- Organizational resources.

Italian firms preferred to form more powerful groups in order to increase productivity rates and face the internalization and global competition (Oliver et al.,2008) . Conversely, Spain has adopted the model of mutually dependent firms that cooperate with each other.

Strengths and weaknesses. Some Insights.

Both industrial districts are characterized by a large number of firms concentrated in a small area. Considered as clusters, ceramic tile district of Castellón and that of Sassuolo share the advantages of industrial districts such as sharing technology and knowledge, having an easy access to a high skilled workforce, using the interrelations with institutions and other bodies in order to promote innovation and product development. As knowledge and innovation spread, firms are under pressure to improve their performance and enhance their position by developing competitive advantage over their competitors (Porter, 1990). Porter (1990) also suggested that demand is changing and competition is constantly increasing due to globalization. Marin (2006), states that in ceramic tile industry, the range of products is constantly changing, quality and design play a crucial role, product life is shortening and there is an effort to reduce delivery and production times.

Another similarity that districts share is that their development was mostly driven by domestic demand and changes in legislation. Economic recession in the European Union affected their performance and their competitiveness in many ways. One of the most important consequences were the domestic demand for both districts that continued to fall, deteriorating their performance.

As Oliver et al. (2008) pointed, the Castellón cluster has a leading position in glazing industry while Sassuolo is a cluster more focused in the ceramic equipment

manufacturing. In the same study Oliver et al. (2008), mentioned that local universities and other R&D institutions in Castellón are better linked to firms within the cluster promoting innovation and empowering firms with trained employees. On the other side, Sassuolo manufacturers considered to be world leaders, equipping and modernizing their competitors but still remaining the best. Castellón tile district has the competitive advantage of using local raw materials and having lower production costs comparing to Sassuolo.

Italian firms are exporting medium-high price ceramic tiles towards markets where Italian quality and design are valued. They point to provide tile market with refined, esthetically unique and high performance products in order to maintain a high profit margin. They aim at completely corner the market share with a relatively high buying power, at defeat their "Made in Italy" and achieve to even perform less in volume but more in value. On the contrary, Spanish firms are exporting low-medium price products with technical characteristics inferior than those of Italian products. Great volume of sales is their first objective to be accomplished .

Italian firms are creating groups in order to use economies of scale and vertical integration, using size to increase competitiveness and improve performance. Some Italian firms are relocating to other countries in order to expand the network and approach the distant markets. Another important change in the global map was the handover of important traditional Italian production firms to foreign ownership.

There are many challenges that industrial districts are called to face. The training and specialization of human resources, the constant investment on innovation and product development, the persistence in keeping quality and technology supremacy are some of the most important weapons a district could use in order to gain a better position in the world map. As competition is constantly increasing, the two districts should be open to new technologies, innovation and knowledge coming from distant markets using all their capabilities in order to differentiate their products and establishing a unique reputation. They should be ready to adjust to sector's changes and take advantage of the opportunities and future challenges.

V. ISEW

Gross Domestic Product (GDP), defined as the annual market value of final goods and services produced within a nation is the most common measure of economic activity. Many academics and economists have claimed that the GDP is inadequate for measuring the economic welfare of an area. In 1989, Daly and Cobb introduced the Index of Sustainable Economic Welfare (ISEW), with further changes to the traditional framework of economic accounting. Starting from private consumption, adjusted to take into consideration inequality of income distribution, they included environmental problems(such as pollution costs, long term environmental damage, depletion of non-renewable resources) and social issues (such as commuting costs, urbanization costs, public expenditure for health and education, private defensive expenditures, and unpaid domestic labor) (Daly and Cobb, 1989).Computations for different nations have shown that in most cases the ISEW increases together with GDP up to a point, beyond which it stagnates or even decreases, due to the environmental and social pressures of economic growth.

ISEW accounting starts with the value of private consumption which is also the starting point for GDP calculations. The Regional Index of Sustainable Economic Welfare (R-ISEW) is a measure of how much a region's economic activity contributes to and detracts from well-being and how sustainable this activity is. It is an adjusted economic indicator which attempts to incorporate costs and benefits not normally measured in monetary terms such as environmental and social issues.

The basis for the index is consumer expenditure. Positive and negative adjustments are made to account for a series of social, economic and environmental factors. For example, the values of household labor and volunteering are added to index together with public expenditure on health and education. On the negative side, the ISEW subtracts environmental costs associated with habitat loss, localized pollution, depletion of non-renewable resources and climate change increasing sustainably in a given region with public expenditure on health and education. In the table below the basic components of the ISEW as it has been calculated for the region of Emilia Romagna-Italy and the Autonomous Community of Valencia:

ISEW Basic Components

ISEW component	Basis for inclusion
A-Private consumption expenditure	Welfare deriving from goods and services
B- Gini's Index of income distribution	Adjusting for income inequality
C- Adjusted private consumption	Adjusted consumption base
D- Services from domestic labor (+)	Adding non-monetarized aspects of the regional economy that increase welfare
E-G Services from consumer durables- adjustment	Adjusting for the service value of a given level of consumer durable spending
F- Public expenditure on health and education (+)	Health and education spending that adds to welfare
H- Private defensive expenditure for education and health (-)	Subtracting defensive spending
I- Cost of commuting (-)	Subtracting defensive spending
J- Cost of car accidents (-)	Subtracting defensive spending
K- Cost of water pollution (-)	Subtracting costs of environmental degradation
L- Cost of air pollution (-)	Subtracting costs of environmental degradation
M- Cost of noise pollution (-)	Subtracting costs of environmental degradation
N- Cost of loss of farmland (-)	Depreciation of natural capital base
O- Cost of depletion of natural resources and long term environmental damage (-)	Depreciation of natural capital base
P-Cost of ozone depletion (-)	Depreciation of natural capital base
Q- Net Capital Growth- adjustment	Adjustment to take into account development of man-made capital

As demonstrated in previous studies, application of ISEW at the regional level was found to be feasible; nevertheless even at national level, constructing adjusted economic indicators of progress is a formidable task. At regional level, the task is compounded by limitations in the availability of regional data, although this is improving all the time. As more and better data become available, and as new revisions of the ISEW are developed in other countries and regions, the theory and practice behind the R-ISEW evolves.

The ISEW has been criticized for the arbitrariness in the selection of items and the monetary evaluation of non-market phenomena, as well as for its doubtful political validity and foundations (Munda,2005; Ziegler,2007). However, its essence is a wide and ordered collection of data, concerning also environmental and social questions that any modern society should take into consideration; it also stimulates ideas and direct policies towards popularization of environmental knowledge and awareness, improvement of information systems, and solution of real problems often neglected or even ignored.

VI. R-ISEW in Emilia Romagna and in Community of Valencia

Calculation Method in outline

The calculation of Regional ISEW has been based to an effort to create a suite of the necessary data for the construction of an ISEW for a 10 year interval, 2003-2012. Data collection and analysis is being presented through the investigation of each component of the index. More detailed calculation tables and additional information have been subjoined to Appendix.

- Private Consumption -A

Individual consumption expenditure is the starting point for the construction of the R-ISEW for the regions of Emilia Romagna and Valencia. Consumption spending is considered to provide an estimate of the total welfare that is gained from private goods and services and is considered to be an indicator of a healthy economy and a wealthy society. Total consumption of durable goods, non-durable goods and services was equal to 68.400.400.000€ in 2003 in Emilia Romagna and gradually increased to 84.114.900.000€ in 2011. In the autonomous community of Valencia, total private consumption is lower than in Emilia all the ten-year period long, reaching its peak (56.530.517.120€) during 2007. It is more than obvious that Italians spend more than Spanish, fact partially attributed to their higher average income and Italy's higher cost of living. However, in recent years the level of consumption tends to stagnate in both regions.

Data for this variable for both regions were obtained from the statistical report "Final consumption expenditure of households - territorial data" available at the website of Istat and Ines respectively.

- The index of income distribution -B

In general, private consumption does not really indicate the economic welfare of a population and must be adjusted to reflect more realistic conditions. Daly and Cobb (1994) proposed an index of income distribution to adjust the level of private consumption, the so called Gini's index of income distribution. The value of this index may vary from 0 to 1. When Gini's index is equal to 0 there is perfect income distribution whereas a value equal to 1 means maximum inequality.

The index fluctuates between 0,29 and 0,30 for the region of Emilia Romagna while income inequality seems to be more intense in Spain where Gini's Index's range is between 0,30 and 0,34.

- Adjusted private consumption-C

Consumption expenditure is adjusted downwards according to the formula Adjusted Consumption= Consumption x (1- Gini's Index) in order to reflect the fact that even distribution of income in a region could have welfare enhancing effects. Daly and Cobb (1994) used it to calculate the degree of economic welfare because they sustain that there is a degree of inequality of income distribution in all economic models throughout the world. In fact, less well off members of society are likely to gain more in welfare from a €1 increase in income than a richer person. Therefore a transfer of income from rich to poor that decreases inequalities may act to increase overall welfare. Adjusted private consumption is the basis which all other positive and negative items are added to or subtracted from.

- Services from domestic labor-D

The consumption of household services contributes directly to economic welfare, independently of money exchange. The value of household services is then an addition to consumption expenditure in the process of creating an ISEW. The evaluation of domestic labor services involves three main elements. An estimate of time spent on domestic labor services, an estimate of the value of this time, and an estimate of the population involved in domestic labor services. To begin with, the population able to undertake domestic and family workload was considered to be of an age between 15 and 64 years old. Based on a recent study of the Federal Statics of Italy about the use of citizens' time, I distinguished four different groups of people offering domestic labor, male high school and university students between 15-64 years old, female high school and university students between 15-64 years old, employed and unemployed men of an age between 15-64 and employed and unemployed women of an age between 15-64. According to the same research, I assumed minimum hourly wages of employees in the cleaning services sector ,

determined by the collective national contracts of Italy and Spain, as the average hourly value of domestic work .This may not reflect the true opportunity cost of time. Calculation tables are available in Appendix (Table 1 & 2)

- Services from consumer durables adjustment- E

Money spent for durable goods such as cars and appliances is an important element of Spanish and Italian consumption expenditure . The majority of such goods last more than one year and provide welfare outside of one accounting period. Therefore within the framework of the regional ISEW, it is necessary to estimate the flow of services arising from a net stock of consumer durables in a given period. To adjust for this, we estimated the service flow from consumer durables, accounting for depreciation and obsolescence. Based on common depreciation rates for consumer durables, I considered that they have an average useful life of 8 years (Appendix II-Table3), and therefore that one-eighth of the purchase price of each item would be a reasonable representation of its annual service value. The assumption of an average lifetime of 8 years equates to a depreciation rate of 12,5%. An average interest rate of 7,5% is added as the opportunity cost of owning consumer durables. As a result the eight year total expenditure on durables is multiplied by 20% in order to obtain a value of the service deriving from that stock.

The methodological overview of this study differs slightly from that suggested by Cobb and Cobb (1994) in the original ISEW where the service flow from consumer durables was calculated by multiplying net stock in each year by 22,5% based on an assumed depreciation rate of 15%.

- Public expenditure on health and education -F

The original Daly & Cobb ISEW deemed 50% of education expenditure as 'defensive' but I adopted the method suggested by Guenno and Tiezzi (1998) .I retained that 50% of healthcare costs are defensive as they are influenced by dynamics not directly connected to a measure of welfare, whereas all expenditures on education , rather than only tertiary education, are included for the calculation of R-ISEW. All the necessary data has been collected from the websites of the official

national statistics bureau of Italy and Spain and the websites of the respective ministries.

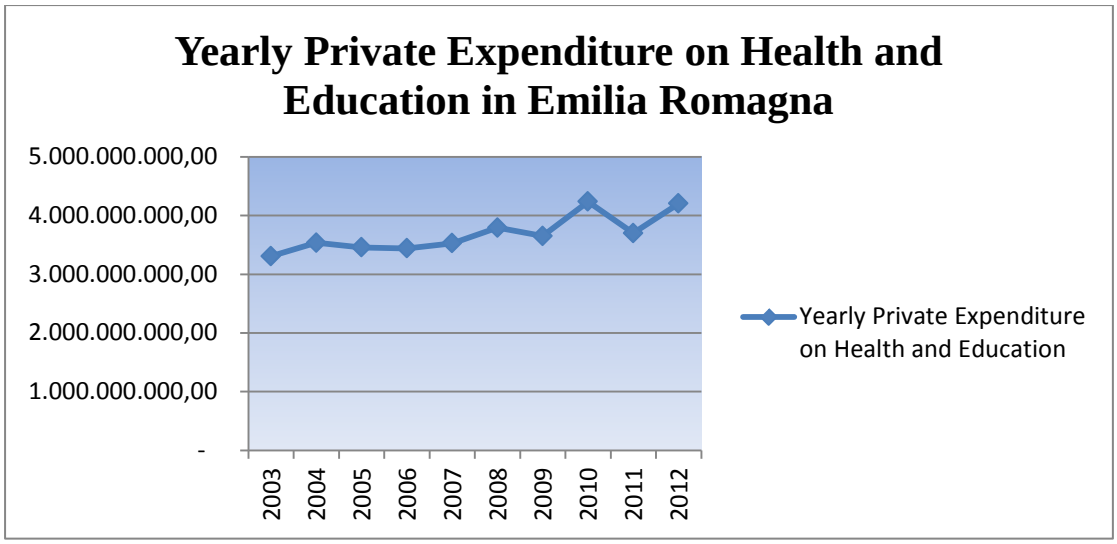
- Costs of durable goods-G

Durable goods provide utility along their life time, therefore their mere cost must be subtracted from consumption base. The amounts spent for durable goods in the regions of Emilia Romagna and this of Valencia have been sourced from the national surveys on households expenditures.

- Private defensive expenditure for education and health -H

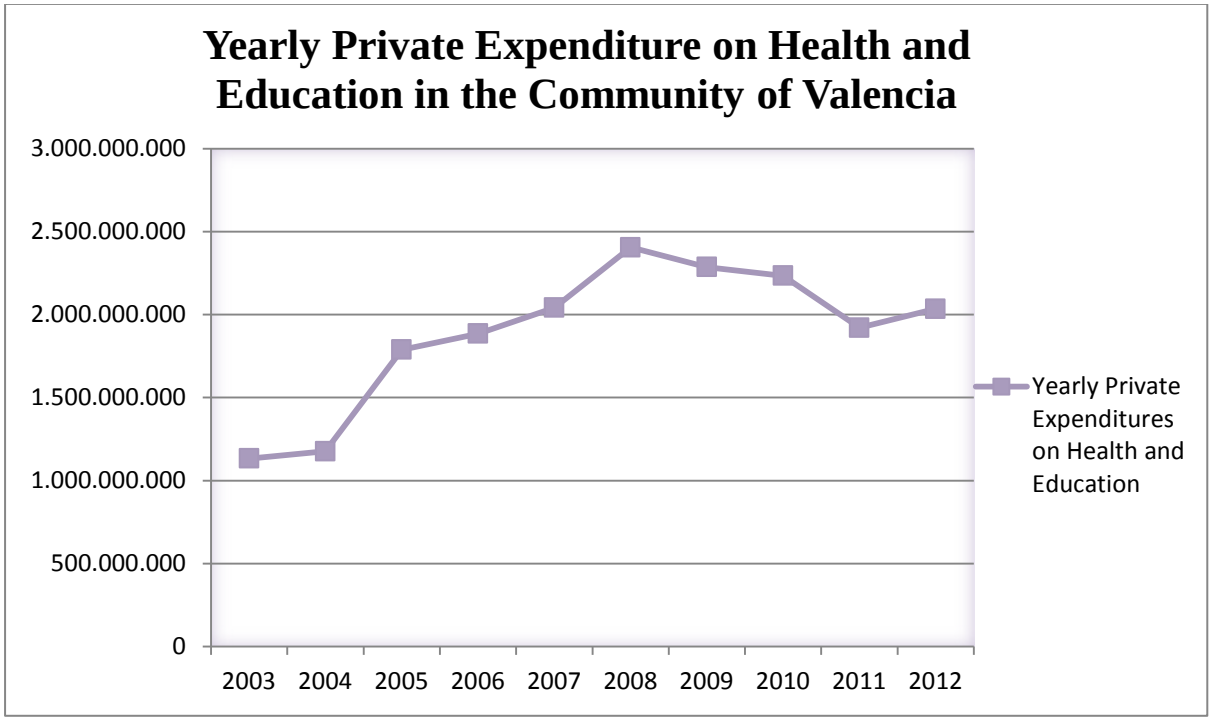
Private expenditures for health care and education are included in the consumption expenditures base. Part of this kind of expenses is likely to be defensive in nature. Therefore these figures should be deducted from the index. Following previous ISEW research, the approach taken here was to consider half of estimated private expenditure on health and education and to assume that this is defensive. Using the same datasets and information available on the websites of national institutes of Statistics of Italy and Spain about the nature of family consumption at territorial level, I individuated households' expenses on items such as medicines, prescriptions, medical fees, medical insurance, and general education and training. For the specific expenditures on medical insurance I supposed an average outflow of 20,17€ per month per family only for the region of Emilia Romagna as for this of Valencia this type of medical cost is not common. For the region of Emilia Romagna the trend of this type of expenditure is characterized by stability with exception to 2010 and 2013. This fluctuation is heavily driven by the unusual increase of education expenditures.

Figure 1: Private Expenditure on Health & Education in Emilia Romagna



On the other hand, aggregate private expenditure on health and education in the region of Valencia is much lower but less stable. In particular, there is a primacy of health care expenditure, probably due to the increasing number of elderly people.

Figure 2: Private Expenditure on Health & Education in the Community of Valencia



- Cost of commuting – I

Commuting is a cost deriving from urbanization, overcrowding and traffic and should therefore be subtracted from the consumption base. As Daly and Cobb (1994) proposed, I consider that 30% of the costs related to private cars and public means of transport together with 30% of the costs for public and private vehicle maintenance are directly related to commuting costs, according to the following formula:

Direct cost of commuting = 0.3 (A-0.3A)+0.3B+0.3C , where

A = automobile and other private vehicle costs

0.3A = the estimated amortization costs for private cars

B = expenditure for tickets on public transport

C = costs for public and private vehicle maintenance

0.3 = the estimated portion of the use of non-commercial vehicle and the estimated portion of passenger miles on local public transport related to commuting.

The amortization costs for private cars were decided to be excluded from the calculation of cost of commuting as they have been deducted in order to estimate the value of services from consumer durables. Consequently, the initial formula becomes:

Direct cost of commuting = 0.3A+0.3B+0.3C

By automobile and other vehicle costs, we consider average yearly household expenditure on cars and motorbikes including insurance costs and fuels multiplied by the number of households per region, whereas by maintenance costs we mean spare parts, oils and lubricants, maintenance and repairs multiplied by the number of vehicles (cars, motorbikes and buses) per region. (Appendix II-Table 4)

To fully estimate the costs of commuting, an opportunity cost should have been included to compensate loss of leisure time but this kind of calculation has been omitted from the present study.

- Cost of car accidents -J

The cost of car accidents consists a negative externality and in some measure is a real cost of industrialization and increased congestion. Therefore, it consists an element of consumption whose nature is defensive and should be subtracted from the index. The

cost of car accidents has two main components, the costs of damage to vehicles and property and the costs of ill-health and fatality.

The cost for accidents, excluding medical treatment - this cost is accounted under defensive public expenditure on health - was sourced from the study conducted by the Italian Ministry of Infrastructures and Transport (2010) in an effort to determine the social cost deriving from a car accident. This study estimated that for injury accidents there are 3 types of cost, social, administrative and material costs, whereas for non-injury accidents there are only 2 cost categories, administrative and material. Average social cost per injury accident, average administrative and material cost per accident were approximately calculated for the purpose of the Italian Ministry's research(Appendix II, tables 5-6-7-8) and hence I hypnotized nonmedical costs for injury accidents at 49. 538€ and non-injury accidents at 9.284 €.

In both Italy and Spain, since 1991, non-injury accidents have been excluded from the statistical surveys and hence there is no data available for the number of non-injury accidents. In an attempt to increase the accuracy of the data it was decided to use the actual number of accidents reported as serious for 'injury' accidents and calculate only the cost of these car accidents. From the table nr.9-Appendix II we can observe a significant downturn of the cost of car accidents for the region of Emilia Romagna as road safety measures begun to have a positive impact on the number and severity of road casualties.

Using the same methodology and cost per injury accident for calculating the cost of car accidents in the region of Valencia we can affirm that the total number of car accidents that caused people to be injured or dead is significantly lower than this in Emilia Romagna (Appendix II-Table 10). This could be justified considering the kilometers of road network in both regions, 17.971 km of roads in Emilia Romagna compared to 8.363 km in community of Valencia (2010).

- Cost of water pollution –K

The availability of high quality water is an important component of welfare, through the provision of both drinking water, and cleaning capacity. It is also a vital component of agriculture and manufacturing. Assessment of water quality is a complex and multifaceted task. There is no single measurement which will suffice to

reflect overall water quality which is usually determined on the basis of parameters such as BOD (biological oxygen demand) and COD (chemical oxygen demand). As suggested by Guenno and Tiezzi (1998), for estimating cost of water pollution I calculated the cost of water purification, obtained from a standard purification plant. This cost was equal to 14,56€ per equivalent inhabitant (E.I.) in 2001. Purification cost has been adjusted to real prices every year of the study's period. The number of E.I. of both areas was obtained by the sum of resident population, E.I. corresponding to industrial and agricultural sector and E.I. for tourism and catering sector. For most of the years of the period under study the number of equivalent inhabitants was sourced from the web. When such data was not available, I estimated this number based on suggestions of previous studies (Appendix II-Table 11).

- Cost of air pollution –L

I have only considered costs deriving from SOx[1], NOx[2], CO2 aggregate emissions (data available on the website of Ines and Istat at national level). The emissions expressed in tons, were converted into monetary values according to the following relationships suggested by Guenno and Tiezzi (1998- data from I.R.S.E, 2000).

SOx = 2.324 Euro/ton

NOx = 904 Euro/ton

CO2 = 10 Euro/ton

Technological advance together with improvements on production procedures in industrial sector caused a significant decrease of the cost pollution during the period under study. The implication of stricter government legislation and the gradually raised citizens' awareness towards environment also contributed to the downturn of air pollution cost. (Appendix II-table nr 12.)

- Cost of noise pollution -M

Aircraft noise , traffic noise, road works, construction, demolition and music reproduction consist some of the main sources of noise pollution. The fact that

[1] SO_2 is formed by oxidation of sulphur (S), mainly through combustion of fuels containing S. The electricity generation sector is the most important source of SO_2.

[2] NO_x is emitted during fuel combustion e.g. from industrial facilities and the road transport sector. NO_x is a group of gases comprising nitrogen monoxide (NO) and nitrogen dioxide (NO_2).

different noise levels affect people in different ways and the difficulties in measuring noise levels at a regional level, renders the cost of noise pollution hard to be estimated. For this reason, in this study vehicular traffic has been considered as the main cause of noise pollution. Noise associated to the number of cars implies a social cost of 129,54€ in 2003[3]. The value of social cost is expressed in constant prices for both Spain and Italy as it has been adjusted according to Harmonized Index of Consumer Prices. Finally, social cost for noise pollution has been multiplied by the number of vehicles per region. The trend of noise pollution cost is tightly linked to the number of vehicles and consequently it has been progressively rising.

- Cost of loss of farmland –N

Overexploitation and depletion of natural capital affect the quality of the environment and as a result the quality of human life. There are two means by which sustainable productivity is reduced, through physical loss of land from urbanization and through deterioration of soil quality. Although the difficulties with valuation, this loss should be estimated in a proper economic welfare index, as it remains unaccounted for in traditional economic measures. Daly and Cobb (1989) valued the cost of farmlands lost in the process of urbanization by an estimate of the forgone benefits of these lands. The forgone benefits of these lost farmlands were calculated at a value of $100 per acre and per year in 1972. The adjustment of the value proposed by Daly and Cobb is likely to underestimate the current market prices so in order to assign a cost to loss of farmland the average market sales price for land in 2003 was used, obtained through personal communication with the Regional Office of Agriculture of the Community of Valencia and by a personal estimation regarding the market price of land in Emilia Romagna .These values have been adjusted to real prices for the rest of the years according to Harmonized Index of Consumer Prices. The area of farmland lost was identified using statistics from the agricultural Census for both regions available on the websites of National Institute of Statistics of Spain and Italy. For the region of Valencia Agrarian Census were available for 1999 and 2009 and consequently he difference between the values of

[3] Pulselli, F. (2011). *La soglia della sostenibilità, ovvero Quello che il Pil non dice*. Roma: Donzelli.

1999 and 2009 was divided by 10 to calculate annual depletion (Appendix II ,table13).

Estimating the cost of loss of farmland productivity resulting from falling soil quality is almost impossible as many and complex factors can contribute to such a loss. For this reason this evaluation has been omitted.

- Cost of depletion of natural resources and long term environmental damage-O

Although the usage of natural capital is considered unsustainable, GDP takes no account of it. Depreciation of non-renewable natural resources represents a loss of natural capital and thus a reduction of future consumption possibilities. In the original ISEW (Daly and Cobb, 1989), this cost was computed by estimating the economic value of mineral production as a proxy for resource depletion. The original method has been severely criticized and Cobb and Cobb (1994) abandoned it in their revised index. Cobb and Cobb (1994) introduced an alternative valuation method with the aim to estimate the amount that has to be put aside as a kind of compensation to future generations for the loss of natural capital. Consumption of primary fuels (coal, oil, gas, nuclear) is valued using a replacement cost factor which reflects the costs involved in replacing each barrel of oil equivalent of energy consumed with renewable energy resources.

The replacement cost was taken to be $75 per equivalent barrel of oil in 1988- around 84€ in 1995- and is assumed to be subject to a 3% per year increase to account for the increasing costs of supplying each marginal unit of energy. For the conduction of this study data about total primary energy consumption, including the consumption of petroleum, dry natural gas, coal, and net nuclear, hydroelectric and non-hydroelectric renewable electricity, was obtained from the U.S. Energy Information Administration. Data that was available in million Btu per capita was converted to barrel of oil equivalent according to the relationship:

1 Btu = 1.8013586919434E-7 barrel of oil equivalent. (Appendix II-table 14)

- Cost of ozone depletion-P

Chlorofluorocarbons (CFCs) are a substance used in fridges and aerosols that have been associated with depletion of the ozone layer. Depletion of the ozone layer is

connected to a number of environmental and health risks and as a consequence has a negative impact on welfare .When Daly and Cobb accounted for the long term damages to the ozone layer resulting from CFC consumption they applied an environmental cost of $15 (1972 dollars)per year to each kilogram of cumulative world production of CFC11 and CFC 12. For the purposes of the present study, the original methodology has been modified regarding two main points. Firstly, consumption rather than production has been used as the basis of cost estimation. Secondly, consumption of all Montreal-listed CFCs has been included as Jackson and Marks (1994) argued.

The total cost of ozone depletion in each year is estimated by multiplying the yearly consumption by a cost per kilogram of consumption. In assessing costs we have used essentially the same unit cost as that assumed by Cobb and Cobb (1994), namely $15 (1972 dollars) per kilogram of CFCs , equivalent to around 53,71€ per kilogram of CFC equivalent emissions in 2000. Since no data on Italian and Spanish CFC consumption is available, average CFC consumption per capita figure for the Europe had been multiplied by the number of inhabitants of each region. Such information has been sourced from United Nations Environment Programme Geo Data Portal. Both CFC production and consumption has been extremely limited over the last years so this cost is relatively low for both regions. (See Figure 1 -Appendix II)

- Net capital growth – Q

Net capital growth (NCG) is generally estimated by adding the stock of new capital and subtracting the capital requirement -the quantity necessary to maintain the same level of capital per worker-.This adjustment accounts for changes in the net stocks of human made capital over time. Where consumption depletes human as well as environmental capital this cannot be regarded as sustainable. I considered the rate of the variation of labor force multiplied by gross investment at constant prices during the 10 year period under study. This calculation could be criticized as gross domestic fixed capital formation (GDFCF) does not account for the depreciation of capital.

Necessary information for this adjustment has been derived from the national statistics services of Italy and Spain (Appendix II-Table 15).

VII . R-ISEW and GDP.R-ISEW and Tile Industry Performance: Conclusions

1.R-ISEW in Emilia Romagna VS R-ISEW in Community of Valencia.

Traditionally, Italy has been richer than Spain and the findings of this study come to confirm this. R-ISEW per capita for the autonomous Valencian community is considerably lower during the period 2003-2012 than that for Emilia Romagna with the latter one counting values about 25% higher than those of Valencia. Several key factors dominate the shape of regional ISEW in Emilia Romagna, and are also partly responsible for the distinctive differences between Emilia Romagna and Valencia ISEW. The gap basically depends on economic variables and especially to the higher private consumption base of the Italian economy. What is more , the income distribution seems to be more fair in the Italian region. In overall terms, the gap between the R-ISEW per capita of the two regions decreases during 2007 and 2008 when in Emilia Romagna the index is equal to 14.130,51 €/capita and 14.274,79 €/capita respectively and in the region of Valencia the Index reaches its highest prices, 9.757 in 2007 and 9.406 in 2008. Moreover, since 2009, ISEW/capita has been falling in the Spanish community whereas a slight decrease of 2,48% in 2012 can be observed in Emilia Romagna.

Looking carefully at the figures 3 and 4, we can conclude that, over the period of the study, the regional ISEW has a smoother fluctuating rate in Emilia Romagna -average growth rate 2,92%- than in the area of Valencia where some sharp changes can be observed. Characteristically, the index reflects an increase of almost 19% from 2006 to 2007 but its rate turns to fall in 2008.

To continue with, by analyzing the behavior of ISEW basic components, it is clear that some positive items grew faster (e.g. services from domestic labor) in both regions. The general trend of negative items of the index was also to grow over the years with exception to the cost of car accidents and the cost of ozone depletion. Finally, it is worth mentioning that not all items are equally important within the ISEW regional framework. In other words, some items account for less than 2% of

the positive or negative totals, while others account for more than 25% - consumption expenditures and cost of long-term environmental damage.

2.R-ISEW and GDP

The ISEW per capita for the regions under study, as it has been calculated for the period 2003-2012, is presented in Figures 3 and 4. The conventional measure of GDP per capita is included in the graph in order to identify the trend of both measures. The numerical results on which Figures 3 and 4 are based are presented in the Appendix II.

To start with, it is evident that there is a noticeable difference between ISEW per capita and GDP per capita over the study period for both regions. The value of the ISEW is typically within a range of 41-48% of GDP between 2003 and 2012 for the region of Emilia Romagna and within a range of 40-46% for that of Valencia. Previous studies at national and local level have proved a significant gap between ISEW and GDP values and the results presented in this paper seems consistent with this affirmation.

Interestingly, for almost all the ten year period long, ISEW per capita is moving parallel to GDP per capita either in the Italian and Spanish region. In the US and UK studies ISEW per capita has tended to stabilize and decline from about the early 1970s onwards, in spite of a trend of continuous growth in GDP per capita. In Germany, Austria and Netherlands , studies have shown a divergence between ISEW per capita and GDP per capita too. This trend does not appear in our case.

By concluding, it can be claimed that aggregate indicators like ISEW have potential value if they are used with others indicators to stimulate questions about the nature of the development process. ISEW attempts to incorporate social and welfare aspects of sustainable development. Unlike more conventional (and indeed alternative) measures of progress, ISEW considers the distribution of resources in a society, transactions outside the market process adding to welfare, and takes account of the depreciation of natural capital. Care needs to be exercised in drawing fast conclusions from such a complex methodology. But as a tool for examining the influence of social and environmental factors on economic welfare, ISEW continues to play a valuably critical role.

Figure 3- ISEW and GDP per capita in Community of Valencia

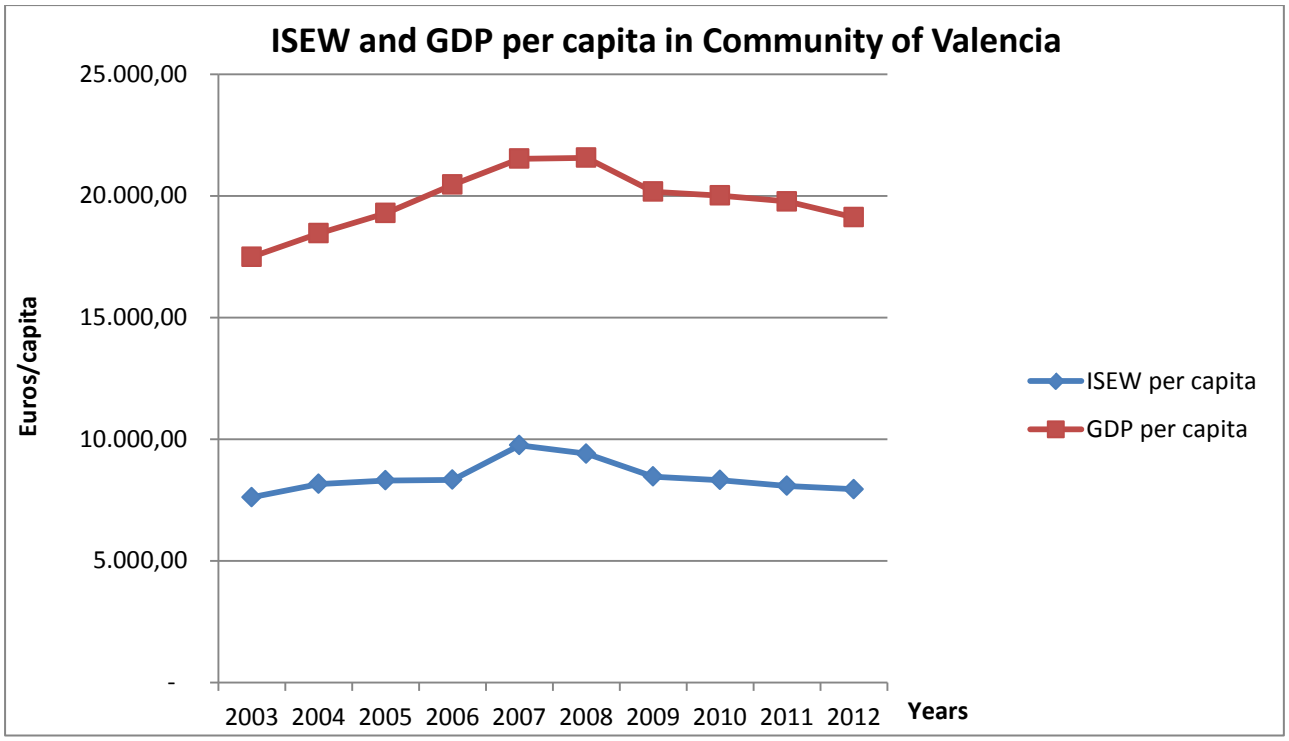
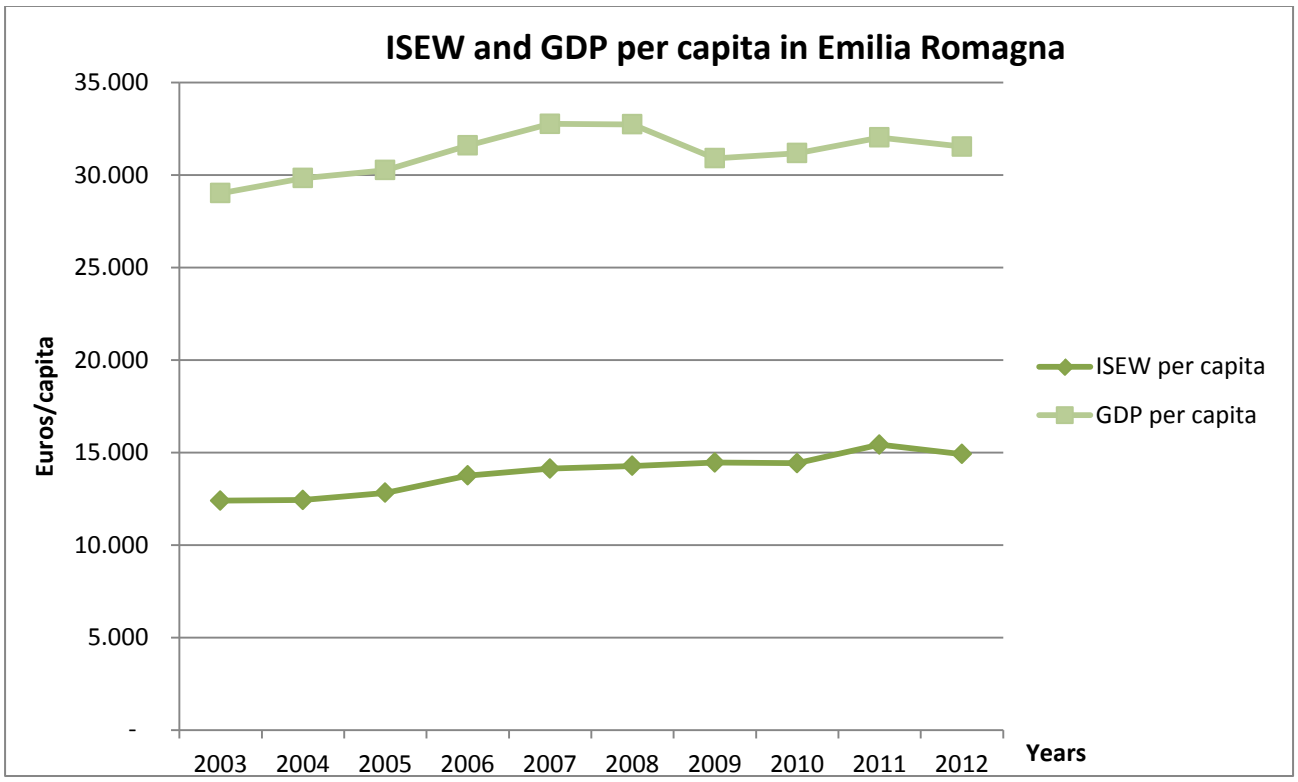


Figure 3- ISEW and GDP per capita in Emilia Romagna



3.R-ISEW and Industrial Performance

One of the objectives of the study was to prove the existence or not of a relationship between the development of R-ISEW and the growth of the tile industry performance. Such a task is really hard to accomplish with certainty as data regarding the individual performance of tile industry is not available at regional level.

Hypothesis for the existence of a relationship between the performance of ISEW and tile industry seems to be confirmed in the case of Emilia Romagna since domestic tile production increases across with ISEW from 2009 to 2011 and declines in 2012 when ISEW also decreases. (see Appendix I-Table 1). At the same time, tile production in Spain continues to grow contrary to the R-ISEW in the region of Valencia that is following a downturn. In addition, the consistence of Italian firms' exports with the R-ISEW evolution could also prove the positive relationship between industry's performance and ISEW. It is remarkable that tile exports for Italy grow up to 2011- as R-ISEW does - and decrease in 2012 when a fall in the R-ISEW value is observed. On the other hand, exports for Spanish industries keep increasing for the period 2009-2012 while a decline of R-ISEW in Valencian area can be noticed(Appendix I-Table 3).

Given these deliberations and comparisons, no relationship between the growth of regional ISEW and tile industry's performance can be guaranteed.

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APPENDIX I-Tile Industry in numbers

Table 1-World Tile Production 2009-2013 in million m^2

Country	2009	2010	2011	2012	2013	% on 2013 national consumption
China	**3.600**	**4.200**	**4.800**	**5.200**	**5.700**	**57,8%**
Brazil	**715**	**754**	**844**	**866**	**871**	**7,3%**
India	**490**	**550**	**617**	**691**	**750**	**6,3%**
Iran	**350**	**400**	**475**	**500**	**500**	**4,2%**
Spain	**324**	**366**	**392**	**404**	**420**	**3,5%**
Indonesia	**278**	**287**	**320**	**360**	**390**	**3,3%**
Italy	**368**	**387**	**400**	**367**	**363**	**3%**
Turkey	**205**	**245**	**260**	**280**	**340**	**2,9%**

Source: Acimac Survey dept. "World Production and consumption of ceramic tiles", 2nd edition 2014

Table 2-World Tile consumption 2009-2013 in million m^2

Country	2009	2010	2011	2012	2013	% on 2013 national consumption
China	3,030	3,500	4,000	4,250	4,556	**39.4%**
Brazil	644	700	775	803	837	**7.2%**
India	494	557	625	681	748	**6.5%**
Indonesia	297	277	312	340	360	**3.12%**
Iran	295	335	395	375	350	**3%**
Vietnam	240	330	360	254	251	**2.2%**
Saudi Arabia	166	182	203	230	235	**2%**
Russia	139	158	181	213	231	**2%**
USA	173	186	194	204	230	**2%**
Turkey	138	155	169	184	226	**2%**

Source: Acimac Survey dept. "World Production and consumption of ceramic tiles", 2nd edition 2014

Table 3 - World Exports 2009-2013 in million m^2

Country	2010	2011	2012	2013	% on 2013 national production	% on 2013 world exports
China	867	1015	1086	1148	20.1%	42.9%
Spain	**248**	**263**	**296**	**318**	**75.7%**	**11.9%**
Italy	**289**	**298**	**289**	**303**	**83.5%**	**11.3%**
Iran	54	65	93	114	22.8%	4.3%
Turkey	84	87	92	88	25.9%	3.3%
Mexico	57	63	68	80	35.1%	3%
Brazil	57	60	59	63	7.2%	2.4%
UAE	44	48	50	51	54.3%	1.9%
Vietnam	28	42	41	50	16.7%	1.9%
Poland	33	36	41	48	36.1%	1.8%

Source : Acimac Survey dept. "World Production and consumption of ceramic tiles", 2nd edition 2014

Table 4 - World Imports 2009-2013 in million m^2

Country	2009	2010	2011	2012	2013	% on 2013 national consumption	% on 2013 world imports
USA	124	130	131	139	160	**69.6%**	**6%**
Saudi Arabia	116	117	129	150	150	**63.8%**	**5.6%**
Iraq	45	66	80	105	121	**100%**	**4.5%**
France	101	103	104	105	96	**82.8%**	**3.6%**
Nigeria	30	33	44	60	84	**100%**	**3.1%**
Germany	78	80	90	87	83	**75.5%**	**3.1%**
Russia	30	41	56	70	80	**34.6%**	**3%**
Thailand	28	33	42	52	68	**37.8%**	**2.5%**
South Korea	55	59	63	61	65	**61.3%**	**2.4%**
UAE	45	48	48	51	53	**55.2%**	**2%**

Source : Acimac Survey dept. "World Production and consumption of ceramic tiles", 2nd edition 2014

Table 5-Italian firms sales performance variation in 2013**.**

Market	Sales Value Variation in 2013
Italy	-7,2%
NAFTA markets	+11,7%
Central and Eastern Europe	+3,9%
Balkans	+1,5%
Far East	+17,6%
Gulf States	+15,2%
North Africa & Middle East	+29,8%
Latin America	+19,8%

Source: ASIMAC ceramic world review 2013

Table 6 -Spanish exports analysis by volume and value in 2013

Market	% of Sales Volume	% of Sales Value
Europe	35%	47%
Asia	32%	26%
Africa	24%	17%
America	9%	10%

Source ASCER

APPENDIX II-ISEW Basic Components

Table 1 -Calculation of the Value of domestic services in Emilia Romagna

EMILIA ROMAGNA	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Women 15-64 years-Students Excluded	1.170.178	1.184.067	1.186.096	1.190.819	1.206.601	1.227.250	1.240.930	1.216.777	1.227.020	1.228.437
Men 15-64 years-Students Excluded	1.202.824	1.223.189	1.224.793	1.227.545	1.239.223	1.254.929	1.263.622	1.222.054	1.219.457	1.222.481
Female Students(High School and University) between 15-64 years	151.835	154.672	158.028	160.559	163.043	164.206	163.552	165.064	165.098	164.412
Male Students(High School and University) between 15-64 years	138.096	140.105	145.160	149.154	151.127	152.373	150.642	151.679	152.024	151.564
Average yearly hours spent on domestic workload by women 15-64 years-Students excluded	1.498,47	1.498,47	1.498,47	1.498,47	1.498,47	1.413,53	1.413,53	1.413,53	1.413,53	1.413,53
Average yearly hours spent on domestic workload by men 15-64 years-Students excluded	667,33	667,33	667,33	667,33	667,33	691,60	691,60	691,60	691,60	691,60
Average yearly hours spent on domestic workload by female students 15-64 years	612,73	612,73	612,73	612,73	612,73	637,00	637,00	637,00	637,00	637,00
Average yearly hours spent on domestic workload by male students 15-64 years	327,60	327,60	327,60	327,60	327,60	370,07	370,07	370,07	370,07	370,07
Hourly wage rate	6,23	6,23	6,54	6,54	6,89	6,89	7,40	7,40	7,52	7,52
Value of services of domestic labor	16.786.310.719	17.015.567.878	17.913.413.023	17.990.408.422	19.184.772.858	19.041.583.432	20.630.814.312	20.175.393.337	20.599.059.027	20.625.282.489

Table 2-Calculation of the Value of domestic services in Community of Valencia

VALENCIAN COMMUNITY	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Women 15-64 years-Students Excluded	1.350.143	1.475.803	1.434.011	1.462.759	1.490.072	1.535.956	1.561.149	1.567.453	1.559.542	1.554.913
Men 15-64 years-Students Excluded	1.402.835	1.339.417	1.498.476	1.535.106	1.559.509	1.613.131	1.631.504	1.632.226	1.618.024	1.610.371
Female Students(High School and University) between 15-64 years	174.613	75.954	170.711	169.852	170.778	170.093	159.758	150.161	151.136	151.790
Male Students(High School and University) between 15-64 years	162.717	258.301	162.975	163.553	163.176	162.702	155.664	145.900	146.107	148.139
Average yearly hours spent on domestic workload by women 15-64 years-Students excluded	1.932,23	1.932,23	1.932,23	1.932,23	1.932,23	1.932,23	1.486,33	1.486,33	1.486,33	1.486,33
Average yearly hours spent on domestic workload by men 15-64 years-Students excluded	785,63	785,63	785,63	785,63	785,63	785,63	934,27	934,27	934,27	934,27
Average yearly hours spent on domestic workload by female students 15-64 years	509,60	509,60	509,60	509,60	509,60	509,60	509,60	509,60	509,60	509,60
Average yearly hours spent on domestic workload by male students 15-64 years	412,53	412,53	412,53	412,53	412,53	412,53	412,53	412,53	412,53	412,53
Hourly wage rate	5,05	5,05	5,16	5,18	5,87	5,95	6,10	6,10	6,10	6,10
Value of services of domestic labor	19.528.421.800	20.448.208.693	21.167.989.234	21.685.809.890	24.998.645.601	26.114.277.833	24.340.688.885	24.347.556.138	24.198.444.177	24.120.006.511

Table 3-Estimated useful life of durable goods

Type of Durable Good	**Estimated Useful life**
Furniture	12
Domestic electric appliances	8
Sanitary Systems	4
Cars and other means of transport	8
Fix Telephony	5
Mobile phones	2
Personal computer	4
Radio-TV, Hi-fi, registrators, photocameras & videocameras,	5
Jewellery and watches	30
Other durable goods	5
Average useful life of durable goods	**8**

Table 4 -Calculation of Cost of Commuting

EMILIA ROMAGNA	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Automobile and other private vehicle costs	6.136.948.910	6.774.910.389	7.202.481.133	7.327.753.644	7.815.474.256	7.571.022.991	6.847.950.954	7.351.863.869	7.105.521.674	7.640.149.402
Expenditure on public transport (tickets)	521.347.860	546.505.856	564.111.634	622.792.403	692.071.784	689.953.025	662.267.711	764.134.085	657.374.775	856.314.623
Yearly Average Expenditure on private and public vehicles' maintenance per vehicle	619	766	838	801	764	826	904	892	863	882
Nr. Vehicles (cars, motorbikes and buses)	2.888.593	2.937.206	2.997.158	3.057.407	3.101.868	3.152.073	3.205.164	3.268.314	3.238.120	3.251.373
Costs for public and private vehicle maintenance	1.787.923.749	2.249.782.365	2.511.139.131	2.448.249.344	2.371.067.730	2.602.351.227	2.897.724.651	2.914.813.396	2.795.792.808	2.867.710.986
Cost of commuting	2.533.866.156	2.871.359.583	3.083.319.569	3.119.638.617	3.263.584.131	3.258.998.173	3.122.382.995	3.309.243.405	3.167.606.777	3.409.252.503

Source: Istat and ACI(Automobile Club d'Italia)

VALENCIAN COMMUNITY	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Total Automobile and other private vehicle costs	3.512.506.091	3.181.039.729	4.512.446.656	7.142.405.570	7.879.511	6.537.650	6.025.154	5.724.500	5.465.064	5.708.368
Expenditure on public transport (tickets)	218.358.023	210.991.038	318.711.136	323.497	326.841	342.301	307.084	318.882	320.294	384.824
Yearly Average Expenditure on private and public vehicles' maintenance per vehicle	619	766	838	801	764	826	904	892	863	882
Nr. Vehicles (cars, motorbikes and buses)	2.768.851	2.921.218	3.064.421	3.146.301	3.327.281	3.367.561	3.326.571	3.330.288	3.333.887	3.318.101
costs for public and private vehicle maintenance	1.713.808.015	2.237.536.139	2.567.494.491	2.519.431.989	2.543.373.596	2.780.258.362	3.007.486.310	2.970.084.050	2.878.478.036	2.926.565.082
Cost of commuting	1.633.401.639	1.688.870.072	2.219.595.685	2.898.648.317	765.473.984	836.141.494	904.145.564	892.838.230	865.279.018	879.797.482

Source: Ine and DGT (Direcciòn General de Trafico)

- Elements of the calculation of Cost of car accidents

Table 5 -Average social cost per injury caused by a car accident		
	Formula	Value in €
Average cost per serious injuries (Csi)	Csi = CHL[4]*0,13	**195.263**
Average cost per slight injuries (Cii)	Cii= CHL* 0,01	**15.020**

[4] CHL is the Cost of human life calculated to 1.502.25, as the sum of 940.291 € for missing productivity and 561.734 € for non material damage.

Table 6-Average social cost per injury caused by a car accident		
14% of the average cost per serious injuries 5	195.263 * 0,14	**27.337**
86% of the average cost per slight injuries	15.020 * 0,86	**12.917**
Average social cost per injury		**40.254**

Table 7 -Average administrative cost per car accident	
Expense on insurance per accident	1.727,00
Legal Expenses	1.573,00
Total average administrative cost per accident	**3.300,00**

Table 8-Average material cost per car accident	
Average material damage per accident	4.117,00
Number of cars involved per accident	1.867,00
Total average material damage per accident	**5.984,00**

Table 9: Cost of Car accidents in Emilia Romagna

EMILIA ROMAGNA-ITALY				
Year	Nr. of injury accidents	Average cost of Injury accident	Total Cost of Car Accidents	Variation in %
2003	26.454	49.538,00	1.310.478.252,00	-
2004	25.894	49.538,00	1.282.736.972,00	- 2,12
2005	24.250	49.538,00	1.201.296.500,00	- 6,35
2006	23.950	49.538,00	1.186.435.100,00	- 1,24
2007	23.074	49.538,00	1.143.039.812,00	- 3,66
2008	21.744	49.538,00	1.077.154.272,00	- 5,76
2009	20.411	49.538,00	1.011.120.118,00	- 6,13
2010	20.152	49.538,00	998.289.776,00	- 1,27
2011	20.415	49.538,00	1.011.318.270,00	1,31
2012	18.313	49.538,00	907.189.394,00	- 10,30

[5] According to Istat the proportion of serious and slight car accidents is 14% and 86% respectively.

Table 10: Cost of Car accidents in Autonomous Valencian Community

VALENCIAN COMMUNITY-SPAIN				
Year	Nr. Of injury accidents	Average cost of Injury accident	Total Cost of Car Accidents	Variation in %
2003	8.762	49.538,00	434.051.956,00	-
2004	8.321	49.538,00	412.205.698,00	-5,03
2005	9.166	49.538,00	454.065.308,00	10,16
2006	10.115	49.538,00	501.076.870,00	10,35
2007	10.308	49.538,00	510.637.704,00	1,91
2008	9.009	49.538,00	446.287.842,00	-12,60
2009	7.450	49.538,00	369.058.100,00	-17,30
2010	6.936	49.538,00	343.595.568,00	-6,90
2011	7.404	49.538,00	366.779.352,00	6,75
2012	6.990	49.538,00	346.270.620,00	-5,59

Table 11-Criterions for the Calculation of Equivalent Inhabitants

Type of Company/Facility/Activity	**Equivalent Inhabitants**
Offices and companies of the service sector	1 E.I. per 2 employees (permanent or not)
Factories and laboratories	1 E.I. per 2 employees (permanent or not)
Schools and other Educational Institutes	1 E.I. per 10 desk places
Cinemas, theatres and stadiums	1 E.I. per 30 places
Prisons and military barracks	1 E.I. per 6 bed-places
Service Stations	1 E.I. per 6 vehicles
Hotels, camping, hostels and other tourism facilities	1 E.I. per bed-place
Hospitals and nursing homes	2 .E.I per bed-place
Restaurants	1 E.I. per 3 places
Sport Centers, pools etc	1 E.I. per 5 sportsmen
Stadiums	1 E.I. per 6 spectators

Source:ARPA- Agenzia regionale per la protezione dell'ambiente

Table 12-Cost of air pollution

Spain	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	SOx: Óxidos de azufre (toneladas)									
Total emmission	1.328.423	1.374.022	1.325.613	1.218.291	1.203.469	529.404	511.554	479.951	459.652	408.075
Total Cost	3.087.255.052	3.193.227.128	3.080.724.612	2.831.308.284	2.796.861.956	1.230.334.896	1.188.851.496	1.115.406.124	1.068.230.551	948.366.300
	NOx: Óxidos de nitrógeno (toneladas)									
Total emmission	1.413.612	1.454.892	1.450.660	1.410.343	1.391.526	1.193.275	1.095.767	1.018.554	1.006.311	972.935
Total Cost	1.277.905.248	1.315.222.368	1.311.396.640	1.274.950.072	1.257.939.504	1.078.720.600	990.573.368	920.772.816	909.705.054	879.533.330
	CO2: Dióxido de carbono (miles de toneladas)									
Total emmission	336.167	354.145	369.587	360.154	367.802	336.858	300.356	287.512	286.149	281.946
Total Cost	3.361.670.000	3.541.450.000	3.695.870.000	3.601.540.000	3.678.020.000	3.368.580.000	3.003.560.000	2.875.120.000	2.861.486.000	2.819.460.000
Total Cost of air pollution	**7.726.830.300**	**8.049.899.496**	**8.087.991.252**	**7.707.798.356**	**7.732.821.460**	**5.677.635.496**	**5.182.984.864**	**4.911.298.940**	**4.839.421.604**	**4.647.359.630**

Sources: OECD and INE

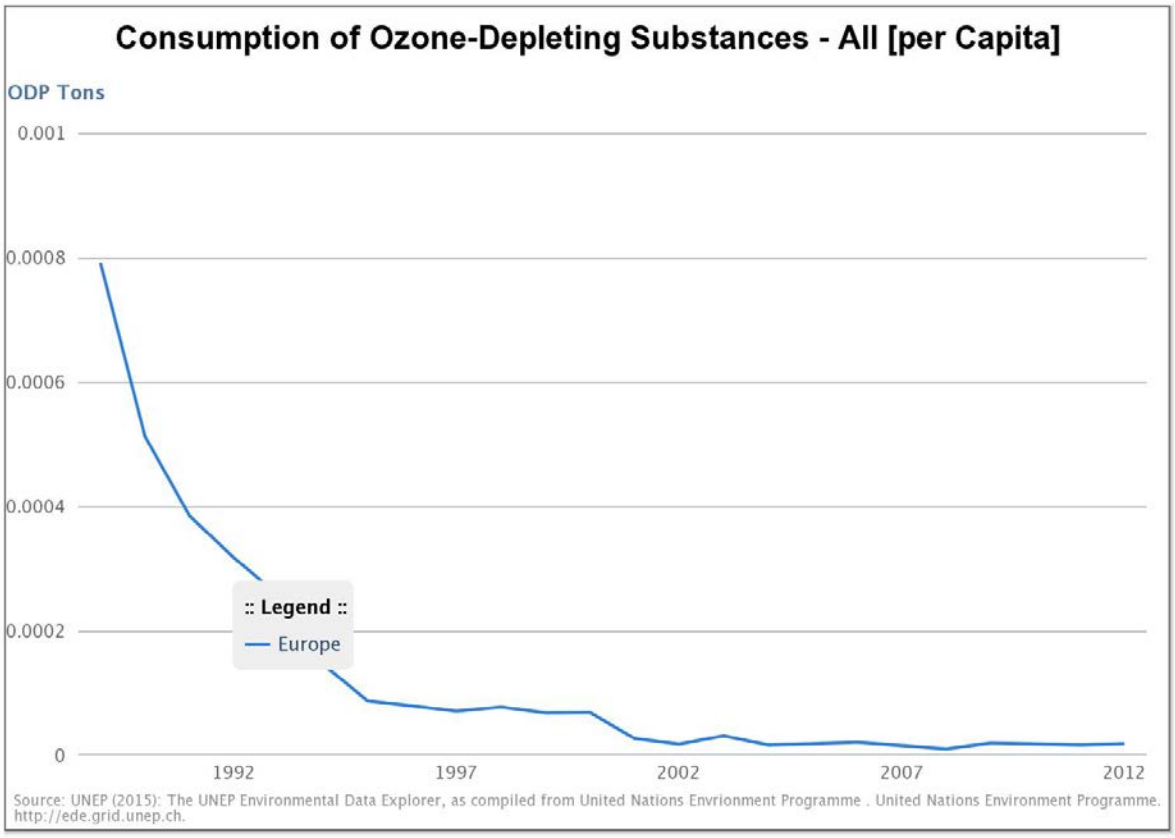
Italy	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
	SOx: Ossidi di zolfo (ton)									
Total emmission	518.822	481.341	402.526	380.703	338.231	283.494	232.148	210.185	201.659	198.669
Total Cost	1.205.742.929	1.118.636.871	935.469.793	884.754.347	786.049.654	658.840.555	539.511.085	488.469.555	468.655.516	461.706.756
	NOx: Ossidi di azoto(ton)									
Total emmission	1.319.476	1.279.871	1.212.176	1.158.391	1.127.391	1.056.655	973.498	963.637	957.623	928.935
Total Cost	1.192.806.193	1.157.003.768	1.095.807.354	1.047.185.108	1.019.161.065	955.216.128	880.042.063	871.127.587	865.691.192	839.757.330
	CO2:Anidride carbonica (ton)									
Total emmission	486.638.461	489.462.002	488.162.902	483.613.716	475.485.799	463.962.155	415.434.484	426.086.644	424.651.023	422.578.964
Total Cost	4.866.384.611	4.894.620.018	4.881.629.019	4.836.137.161	4.754.857.991	4.639.621.549	4.154.344.835	4.260.866.443	4.246.510.230	4.225.789.640
Total Cost of air pollution	**7.264.933.733**	**7.170.260.657**	**6.912.906.166**	**6.768.076.616**	**6.560.068.710**	**6.253.678.231**	**5.573.897.983**	**5.620.463.586**	**5.580.856.938**	**5.527.253.726**

Sources: OECD and ISTAT

Table 13-Cost of loss of farmland

Cost of loss of farmland	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Farmland Variation in EMR in hectares	-20.967	-20.967	-20.967	17.322	17.322	6.833	6.833	6.833	-2.541	-2.541
Farmland Variation in Community of Valencia in hectares	-79.848	-79.848	-79.848	-79.848	-79.848	-79.848	-79.848	-79.848	-79.848	-79.848
Average market sales price in EMR (€/ha)	14.500	14.834	15.160	15.493	15.803	16.356	16.487	16.751	17.237	17.806
Average market sales price in Valencia (€/ha)	12.700	13.086	13.528	14.012	14.409	15.005	14.969	15.277	15.743	16.128
Cost of variation of farmland in € in EMR	**-304.022.998**	**-311.015.478**	**-317.857.869**	**268.374.319**	**273.741.805**	**111.764.460**	**112.658.576**	**114.461.113**	**-43.798.600**	**-45.243.954**
Cost of variation of farmland in € in Community of Valencia	**-1.014.072.140**	**-1.044.916.834**	**-1.080.182.777**	**-1.118.799.312**	**-1.150.498.626**	**-1.198.148.444**	**-1.195.252.918**	**-1.219.855.207**	**-1.257.060.791**	**-1.287.754.026**

Cost of ozone depletion-Figure 1



Source UNEP GEO Data Portal

Table 14: Total Primary Energy Consumption per Capita

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Italy-Million Btu per Person	135,43648	137,77214	137,69113	136,23112	133,60194	131,5385	121,61378	126,11908	122,99431	121,8556
Spain-Million Btu per Person	144,91014	147,51865	149,20343	147,85152	148,96904	142,24144	131,89478	134,26497	130,79738	129,9981
Cost in €/boe	106,41	109,60	112,89	116,28	119,76	123,36	127,06	130,87	134,80	138,84
Italy Btu per capita	135.436.480	137.772.140	137.691.130	136.231.120	133.601.940	131.538.500	121.613.780	126.119.080	122.994.310	121.855.600
Spain Btu per capita	144.910.140	147.518.650	149.203.430	147.851.520	148.969.040	142.241.440	131.894.780	134.264.970	130.797.380	129.998.100
Italy boe per capita	24,3969	24,8177	24,8031	24,5401	24,0665	23,6948	21,907	22,7185	22,1556	21,9505
Spain boe per capita	26,10	26,5734	26,8768	26,6333	26,8346	25,6227	23,7589	24,1859	23,5612	23,4173
Emilia Romagna Population	4.080.479	4.151.369	4.187.557	4.223.264	4.275.802	4.337.979	4.377.435	4.432.418	4.341.240	4.377.487
Community of Valencia Population	4.470.885	4.543.304	4.692.449	4.806.908	4.885.029	5.029.601	5.094.675	5.111.706	5.117.190	5.129.266
Total cost-EMR	10.593.095.239	11.291.903.988	11.725.145.183	12.050.728.898	12.324.136.614	12.679.545.890	12.184.369.090	13.178.258.431	12.964.990.205	13.340.785.098
Total cost-Valencia	12.418.505.242	13.232.235.768	14.237.333.358	14.886.052.594	15.699.587.975	15.897.236.407	15.379.536.468	16.179.525.355	16.251.888.335	16.676.470.810

Source: U.S. Energy Information Administration - EIA - Independent Statistics and Analysis

Table 15-Net Capital Growth

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Community of Valencia-Employed people	1.881.400	1.962.700	2.039.700	2.129.600	2.198.100	2.175.500	1.974.900	1.918.500	1.857.700	1.790.600
Valencia-Variation of labor workforce	3,54	4,32	3,92	4,41	3,22	- 1,03	- 9,22	- 2,86	- 3,17	- 3,61
Emilia Romagna-Employed people	1.880.640	1.857.530	1.839.240	1.860.440	1.892.760	1.942.480	1.938.350	1.882.070	1.903.760	1.931.470
EMR-Variation of labor workforce	- 0,83	- 1,23	- 0,98	1,15	1,74	2,63	- 0,21	- 2,90	1,15	1,46
Valencia-Gross Fixed capital Investments	21.484.621.000	23.797.685.000	26.486.606.000	30.527.236.000	32.955.417.000	32.975.236.000	31.857.369.000	29.458.967.000	29.005.647.000	29.124.631.000
EMR-Gross Fixed capital Investments	23.584.840.000	23.023.170.000	24.320.720.000	25.176.280.000	27.240.910.000	27.628.900.000	27.513.800.000	24.396.100.000	25.610.200.000	24.666.500.000
Valecia -Net Capital Growth	760.255.974	1.028.357.495	1.039.113.803	1.345.491.257	1.060.032.900	- 339.038.412	- 2.937.526.188	- 841.301.199	- 919.230.304	- 1.051.979.728
EMR- Net Capital Growth	- 194.768.019	- 282.917.230	- 239.471.755	290.194.393	473.235.477	725.770.255	- 58.498.411	- 708.340.861	295.145.897	359.030.926

APPENDIX III- R-ISEW IN NUMBERS

	EMILIA ROMAGNA ITALY									
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Private Consumption	68.400.400.000	71.040.900.000	73.043.500.000	76.075.700.000	77.904.897.272	80.178.300.000	79.461.800.000	81.938.500.000	84.114.900.000	83.549.900.000,00
Index of Income distribution	0,29	0,30	0,30	0,29	0,30	0,30	0,30	0,29	0,29	0,29
Adjusted consumption	48.222.966.004	49.831.639.305	50.852.884.700	53.930.063.730	54.471.104.173	56.354.119.938	55.523.932.750	58.493.436.995	59.790.553.218	59.129.935.228
Services from domestic labor (+)	16.786.310.719	17.015.567.878	17.913.413.023	17.990.408.422	19.184.772.858	19.041.583.432	20.630.814.312	20.175.393.337	20.599.059.027	20.625.282.489
Services from durable goods(+)	10.989.280.000	11.552.480.000	11.865.440.000	12.154.240.000	12.842.381.782	12.333.760.000	11.777.440.000	12.086.400.000	11.776.000.000	10.142.080.000
Non defensive public expenditure on health(50%) and education (100%)(+)	5.948.344.512	6.081.897.938	6.355.325.736	6.596.654.083	6.951.903.440	6.958.299.972	7.091.260.987	7.286.976.890	7.221.514.402	7.472.481.963
Expenditure on consumer durables(-)	6.868.300.000	7.220.300.000	7.415.900.000	7.596.400.000	8.026.488.614	7.708.600.000	7.360.900.000	7.554.000.000	7.360.000.000	6.338.800.000
Defensive private expenditure on health and education(50%)(-)	1.653.673.283	1.769.105.863	1.729.723.695	1.721.177.793	1.765.281.268	1.897.370.818	1.825.676.250	2.119.638.420	1.850.105.250	2.103.247.835
Cost of commuting (-)	2.533.866.156	2.871.359.583	3.083.319.569	3.119.638.617	3.263.584.131	3.258.998.173	3.122.382.995	3.309.243.405	3.167.606.777	3.409.252.503
Cost of car accidents (-)	1.310.478.252	1.282.736.972	1.201.296.500	1.186.435.100	1.143.039.812	1.077.154.272	1.011.120.118	998.289.776	1.011.318.270	907.189.394
Cost of water pollution(-)	271.010.948	277.216.475	283.286.914	273.102.754	273.921.081	284.436.306	267.510.174	253.387.319	254.320.456	249.778.209
Cost of air pollution(-)	7.264.933.733	7.170.260.657	6.912.906.166	6.768.076.616	6.560.068.710	6.253.678.231	5.573.897.983	5.620.463.586	5.580.856.938	5.527.253.726
Cost of noise pollution(-)	357.001.254	371.358.513	387.275.075	403.751.393	417.815.176	439.437.895	450.414.191	466.637.169	475.733.608	493.444.157
Variation of farmland(-)	- 304.022.998	- 311.015.478	- 317.857.869	268.374.319	273.741.805	111.764.460	112.658.576	114.461.113	- 43.798.600	- 45.243.954
Depletion of non-renewable natural resources & Long term environ.damage(-)	10.593.095.239	11.291.903.988	11.725.145.183	12.050.728.898	12.324.136.614	12.679.545.890	12.184.369.090	13.178.258.431	12.964.990.205	13.340.785.098
Cost of ozone depletion(-)	6.849.563	3.678.567	4.139.403	4.744.142	3.561.652	2.322.578	4.578.055	4.293.897	3.870.628	4.328.185
Net capital growth - adjustement	- 194.768.019	- 282.917.230	- 239.471.755	290.194.393	473.235.477	725.770.255	- 58.498.411	- 708.340.861	295.145.897	359.030.926
ISEW	50.588.901.791	51.629.731.797	53.686.741.329	58.105.879.634	60.419.242.477	61.923.753.894	63.276.759.359	63.944.115.471	66.969.671.812	65.309.487.544
GDP	118.439.167.358	123.879.341.781	126.740.600.162	133.474.147.088	140.132.569.267	142.031.505.631	135.309.580.055	138.241.798.518	139.059.033.804	138.058.936.001
Population	4.080.479	4.151.369	4.187.557	4.223.264	4.275.802	4.337.979	4.377.435	4.432.418	4.341.240	4.377.487
ISEW per capita	12.398	12.437	12.821	13.759	14.131	14.275	14.455	14.426	15.426	14.919
GDP per capita	29.026	29.841	30.266	31.605	32.773	32.741	30.911	31.189	32.032	31.538

	AUTONOMOUS COMMUNITY OF VALENCIA									
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Private Consumption	43.682.559.000	47.503.855.000	51.929.770.000	51.778.805.850	56.530.517.120	55.440.103.640	54.050.143.910	52.169.438.310	51.182.500.990	51.714.152.480
Index of Income distribution	0,33	0,32	0,31	0,30	0,32	0,33	0,33	0,34	0,34	0,33
Adjusted consumption	29.214.895.459	32.160.109.835	35.582.278.404	36.245.164.095	38.717.751.175	37.222.485.584	35.991.990.830	34.228.368.475	33.780.450.653	34.648.482.162
Services from domestic labor (+)	19.528.421.800	20.448.208.693	21.167.989.234	21.685.809.890	24.998.645.601	26.114.277.833	24.340.688.885	24.347.556.138	24.198.444.177	24.120.006.511
Services from durable goods(+)	8.421.526.214	8.149.687.963	7.985.632.141	8.442.331.712	9.389.354.560	6.849.698.640	6.100.502.240	5.310.466.400	4.744.838.000	4.121.208.960
Non defensive public expenditure on health(50%) and education (100%)(+)	5.530.005.891	5.708.943.839	5.881.363.321	6.377.572.789	6.998.237.091	7.789.779.000	8.412.996.500	8.248.405.000	7.890.269.000	7.174.265.500
Expenditure on consumer durables(-)	4.986.321.456	4.752.316.987	5.001.236.975	5.276.457.320	5.868.346.600	4.281.061.650	3.812.813.900	3.319.041.500	2.965.523.750	2.575.755.600
Defensive private expenditure on health and education(50%)(-)	566.461.130	588.085.270	894.193.081	942.405.580	1.020.732.095	1.202.829.635	1.143.487.680	1.117.255.240	960.293.025	1.017.271.060
Cost of commuting (-)	1.633.401.639	1.688.870.072	2.219.595.685	2.898.648.317	765.473.984	836.141.494	904.145.564	892.838.230	865.279.018	879.797.482
Cost of car accidents (-)	434.051.956	412.205.698	454.065.308	501.076.870	510.637.704	446.287.842	369.058.100	343.595.568	366.779.352	346.270.620
Cost of water pollution(-)	266.423.846	274.028.216	281.909.521	279.875.414	280.882.097	293.648.480	286.721.481	290.333.606	290.124.041	291.414.657
Cost of air pollution(-)	7.726.830.300	8.049.899.496	8.087.991.252	7.707.798.356	7.732.821.460	5.677.635.496	5.182.984.864	4.911.298.940	4.839.421.604	4.647.359.630
Cost of noise pollution(-)	342.202.295	372.014.763	403.422.540	429.009.530	466.541.268	491.745.710	484.586.254	495.113.260	510.765.597	520.759.257
Variation of farmland(-)	- 1.014.072.140	- 1.044.916.834	- 1.080.182.777	- 1.118.799.312	- 1.150.498.626	- 1.198.148.444	- 1.195.252.918	- 1.219.855.207	- 1.257.060.791	- 1.287.754.026
Depletion of non-renewable natural resources & Long term environ.damage(-)	12.418.505.242	13.232.235.768	14.237.333.358	14.886.052.594	15.699.587.975	15.897.236.407	15.379.536.468	16.179.525.355	16.251.888.335	16.676.470.810
Cost of ozone depletion(-)	7.504.905	4.025.864	4.638.490	5.399.770	4.069.126	2.692.877	5.328.166	4.951.956	4.562.461	5.071.497
Net capital growth - adjustement	760.255.974	1.028.357.495	1.039.113.803	1.345.491.257	1.060.032.900	- 339.038.412	- 2.937.526.188	- 841.301.199	- 919.230.304	- 1.051.979.728
ISEW	34.059.330.429	37.076.708.857	38.991.807.916	40.050.846.681	47.664.430.393	47.309.774.610	43.144.736.871	42.519.685.952	41.383.073.551	40.764.058.765
GDP	78.242.090.000	83.896.036.000	90.535.410.000	98.381.803.000	105.192.625.000	108.507.820.000	102.781.394.000	102.328.966.000	101.210.706.000	98.102.868.000
Population	4.470.885	4.543.304	4.692.449	4.806.908	4.885.029	5.029.601	5.094.675	5.111.706	5.117.190	5.129.266
ISEW per capita	7.618	8.161	8.309	8.332	9.757	9.406	8.469	8.318	8.087	7.947
GDP per capita	17.500	18.466	19.294	20.467	21.534	21.574	20.174	20.019	19.779	19.126