

INEF Report

Institute for Development and Peace
Gerhard-Mercator-University of Duisburg

Improving upon Nature. Creating Competitive Advantage in Ceramic Tile Clusters in Italy, Spain, and Brazil

**Jörg Meyer-Stamer
Claudio Maggi
Silene Seibel**

Report 54 / 2001

Contribution to the Research Project
"The Interaction of Global and Local Governance: Implications for Industrial Upgrading"
Project homepage: <http://www.ids.ac.uk/ids/global/vw.html>

**Financial support from the Volkswagen Foundation
and the Department for International Development is gratefully acknowledged**

Abstract

This paper shows how using a combination of a cluster and a global value chain approach helps to assess local competitive strategies and upgrading possibilities. The global ceramic tile industry is dominated by two industrial clusters, Sassuolo in Italy and Castellón in Spain, which are not only dominating tile production in their respective countries and in Europe but are also the global technology leaders and the leading exporters. The Italian tile manufacturers are closely linked with capital goods manufacturers, the Spanish with producers of glazing materials. The equipment and materials producers drive technical change and innovation in tile design, whereas the tile manufacturers try to establish a competitive advantage in particular by innovating in downstream activities: training tilers, establishing diversified brands for different sales channels, and going into direct sales. Analyzing the value chain, from inputs and capital goods to final sales, offers new insights into scope and alternatives of local upgrading. It also helps to reassess the competitiveness of tile clusters in the developing world. This is done for Brazil's leading cluster which is located in Santa Catarina. Tile firms there can benefit from the fierce rivalry among Italian capital goods producers and among Spanish producers of glazing materials, as well as the rivalry between Italy and Spain. They are technology followers. However, having to deal with a volatile and very competitive market, they are innovative in downstream activities, experimenting with concepts which are not yet used by Italian or Spanish manufacturers.

Content

1	Introduction	1
2	Main Features of the Tile Industry and its Value Chain	3
2.1	The geography of the tile industry	3
2.2	Features of the product and the production process	5
2.3	The role of suppliers of capital goods and glazing materials	6
2.4	The demand side	9
3	The Cluster of Sassuolo / Italy	13
3.1	The structure and evolution of the ceramic tile industry in Italy and the Sassuolo cluster	13
3.2	Upgrading in the Sassuolo cluster	14
3.3	Structure of the value chain	17
3.3.1	Performance of the capital goods industry	18
3.3.2	Interaction between machinery and tile producers	18
3.3.3	Perspectives of technological upgrading	19
3.4	Product structure and market segmentation	20
3.4.1	Sales and after-sales services	20
3.4.2	Exporting and the relevance of international value chains	21
3.5	Structure of supporting institutions	22
3.6	Evolution of local governance	23
3.7	Competitive advantages and challenges	25
4	The Cluster of Castellón / Spain	27
4.1	The evolution of the Castellón cluster	28
4.2	Upgrading in the Castellón cluster	29
4.3	Structure of the value chain	31
4.4	Product structure and market segmentation	32
4.4.1	Sales and after-sales services	33
4.4.2	Exporting	33
4.4.3	The relevance of international value chains	33
4.4.4	Restructuring of the industry and internationalization	34
4.5	Structure of supporting institutions	34
4.6	Evolution of collective action	37
4.7	Competitive advantages and challenges	37

5	The Cluster of Santa Catarina / Brazil	38
5.1	The structure of the ceramic tile industry in Brazil	38
5.2	The SC cluster	39
5.3	Upgrading in the SC cluster	40
5.3.1	Benchmarking on Ceramic Tile Manufacturing Companies in Santa Catarina	42
5.3.2	The relevance of standards	46
5.3.3	Structure of the value chain	46
5.3.3.1	Market segmentation	46
5.3.3.2	Sales and after-sales services	47
5.3.3.3	Exporting	48
5.3.3.4	The relevance of international value chains	49
5.3.4	Structure of supporting institutions	49
5.3.5	Evolution and deterioration of collective action	51
5.3.6	Competitive challenges	52
5.4	Further perspectives for upgrading	52
5.4.1	Production technology and management	52
5.4.2	Product technology	53
5.4.3	Restructuring of the industry	54
5.4.4	Options for renewed collective action	54
6	Conclusions	54
6.1	Comparing the clusters	54
6.2	Mental models of industry actors	56
6.2.1	Wall vs. floor tiles	56
6.2.2	Red vs. white body	57
6.2.3	Italian tiles are more expensive than Spanish tiles	57
6.2.4	Increasing size vs. differentiated small sized designs	57
6.2.5	Wet vs. dry mixture	57
6.3	Evolution of the tile industry	58
6.3.1	Upgrading	58
6.3.2	Governance structure	58
6.3.3	Global value chains	59
6.3.4	Standards	60
6.4	The Interaction of Global and Local Governance: Implications for Industrial Upgrading	60
7	Bibliography	61

1 Introduction

This is a report which can be read from different angles. One option is to take it as a study of latecomer industrialization. The issue as such has been the focus of intensive research for decades. But we will not go back to Gerschenkron, let alone List. We will rather try to take a case study of the tile industry to show how, under current conditions of globalization, latecomer industrialization can still take place.

Another option is to take it as a case study on competitive advantage. The tile industry is a very dynamic industry, and the story is not just about the rivalry between tile producers. It also involves two types of suppliers – those who produce the capital goods, and those who supply the glazing materials. It is these suppliers who, striving to establish a competitive advantage, are driving technological progress in the industry.

Our research was guided by two concepts which have gained prominence in the course of the 1990s, but which remained mostly unconnected; in fact, some people might have argued that they were not connectable at all – the concept of clusters and the concept of global value chains.

Clusters, commonly defined as concentrations of firms of a given sub-branch of industry plus supporting industrial and service firms within a delimited region, started to receive attention in the 1980s, initially based on the striking growth and export performance of Italian industrial districts, mostly populated by small and medium-sized enterprises / SME (Piore and Sabel 1984, Pyke, Becattini and Sengenberger 1990). As such clusters are frequent in developing countries, and the private sector there mostly consists of SME, promoting clusters appeared as a promising new approach to stimulate latecomer industrialization (Schmitz 1989). Clusters promised to reduce all sorts of barriers – barriers to intra-firm competence building, as firms could specialize more; barriers to exports, as local

firms could work jointly in export consortia; barriers to upgrading, since an agglomeration of many firms of the same branch created strong demand for business development services. Firms in clusters which operated individually did already enjoy all sorts of advantages (e.g. the availability of specialized, experienced workers), but firms in clusters which managed to act collectively had a chance to create a competitive advantage beyond this, based on “collective efficiency” (Schmitz 1995, Nadvi 1999).

Yet closer investigation showed that the capacity and scope for local governance (private and public) varies with the ways industrial clusters feed into global value chains, i.e. world-wide production networks which are often coordinated by a small number of firms (large producing multinationals such as GM, or global brand holders such as Nike, or global distribution chains such as Ikea). Evidence surfaced which showed that the more the key value adding activities in the chain are controlled by a small number of large overseas firms, the more difficult it becomes to establish effective joint action at the local level. The relationships between these overseas firms and key local agents tend to disarticulate governance structures within the cluster, something that has been observed, for instance, by Schmitz (1998).

This proposition built, to a certain extent, on earlier work by Gereffi (1996) and others who claimed that, apart from intra-firm trade and arm's length transactions, an important part of world trade is based on value chains (Gereffi calls them “commodity chains”), i.e. relatively stable arrangements between producers, often in developing countries and sometimes small or medium-sized, and big firms in industrialized countries. Gereffi distinguishes between supplier-driven commodity chains, for instance in the car industry, and buyer-driven commodity chains, for instance in the garment industry. We will show that this conceptualization is somewhat narrow, as there are clearly global value chains in the tile industry, but they are neither buyer-

nor supplier-driven. The case of the tile industry shows that there are still industries and commercial sectors which, unlike car production or garment marketing, do not display a high degree of concentration.

But this observation is only a minor contribution of this report. Its main message is that combining cluster research with value chain research creates a enormous value-added. The tile industry appears to be an obvious candidate for a cluster study, since the leading firms of this industry are concentrated in just two relatively small regions. But it will become evident in the course of the report that analyzing the tile industry exclusively from a cluster angle would not even remotely catch the dynamics of struggle for competitive advantage which are currently reshaping the industry. Introducing the value chain perspective permits a leap in understanding what is going on in the industry. At the same time, taking just the value chain perspective, neglecting the cluster issue, would be just as foolish, since it is not by chance that clusters play such an important role in this industry.

This leads us back to the starting point. Late-comer industrialization these days is increasingly about creating a competitive advantage. In the days of import substitution, having a local market was often sufficient, and competitiveness was not much of an issue (Meyer-Stamer 1997). In an era of free trade and globalized corporate structures, the late-comer has to face competition early on. In the tile industry, Italy was the early mover, being the first country where firms moved in the 1960s from craft to industrial patterns. Spain was the first latecomer, starting the transition from craft to industry in the 1970s, with the Brazilian firms coming right behind. Both cases show that even with a well-established, highly competitive industry being around, latecomer industrialization is still possible. But their experience also shows that this is a constant struggle.

The research presented in this paper is based on three fieldwork exercises which involved

three clusters – Sassuolo in Italy, Castellón in Spain, and Santa Catarina in Brazil.¹ Jörg Meyer-Stamer and Silene Seibel conducted interviews with tile firms and other actors in the Santa Catarina cluster in April 2000; this included a visit to the Construction Materials Fair in São Paulo (Feicon). All three authors conducted interviews with tile firms and other actors in Sassuolo and Castellón in October 2000; this included a visit to the Tile Fair in Bologna (Cersaie). Silene Seibel conducted a benchmarking exercise with six medium-sized tile firms in the Santa Catarina cluster in November/December 2000. Apart from this, we exploited the information provided in trade journals and by internal papers and workshop documentations from sector associations.

There is surprisingly little literature on the tile industry from an economic or social science perspective (Russo 1985, Porter 1990, Rowley 1996). We have investigated the Santa Catarina cluster before (Meyer-Stamer et al. 1996), and subsequently a further investigation has been conducted on that cluster from a "local systems of innovation" perspective (Campos et al. 1998). Moreover, Brazil's National Development Bank, which is the main creditor of tile firms in Brazil, has repeatedly investigated the sector (Romero et al. 1994, BNDES 1995, Gorini 1999). We found that hardly any of these studies gives an adequate view of the current competitive pattern in the sector.

This report is organized as follows. The following section gives an overview of the main features of the tile industry and its value

1 We are grateful for the time company representatives, association officials, and other source persons spent with us. We are also grateful for the feedback we received on the first draft from Hubert Schmitz and ASCER, the feedback on the second draft we received during the workshop at IDS in February 2001, and the subsequent detailed comments from Hubert Schmitz and John Humphrey. The usual disclaimers apply.

chain. It gives an overview of the main producer countries, the main locations, technical features of the production process and the product, the role of key suppliers, and the demand side, i.e. the structure of the value chain after production. The three subsequent sections present the main findings regarding each of the clusters. Since neither of these clusters has been adequately documented in the recent literature, we will present a rather comprehensive picture, including information which is only indirectly related to the key questions which guided this research. The final section presents the main findings in a comparative perspective.

2 Main Features of the Tile Industry and its Value Chain

One may be tempted to perceive the ceramic tile industry as a relatively mature, traditional industry. Nothing could be further from the truth. There is a misconception of the tile industry which is based on the fact that tiles have been used to cover floors and walls for centuries. However, a modern tile has as much to do with an azulejo in Lisbon's Alfama as a microfibre jacket has with the Marquis de Pombal's coat. The tile industry is something like a "latecomer industry": it was only in the 1960s and 1970s that tile production started to evolve from craft production to industrial scale, and this transition is still going on. The tile industry is a highly dynamic industry both in terms of technological innovation and design. If you see a floor or a wall which appears like stone, granite, or marble, it is probably made of ceramic tile. What appears like brick may also be a tile. Even what appears to be wood may be a ceramic tile.

The tile industry is enjoying strong growth both in terms of world production and exports. What is behind this dynamism is, first of all, strong rivalry. More specifically, it is strong rivalry at four different stages which is creating a constant process of upgrading – ri-

valry between manufacturers of capital goods for the industry, rivalry between producers of glazing materials, rivalry between manufacturers of tiles, and rivalry at the commercialization stage. And three of these rivalries are strongly localized: the first one in a cluster in Italy, the second one in a cluster in Spain, and the third one in both of these clusters as well as another cluster in Southern Brazil. This report will take a close look at these three clusters.

In this chapter we will discuss some general features of the tile industry. Having a basic understanding of the geography, some technical features, and some issues regarding industrial organization is important for an understanding of the individual clusters which we will analyze in the three subsequent chapters.

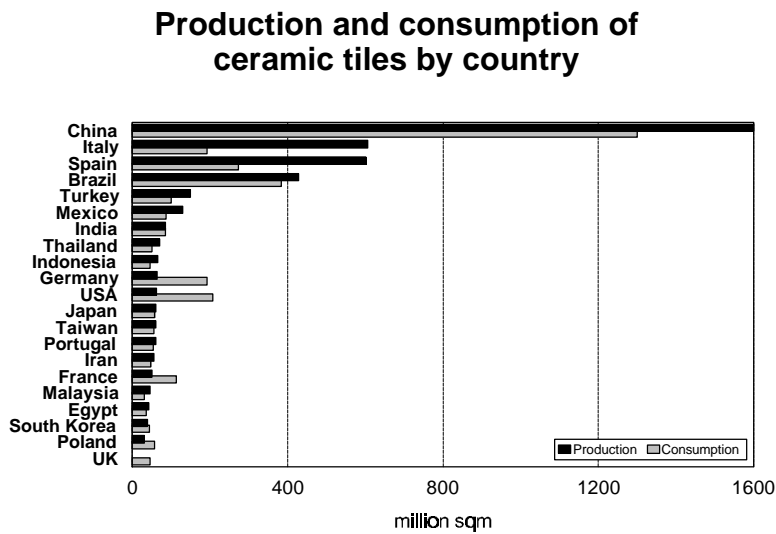
2.1 The geography of the tile industry

What does the map of the tile business look like? Let us take a narrow perspective first, just looking at tile production and consumption as such. First, there is China. It is by far the largest producer and consumer of tiles. Production increased from 272 million square meters² in 1991 to 1,842 million square meters in 1997, with a strong contraction since.³

2 The common statistic measure in the tile industry is the square meter (except for the U.S., where it is the square foot). For participants in the industry this has the advantage that they do not have to talk about sales, let alone profit. However, the analytical use of this measure for our purposes is low, except in terms of changes in the relationship between sales value and square meters sold. We will come back to this point later. – The source of square meter data, if not otherwise mentioned, is the trade journal *Ceramic World Review*, usually based on data from ACIMAC, the association of Italian tile equipment manufacturers.

3 Data from *Ceramics World Review*, various issues. It must be noted that some industry sources have serious doubts regarding the accuracy of these data.

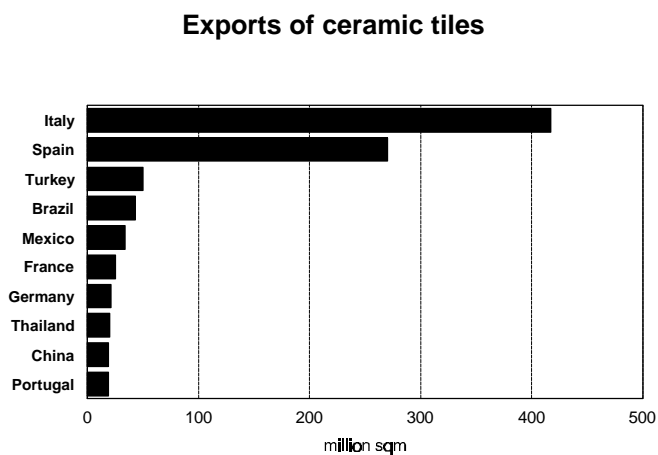
Figure 1



1999. Source: Ceramic World Review.

© JMS

Figure 2



1999. Source: Ceramic World Review.

© JMS

But China is a self-contained market so far – there are no imports and little exports of tiles, and the boom of machinery imports which marked the first half of the 1990s seems to be over as well. Accordingly, we will take no further looks at China.

Second, there is a group of countries with a strong tile consumption, namely Brazil, Spain, the U.S., Germany, and Italy. Three of them are major producers, namely Italy, Spain, and Brazil, whereas the other two are major importing countries. With respect to these countries, there is a clear pattern:

- Italy so far is the leading producer. It was the first country where tile production moved from craft to industry. Italian firms achieve the highest average price per square meter, a fact that reflects the high quality of Italian tiles, not only in terms of physical characteristics but especially in terms of features such as design, style, fashion, and image. It also reflects the higher cost of Italian producers, in particular in terms of high-quality inputs for high-end products. Italian firms dominate the German market but have a strong presence elsewhere as well. Italian production is concentrated in the Modena province in the Emilia-

Romagna region (about 80% of total), especially around the city of Sassuolo.

- Spain's tile industry is more recent than the Italian. It enjoyed very strong growth in the 1990s; Spanish production is about to overtake that of Italy in terms of square meters, albeit not yet in terms of sales value since the average price of Spanish tiles per square meter is about 60 % of that of Italian tiles. Spanish production is concentrated around Castellón de la Plana in the Autonomous Region of Valencia (more than 90% of total).

- Brazil is the second largest tile market in the world. Import penetration is close to nil, whereas domestic producers have recently increased their participation in the world market. Production is concentrated in the states of Santa Catarina and São Paulo.
- The U.S. have been, and continue to be, the most dynamic market open for ceramic tile exporters, with consumption increasing from less than 100 million square meters in 1990 to more than 200 million square meters in 1999. Two thirds of this is met by imports, and part of the domestic production comes out of plants owned by Italian firms.
- Germany is by far the most important import market in Europe, with only one third of the market being served by domestic producers. However, sales growth is very limited.

This was the narrow perspective. However, to understand the tile industry it is essential to take a wider perspective, taking a look at the entire value chain from inputs to retail sales. Competition is based on innovation – in terms of production processes, products, and merchandising and after-sales services. In terms of product and process innovation, and following the terminology of Pavitt (1984), the tile industry is clearly a supplier-driven industry. There are two types of suppliers which drive innovation in the tile business, namely manufacturers of capital goods and producers of glazing material. To understand their respective role, it is useful to take a look at the technical aspects of the process and product.

2.2 Features of the product and the production process

There are two types of tiles, conventional tiles and porcelain tiles (*porcelanato*). The body of a *conventional tile* mainly consists of clay, feldspar, kaolin, and quartz, with other

substances such as salt being added for visual effects. These are ground into a very fine granulate which then is formed and pressed to create a biscuit. The biscuit is then covered with a glazing material; this is the crucial step in terms of color and surface pattern. The material then passes through a kiln where it is being fired for less than an hour at temperatures of more than 1200° centigrade. At the end of the kiln the tiles are inspected, mostly visually, but increasingly by automatic inspection machines, and graded into different qualities. The end of the line, which is usually fully integrated, is packaging. A glazed tile may suffer a second or even third trip through the kiln, with further glazing material being added to create a more refined visual appearance. An important part of the glazed tiles segment, especially those with elaborate patterns and colors other than white, are subject to relatively quick changes in fashion, with prices being lowered after a year and the product life-cycle for the more fashionable segment not extending over more than two to three years. Standard tiles, such as white, glossy, and 20 by 20 or 30 by 30 cm are a permanent part of the product spectrum. They are the bread-and-butter segment of the industry, having low margins but making an important contribution to the amortization of production equipment. It appears that for most firms they make up the larger part of sales not only in terms of square meters but also sales value.⁴

Apart from conventional tiles, there are *porcelain tiles* (*gres porcelanato*). This kind of tile goes back to a traditional Italian product which was ugly but very resilient (“*gres rosso*”). In the course of the 1980s its production was continuously refined, in the end leading to a product which for the layperson is not distinguishable from marble or granite; “improving upon nature” is the leading idea of manufacturers of such products, who systematically look around in the world to un-

4 Firms are unwilling to unveil any data in this respect.

derstand which natural stones are preferred by customers and then proceed to reproduce them. The chemical composition of a porcelain tile is only slightly different from that of conventional tiles, with colors sometimes being part of the biscuit since most porcelain tiles are not glazed. But its physical characteristics are clearly different, with porcelain tiles being more dense, with water absorption being less than 0.5 % and often achieving 0.05 %, thus making the product viable for outside installation in cold climates (both for pavement and covering of building surfaces); this, in turn, opens new markets for tile producers. A porcelain tile may be covered with glazing material, something that according to some industry sources does not really make sense but reflects the sales effort of producers of glazing material. The current main trend in porcelain tiles are non-glazed, full-bodied tiles, i.e. they look the same from both sides. In the production of such tiles, the press is becoming the most important part of the production process. Whereas it is just pressing the mixture of raw materials in the case of conventional tiles, it is defining not only physical but also visual characteristics of a full-bodied porcelain tile. Understanding and controlling what goes on inside the press becomes paramount. Full-bodied porcelain tiles are comparable to marble or granite in terms of appearance and physical characteristics (“marmi / graniti di fabbrica”), but they are cheaper (although more expensive than a conventional tile). Life cycles of porcelain tiles are longer than those of conventional tiles.

Table 1 summarizes the steps and the main issues regarding the production process. It does not distinguish between the two main types of tiles since the main features of the process are identical.

2.3 The role of suppliers of capital goods and glazing materials

Let us come back to the two types of supplying industries which play the main role in

pushing the technological frontier in the tile business forward. First, there are suppliers of *capital goods*. They are located almost exclusively in Italy, with more than 56% being located inside the Sassuolo cluster, and many of the others not far away (for instance SACMI, the largest manufacturer, is located in Imola, some 40 km away). The generation of a radical innovation such as the porcelain tile involved intense interaction between capital goods producers and tile manufacturers (with a limited role being played by producers of glazing materials). The capital goods producers played a leading role. Since the end of the 1970s they came up with innovations such as wet grinding, pressing with high tonnage machines, roller kilns, and increasingly sophisticated control instruments (Burzacchini 2000, 98). Wet grinding allowed a much better control of the mass which enters into the press, thus homogenizing product quality. Improved pressing had the same effect. The introduction of roller kilns shortened the firing process, thus not only improving quality but also reducing production costs and improving the control of the firing process. Another important innovation was the single firing process. Whereas traditionally there were two firing processes, with the glazing material being added and fired after the biscuit had already passed through the kiln once, with the single firing process the pressed biscuit was covered with glazing material before entering the kiln.

Producers of capital goods have in-house development departments for both machinery and tiles, and the large ones also have experimental production lines. They constantly come up with incremental innovations for each step of the production process. Typical examples go like this:

- A capital goods manufacturer comes up with a new line of tiles with an innovative surface structure which appeals to tile manufacturers since it offers the opportunity to produce a differentiated, higher-margin product. However, in order to manufacturing this new tile they will have

Table 1: Production process in the tile industry

<i>Production process</i>	<i>Features</i>	<i>Technological issues</i>	<i>Manufacturers of capital goods</i>
Weighing of raw materials	Important to control the characteristics and content of each raw material	Brazilian producers underestimate the importance of scientific control of this part	
Milling	Dry or wet milling	Wet milling used to be superior to control the process, but the difference is fading away, especially as Italian producers start to improve dry milling to reduce the water intensity of the sector	Italian and Spanish
Atomization	Essential to control the quality of the biscuit		Italian and Spanish
Silo	Stocking and homogenizing of mixture of raw materials		local in each cluster
Press	Current maximum weight 7,200 tons	Essential for product quality. In case of porcelanato, most important step of the whole production process regarding product quality and visual appearance.	Italian, with local manufacturers for tools
Dryer	Using recycled heat from the kiln		Italian
Intermediate stock of biscuits	First quality inspection. Waste often not counted in quality statistics		Italian (for handling along the whole process)
Mixing of glazing material			Italian and Spanish
Covering of biscuit with glazing material	May include printing process	Efforts to reduce the thickness of glazing = reducing costs. Different printing technologies	Italian and Spanish
Firing	Continuous moving inside the kiln (single, double, or triple firing)	With progress in roller technology, kilns are getting wider to give more flexibility in terms of tile sizes	Italian
Product inspection	Grading of tiles into two or three different quality grades	Move towards automation, especially in terms of color shade	Italian, UK
Packaging		Fully automated process	

to acquire a new, more powerful or better controllable press.

- Another capital goods manufacturer launches a printing machine which is using a rotating drum with a silicon surface rather than the conventional serigraphic printing process. Thus, it is possible to print color patterns onto tiles which are never the same, opening the possibility to create, for instance, marble-appearances with conventional glazed tiles. This innovation not only opens the way to substantial sales of the new machine but also se-

cures a constant inflow of cash since the manufacturer offers its customers to produce the rotating drums according to their specifications.

Second, there are producers of *glazing materials* (colorifici). Technically, this is a sub-sector of the chemical materials industry. It is a sector which has undergone profound restructuring in the past 20 or so years. In the old days, manufacturers came from different countries, and not always from places with strong tile industries; leading manufacturers then were Colorobbia (Italy), Degussa (Ger-

many), and Ferro and Johnson (U.S.). However, today the sector is dominated by Spanish firms, all of which have their headquarters and main laboratories in the Castellón region, and the four firms mentioned before also have located their main tile-related operations there, with both types having affiliates in several other countries as well. This was due to strong and sophisticated demand from local tile manufacturers which differed from their Italian competitors in two respects:

- They used a different kind of clay, one which was more tricky in achieving high-quality, especially a homogeneous quality of the surface. Learning to deal with this challenge was one of the elements in establishing a technology-based competitive advantage for Spanish glazing producers.
- They pursued a more scientific approach to the production process, trying to get a profound understanding of issues such as sintering kinetics inside tiles while they move through the kiln. This, in turn, is one of the basis of their ability to give technical assistance to the tile manufacturers.

Since rivalry between producers glazing materials is strong, they are constantly seeking for ways to establish a competitive advantage. One way of doing so is free technical assistance to customers. Another way is to offer new designs for free to the customers, thus creating a demand for the own glazing product. The core competence in design is therefore moving from tile to glazing manufacturers. Producers of glazing materials have large in-house design departments. While a typical tile manufacturer in Castellón may have three designers, the leading producer of glazing materials has 40 in Castellón and more in the affiliates, while the total number of employees is less than one thousand, distributed across factories in eight countries and representative offices in some more.

One way of understanding the current dynamism in the industry is to define it as the out-

come of a power struggle about technological hegemony in the tile sector. Italian machinery manufacturers are the dominating force in the porcelain segment of the industry, whereas Spanish producers of glazing materials are the dominating force in the conventional tile segment. Both are much more than just suppliers. They have substantial in-house capacities to develop radically and incrementally new products; examples of a radically new product are the full-bodied porcelain tile or glazing materials for the single firing process, whereas incremental innovation in terms of new designs and surface structures is happening all the time, with new products being launched at each of the three main annual fairs (in Bologna, Valencia, and Orlando/New Orleans). Both types of suppliers also provide assistance to tile manufacturers to sort out problems in the production process. Right now, it appears that Italian manufacturers of capital goods have a strong position in China; no less than 27% of all porcelain tile manufacturers are located there, only little less than in Italy itself (32%; Ceramic World Review 37/2000, pp 92 ff). Spanish producers of glazing materials have a very strong presence in Brazil, where right now only the second porcelain tile plant is being set up, whereas most of the leading producers of glazing materials are distributing or even producing locally, and play a very important role in giving support to tile manufacturers, both in terms of new product designs and solution of production process problems.

At the same time, it is important to note that the economies of clustering appear to be very strong in the tile industry. This reflects the constant exchange going on along the value chain, in particular between suppliers and tile producers. Geographical proximity is paramount in facilitating quick and effective communication to sort out problems or come up with innovation. Barriers to entry inside the cluster are low, whereas in other locations the diseconomies of isolation are so strong that it is difficult to run tile production in a profitable way.

2.4 The demand side

So far we have looked at the supply side, i.e. the input and production stage of the tile value chain. Let us now have a look at the demand side, i.e. the distribution and sales part of the tile value chain. In order to get an adequate understanding of the tile business it is essential to recall that, first, it is part of the construction material industry and that, second, tiles are competing with other materials used to cover floors and walls, be they inside or outside buildings. This may appear trivial, but it has important implications for the industry:

- Being part of the construction industry means being subject to demand fluctuations which are bigger than, say, in the dairy industry. This has not been a problem in the recent past, since tiles have been taking market share from other covering materials.
- It also means that tiles are a durable consumer good, and a specific one since an individual over the course of his lifetime will purchase tiles less frequently than, say, a car or a TV set. This, in turn, gives rise to problems of information asymmetry which create specific problems in terms of brand-name strategies.
- Being part of the construction industry in many places also means that informality is an issue which is not alien to the business. This, in turn, creates a specific set-

ting in terms of business-government relationships, and it also means that the mindset of tile firm owners is not necessarily of the MBA-variety.

- Competing with other covering materials means that tile manufacturers have to be aware of tendencies in neighboring industries with substitutive products. It is, however, important to note that in the recent past it was rather firms in neighboring industries, such as marbles, granite, vinyl, wood, and carpets who were losing market share to tiles.
- Competing with other covering materials means different things in different markets. One of the reasons why Italy and Spain are the leading suppliers of the world market is that domestic demand has been very strong in these countries, something that can be explained with customer preferences shaped by the peculiarities of the local climate. In these countries, it is not rare to find that all the floors in a house are covered with tiles. In countries with moderate climates the use of tiles tends to be more limited, especially to those parts of a house where hygienic considerations are important, i.e. kitchens and bathrooms.

A further issue in being part of the construction business has to do with the structure of commercialization. There are two issues, namely who exactly is the customer and who is going to attend the customer.

Table 2: Differences between tiles and other durables and non-durables

	<i>Tiles</i>	<i>other durables</i>	<i>non-durables</i>
frequency of purchase	0 - 3 in lifetime	every 2 - 10 years	daily to monthly
information symmetry	low	high	high
importance of brand	low	high	low to high
systemic character of product	high (style compatibility with other parts of interior design)	limited (e.g. compatibility of stereo components) low (e.g. cars)	limited (compatibility of different pieces of clothing)
characteristics of point of sale	very intransparent (building company + contractor + various suppliers + service providers)	easily understandable for consumer	easily understandable for consumer

- There are basically three types of customers, i.e. tile-purchase decision-makers, namely consumers, architects, and construction companies (in countries such as Germany this includes small specialized tiling firms). Each of them has a different way of making a purchasing decision, and is using different criteria. Consumers have usually little information, make their decision based on aesthetic and price criteria, and demand basic advice at the point of sale. Architects are well-informed, need more sophisticated information, and have a more refined set of aesthetic criteria, making them the most sophisticated customers in this respect. Construction companies are mostly interested in a low price.
- There are three, and in some countries four, types of points of final sale. First, there are independent shops specializing in tiles. They cater to the medium- and high-price segment. They often have alliances with tiling firms, or even have their own tilers. Second, there are home-centers and DIY shops, such as Home Depot, Obi, and Le Roy Merlin. They cater to the low- and medium-price segment. Third, there are construction companies. Finally, in the U.S. there are floor covering shops which used to sell mainly carpets and vinyl but have recently started to sell tiles as well. All of them may purchase tiles from wholesalers, but it is increasingly common for manufacturers to deal directly with final sellers, especially large chains of home-centers and DIY shops.

What are the main tendencies in terms of commercialization? So far, commercialization of ceramic tiles is not particularly concentrated. A large tile manufacturer may have as much as 4,000 customers. However, industry insiders are anticipating, and in mature markets such as Germany already clearly discerning, a strong concentration process in commercialization, in particular a strong growth of chains of home-centers and DIY

shops. This tendency would have two collaterals. First, intermediate actors, such as import agents and wholesale traders, may suffer or even disappear. Second, it is likely that there will be a polarization in tile demand, with a strong demand both for cheap tiles (sold in home-centers and DIY shops) and for fashionable, design-intensive, high quality tiles (sold in specialized shops), with the middle segment slowly disappearing.

What is the importance of brand names in this industry? Regarding final customers, especially individual consumers, it is low. Only few firms found it worth the effort to create a brand image with individual customers; examples are Marazzi from Italy and Porcelanosa from Spain (albeit mostly in its home market). Brand image seems to be more important in terms of interaction with shops. We will come to this point in particular in analyzing the Italian cluster.

At first glance, a somewhat surprising observation is that there is little synergy between tiles and related products. One might expect a tendency towards a complete product offer, for instance tiles, bath tub, wash basin, toilet and maybe even bathroom fittings all following the same design concept and being offered by the same manufacturer. In fact, there are isolated cases of firms pursuing such a concept, such as the Spanish firm Roca. But the success seems to be limited, and there are several reasons why the synergy concept may remain unimportant. One of them is that all manufacturers in the segment are following the same overall design trends anyway, so that for an individual customer, and even more for an architect, it is not difficult to get a compatible set of individual products. Then there is the observation that specialized producers tend to be more efficient and competitive than those who offer a broad range of products. Another issue is that only some of the Italian firms, and hardly any in Spain, are so large that they have the financial clout to form an integrated group.

Figure 3

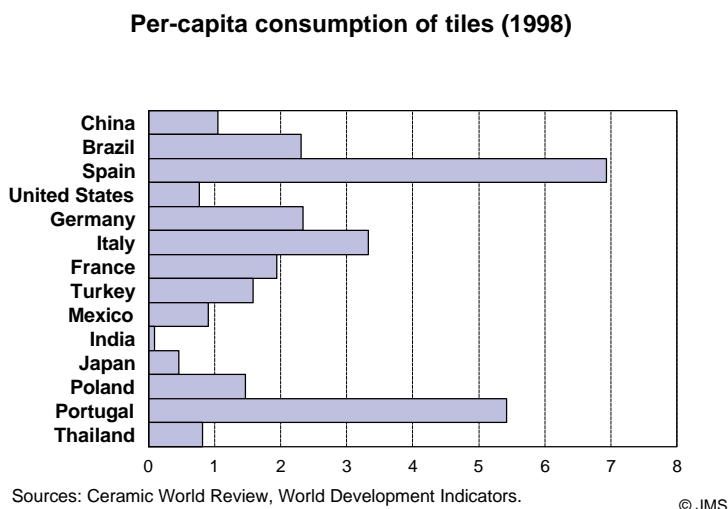
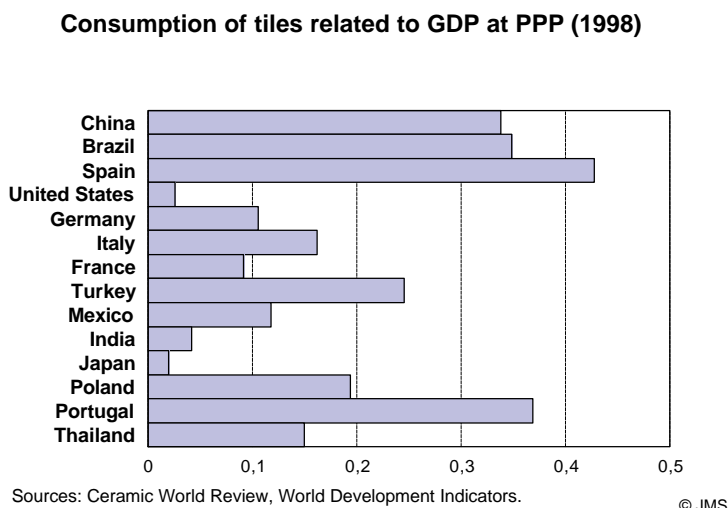


Figure 4



Regarding the future perspectives of demand for tiles, the industry usually points at the differences in per-capita consumption. In such a perspective, not only the United States but also several developing countries appear as promising markets. Things look different if we relate tile consumption to gross domestic product calculated at purchasing-power parities. In this perspective, the room for expansion in the two largest markets, China and Brazil, looks much more limited (Figure 3, Figure 4).

Figure 5 depicts the overall structure of the tile value chain. It does this with a look at the

actors, but from a rather technical perspective. It gives a rough overview of the various types of supporting industries and institutions, it mentions the alternatives for vertical integration at the early stage of the production process, and it depicts the different sales channels.

Figure 6 looks at the actor structure from a somewhat different angle. It is much more a (debatable) interpretation of the current power struggle in the industry. Note that the sales channels are not mentioned explicitly in this figure. What in our view is more important to understand the constant upgrading effort in the industry is localized rivalry in Sassuolo and in Castellón, both within the tile and its local main supplier industry. Moreover, there is the rivalry between the Italian machine producers and the Spanish glazing manufacturers about the dominant technological pattern, and of course between Italian and Spanish tile producers. This

affects some of the more recent latecomers. China appears to be very much influenced by the Italian model of a strong emphasis on porcelanato, whereas Brazil rather follows the Spanish model, with a very strong position of the colorifici; things are less straightforward in Turkey and the NAFTA countries.

In order to get a better understanding of the underlying factors of these various rivalries, we have take a look at the two leading clusters and the Brazilian latecomer cluster in the following three chapters, before coming back to a look at the evolution of the overall value chain in the tile industry.

Figure 5: The value chain of the tile industry

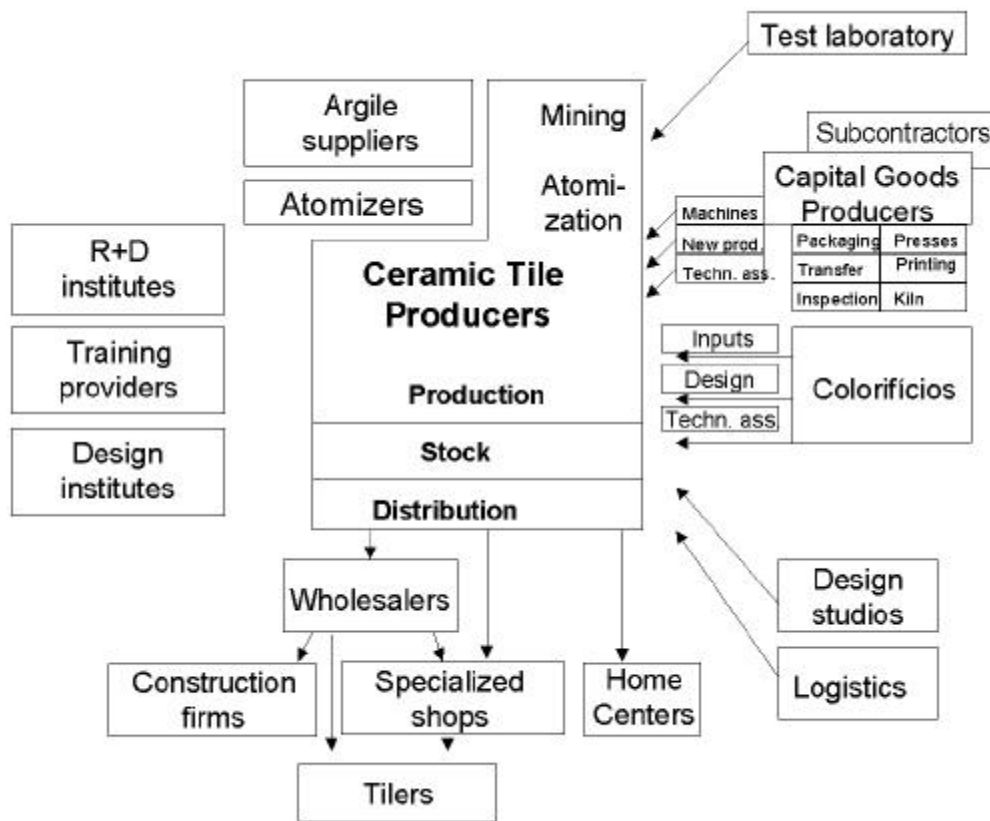
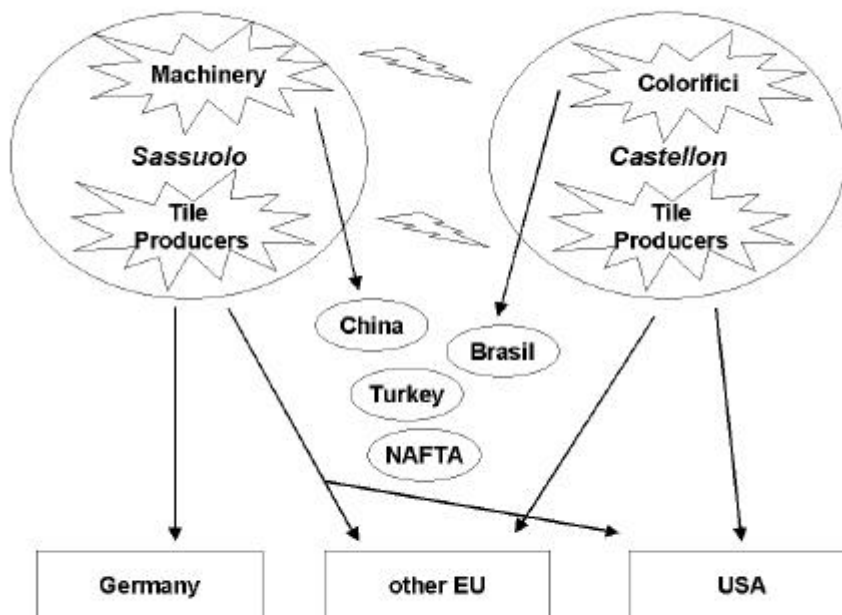


Figure 6: Power structure in the international tile industry



3 The Cluster of Sassuolo / Italy

Why is it that Italy is commonly perceived to be the dominating force in the tile industry? The immediate response appears to be obvious: it has the largest firms, it has a strong design competence, and it is Italian machinery producers who deliver by far most of the capital goods for the tile industry anywhere in the world.

But this immediate response also has its limits, since there are other aspects which are not in favor of Italy. Production costs are higher than in any other important producer country. Environmental standards are stricter, which is the result of a severe environmental impact the industry used to have (and to some extent still has). The domestic market is hardly growing at all, whereas other producers benefit from vibrant albeit demanding local markets. Technology and production of glazing materials is dominated by Spanish firms. And Spanish firms are better than Italian when it comes to scientific understanding and control of the production process. Thus, identifying the competitive advantage of the Italian tile industry, and indeed finding out whether there still remains a competitive advantage, is less straightforward that one might expect.

3.1 The structure and evolution of the ceramic tile industry in Italy and the Sassuolo cluster

90 % of Italy's tile production capacity is located in the Emilia-Romagna region, with 80 % being concentrated in 80 km² of ten municipalities around Sassuolo in the province of Modena, with some firms being located in the neighboring province of Reggio Emilia. The industry builds upon a centuries-long tradition in craft-based ce-

ramics manufacture. Today's firms were mostly created in the post-war period, when the reconstruction of Italy created a strong demand for construction materials. Business-founders often had a background in agricul-

Figure 7
Historical evolution of export share of tile production in Italy

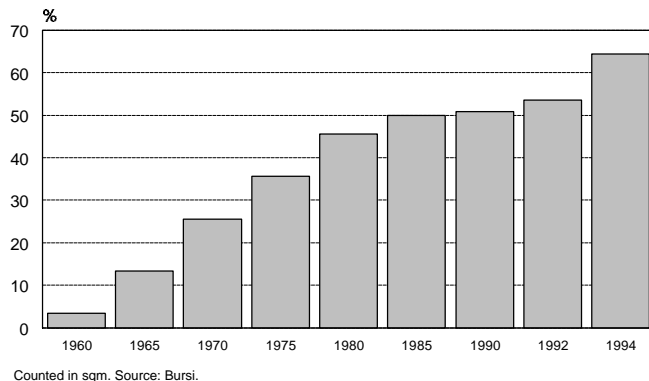


Figure 8
Evolution of number of tile firms in Italy

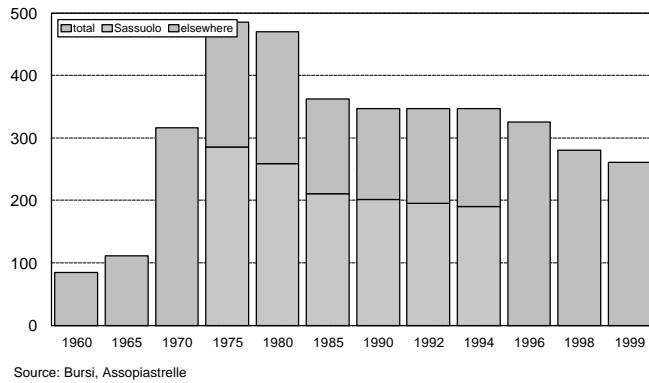
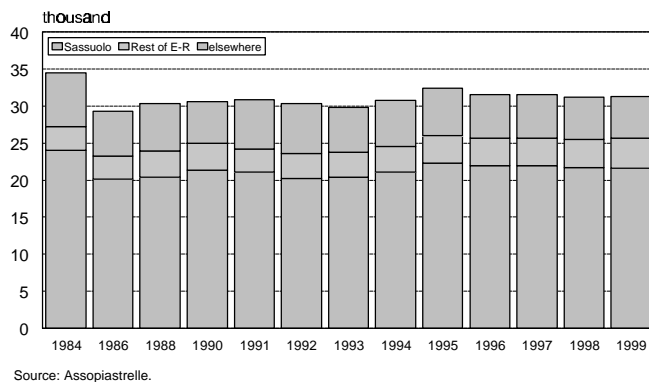


Figure 9
Evolution of tile industry employees in Italy



ture, and it was not rare that the availability of clay on a rural estate was an important element in generating the idea to start tile production.

In order to understand the evolution of the industry since the 1960s, it is important to mention that the region was also a host to many metal engineering firms and workshops. It was these firms who started to drive technical progress in tile manufacturing. They came up with innovations such as continuously moving kilns, a major innovation which improved product quality, reduced production time from days to hours, and thus reduced costs.

Starting in the 1970s, Italian firms started systemically to explore export markets (Figure 7). Leading firms, such as Marazzi, undertook a serious effort to create a brand identity abroad, but it was mainly the Tiles from Italy label which made the difference, with Italian tiles having both a different appearance and more diversified sizes than those produced locally in target markets. Tile manufacturers also started to collaborate with external designers and artists to create innovative designs. In this era, it was essentially by combining a superior production technology and efficiency with superior production design and marketing effort that the Italian tile industry established a clear leadership position, driving traditional competitors such as German firms out of the market.

In order to understand the evolution of the industry it is useful to look at the evolution of the number of firms and the number of employees (Figure 8, Figure 9). The number of firms grew until the late 1970s but has been decreasing ever since, whereas the number of employees has been more or less stable. Behind this is the fact that since the 1980s the industry has been going through a process of concentration, with no new tile manufacturers entering and many producers being taken over by other firms.

3.2 Upgrading in the Sassuolo cluster

It is difficult to identify major turning points in terms of upgrading in the Sassuolo cluster; upgrading is a permanent feature of the cluster, and it is driven both by technology and by marketing and sales. In the 1960s and 1970s major technological innovations included the roller kiln and heavy presses. Examples of more recent innovations are Rotocolor and porcelanato. Rotocolor is a printing machine which is using a rotating drum with a silicon surface. Porcelain tiles (porcelanato) have been mentioned before. The constant technological upgrading involved strong interaction between tile and capital goods manufacturers.

Restructuring of the cluster displays a tendency towards polarization. The following tables indicate that the dominating trend is towards consolidation, i.e. typically mergers and acquisitions which lead to more product diversification and vertical integration. The secondary trend is towards specialization, in particular on special parts (final row in Table 5).

In terms of marketing and sales, the effort to create a brand name and a strong presence in many important countries was a major reason for the concentration process which has marked the industry since the 1980s; as Table 6 shows, the ten largest groups today account for more of 60 % of total production. There were two typical patterns of concentration. First, there were frequent minority cross-holdings between firms which at some point in time were transformed into more formal ties, creating a holding. Second, basically all the firms were family-owned, and in some cases families opted for selling the firm rather than going through the trouble of an intra-family management succession.

Table 3: Diversification in Cluster of Sassuolo (number of firms)

	1987	1990	1995
One-product specialized firms	252	207	143
Two-products specialized firms	74	101	50
Diversified firms	29	39	147
Total	355	347	340

Table 4: Sassuolo: Number of productive facilities by Firm

	1987	1995
Firms with 1 plant	315	283
Firms with 2 plants	25	39
Firms with 3 and more plants	13	20
Total number of plants	415	435
Total number of firms	353	340

Table 5: Sassuolo: Vertically Integrated and Specialized Firms

Type of Firm	1988	1995
Vertically integrated	123	172
Specializ. on tile body	8	5
Specializ. on glazing or 3 rd . fire	128	83

Source: Cer Annuario, in Bursi (1997).

Table 6: Main groups in the Italian tile industry

	1994	1996	1998	accumulated share of industry sales in 1998
Marazzi	361,6	516,4	610,4	13,4%
Iris		464,8	506,1	24,5%
Cisa-Cerdisa-Ricchetti	187,0	315,3	405,9	33,5%
Cooperativa Ceramica d'Imola	148,7	168,7	232,2	39,3%
Concorde	142,0	179,3	256,8	44,9%
Florim	147,7	160,8	204,2	49,4%
Sirotti	139,4	154,4	159,6	52,9%
Riwal Ceramiche	75,7	84,8	114,2	56,1%
Panaria	55,2	91,6	134,1	59,0%
Emilceramica	90,4	105,9	117,2	61,6%

Turnover in EU. Source: Ceramic World Review, 34/1999.

One would expect that concentration also involves an attempt to create economies of scale. This has been the case regarding production, but much less regarding branding and sales. A typical pattern was that the formation of a group led to better utilization of existing production capacity. As overall demand was growing more or less all the time, every firm was expanding all the time. However, with the formation of a group the production of a given brand could take place in any factory of the group. There were only few

cases where a group would create a single brand; Marazzi is a rare example in this respect. A typical large group, such as Iris or Cisa-Cerdisa-Ricchetti, has something like four to six different brands. One or two of them may be product- or segment-specific brands, whereas the other brands cover the same, usually the entire, product spectrum and thus compete against each other. This may appear bizarre, but there is a clear logic behind it which is related to the structure of commercialization. Let us assume that in a given region, say Sussex, there is one major

tile store which is selling Ricchetti, apart from Iris and Marazzi. If we now assume that in the same region a major home-center establishes itself, the Cisa-Cerdisa-Ricchetti group would like to get some shelf-space there, too. But if the home-center started to sell the Ricchetti brand, the tile store probably would kick it out of its offer. The way out is to continue selling Ricchetti to the store and to sell Cisa to the home-center. This is the reason why many groups do not only maintain parallel brands but also parallel sales organizations (albeit not necessarily parallel logistics operations).

There is also a causal link between concentration and internationalization. Exports have doubled in the 1990s (Figure 10). Firms argue that there are minimum size requirements in order to be able to be present in several export markets, which are due to production capacity and size of the sales force. Internationalization so far mostly means having sales representatives and in many cases distribution warehouses in target markets. Internationalization of production so far is a rare phenomenon. An early mover in this respect was Marazzi, which set up factories in Spain and the U.S. in the 1980s. The second largest group, Iris, keeps all its production in the Sassuolo region. The third largest group, Cisa-Cerdisa-Ricchetti, has affiliates in Finland, Sweden, and Germany, which is not so much due to a clear strategy but rather to the fact that Ricchetti for some time was owned by a foreign conglomerate which merged it with its factories in those countries and then decided to leave the tile industry altogether. The only other group with a strong manufacturing presence abroad is Florim which has taken over a major but bankrupt U.S. manufacturer.

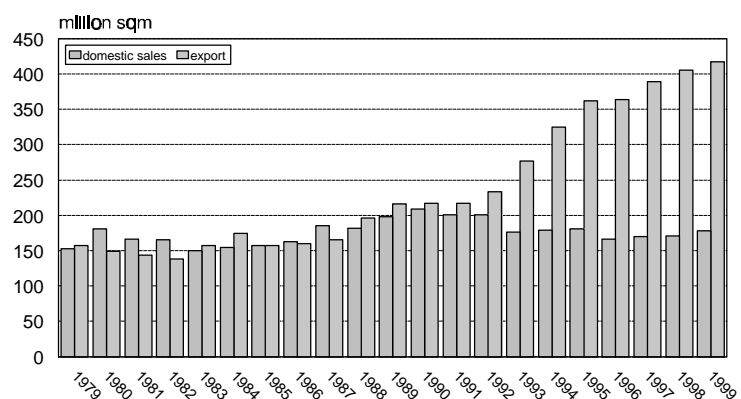
A major competitive advantage of Italian tile manufacturers is quick delivery. This is based on

two factors. First, stocks are deliberately kept large; they amount to about three months of production. Second, there is also upgrading, in this case in terms of distribution where manufacturers have created systems which allow them to deliver a given lot of tiles to any place in Germany, the main export market, within four to five days. The most recent upgrading initiative in this respect was the creation of Assocargo, a collective logistics solution.

Another issue which is related to upgrading and competitive advantage is the environment. One of the big issues in the cluster is EMAS, the EU certification for environmental management which is more comprehensive than ISO 14 000. Many of the firms have already been certified, and there is talk of trying to certificate the cluster as a whole. Behind these achievements is the fact that the tile industry is not necessarily environmentally benign. In the early 1970s, daily emissions of fluoride in the cluster amounted to 2 tons. With the use of filters and changes in the production process, this has been reduced to 0.5 tons, with a much larger overall production volume. Other issues are the high energy intensity and water consumption.

Figure 10

Tile production in Italy



Source: Assopiastrelle.

© JMS

To actors in the cluster it appears that a strong process of concentration and internationalization is occurring. However, compared with what is going on in other industries, concentration and internationalization in the tile industry are progressing at a relatively moderate speed. Assuming that the coming years will be a period when in many countries the future power structures in the construction material industry will be defined, one can even argue that the speed is far too slow.

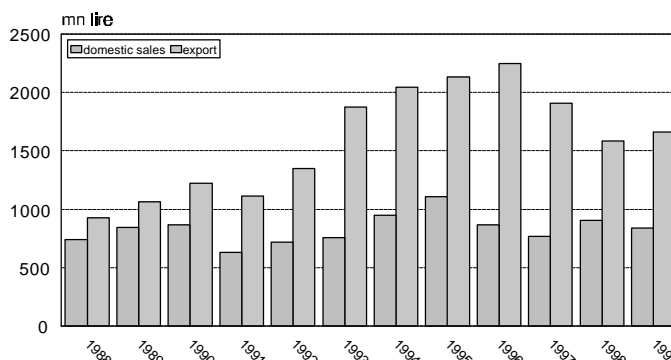
3.3 Structure of the value chain

The first part of the value chain of the Sassuolo cluster is the delivery of clay, mostly white clay, most of which has to be imported from Germany and the Ukraine; yet access to clay does not seem to be a strategically important issue. Processing of the clay, atomization and preparation of the biscuit are usually in-house activities conducted by each tile manufacturer; to a limited extent large firms are selling atomized clay to smaller manufacturers. But there are specialized providers for many other important inputs and services: glazing materials, capital goods and informatics, design and special parts, transport, and marketing and sales.

The production of glazing materials nowadays is dominated by Spanish producers. Even the single remaining important Italian producer, Colorobbia, has moved central functions to Castellón. The reason for this shift is the fact that Italian tile manufacturers have shown much less propensity to outsource more than routine production of glazing materials. There was less demand, and in particularly less sophisticated demand, for glazing materials in Sassuolo.

Figure 11

Ceramics machinery production in Italy

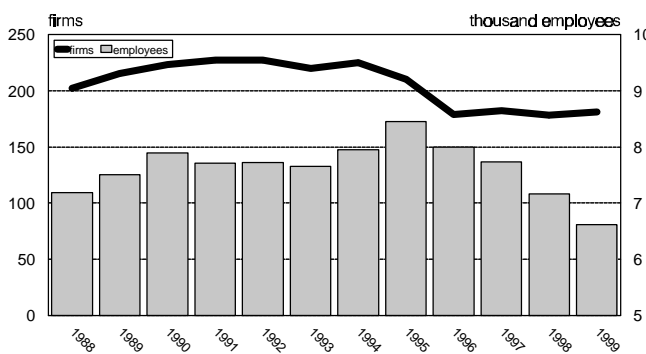


Source: Acimac.

© JMS

Figure 12

Ceramics machinery production in Italy: Number of firms and employees



Source: Acimac.

© JMS

Another important type of specialized firms are those design and special parts firms. The largest of these firms has more than 100 employees, many of them designers. They develop design concepts and entire collections of tiles. They are also subcontracted by tile producers to manufacture special parts.

Another type of specialized firms are those active in sales, in particular tradings. Italian tile manufacturers do not have their own sales chains (with the exception of two large groups in their U.S. operations), and not all of them have their own sales reps in target markets. This opens an important niche for trading firms.

3.3.1 Performance of the capital goods industry

The capital goods industry has gone through a turbulent decade. Demand expanded strongly in the first half of the 1990s, driven by domestic expansion, but much more by a strong increase in exports, in particular to Asia. In the peak year 1996 more than half of total exports, i.e. about EU 650 million, went to Asia. With the Asian crisis demand dropped sharply, amounting to just EU 130 million in 1998. The impact on the industry is clearly visible in Figure 12, i.e. the number of firms in the industry and of employees dropped.

One of the main responses in dealing with fluctuating demand is outsourcing. Bursi and Marchi (2000) report an increasing tendency towards outsourcing, being used by 50 % of the firms. For the subcontractors, the main customer represents on average 30% of the sales, and the main 3 around 55%. More than 25% of subcontractors concentrate on the main 3 customers more than 75% of their sales. There have been no major changes regarding this latter over the last decade. The perception of subcontractors with regard to its relation with final producers is one far closer to a buyer oriented chain. To confirm this, the subcontractors inform that the average duration of the subcontracting relationship with a customer firm is 7 to 8 years.

In the second half of the 1990s, there was not just a drop in demand but also a change in the type of demand. The demand for turnkey plants dropped close to zero, and sales of kilns in 1999 were less than half of the 1996 value. Sales of presses, glazing equipment, and handling equipment remained roughly stable. There are two distinct reasons for the latter:

- Presses and glazing equipment have to be upgraded constantly to keep abreast with product innovation. To put it differently: There is a clear incentive for machinery producers to come up with new types of tiles which can only be manufactured

with new kind of equipment, i.e. in-house development of tiles by machinery producers generates a demand for machinery.

- The tile production process is highly automated, and still there are continued efforts to replace labor with machinery. In the case of Sassuolo, the motivation is not only high wages but also the sheer lack of workers. Ongoing automation has led to features such as fully automated packaging and palleting and laser-guided vehicles.

3.3.2 Interaction between machinery and tile producers

The relationship between tile manufacturers and capital goods firms is profoundly different from that with glazing producers; it is much less hierarchical, and if there is a power disequilibrium, then it is to the detriment of tile manufacturers. To start with, the large capital goods producers are much older than most tile manufacturers; the largest firm, SACMI, started as a cooperative of craftshops in 1920. In the case of Sassuolo, it is capital goods manufacturers who drive technological innovation. When they come up with new types of equipment, they will often install it at one of the tile factories and refine it by on-site experimentation. This will involve the acquisition of a new piece of equipment for free, or at least at a substantial discount, for the tile manufacturer. This is the main explanation for the claim, sometimes heard in other countries, that Italian tile firms pay less for equipment. They also enjoy some privileges in terms of access to latest innovation. However, this does not involve exclusive relationships. The capital goods manufacturers sell their products to whoever is willing and able to pay. For instance, in the first half of the 1990s they sold huge numbers of turnkey plants to Chinese firms, and there is no indication that this involved any outdated equipment.

One might expect that there is highly conflictive relationship between capital goods and tile manufactures, since the former are very active in creating competitors for the latter. But they seem to have found a way of not letting that conflict become too manifest. It is notable that even though Chinese or Brazilian firms may have the same equipment which is in use at Italian tile manufacturers, the style and elaboration of their products comes nowhere close to that of Italian producers. This has to do with the transferability of tacit knowledge. First of all, tacit knowledge by definition is difficult to transfer. But there seems to be another important factor. As our research in Brazil clearly showed, customers in that country conceptualize technology transfer as the acquisition of equipment plus some training, whereas Italian suppliers are well aware of the fact that it is the other way around, i.e. some equipment plus lots and lots of training. But the suppliers are happy to leave customers abroad in their misbelief rather than enlightening them since this reduces the level of conflict they have with domestic customers who are not quite happy about the creation of production capacity elsewhere. By leaving customers abroad in their self-chosen ignorance, capital goods producers are causing somewhat less headache for Italian tile manufacturers.

3.3.3 Perspectives of technological upgrading

At the Ceramics Technology Fair in Munich in October 2000 the machinery firm System (which is based in Fiorano in the Sassuolo-cluster) launched a new product and production process. System had already revolutionized the glazing process in the 1990s when it introduced the Rotocolor machine. This time, the impact of its innovation may become even larger. The new product, called Lamina, and the new process, called Sinterflex, are radically different from established practices. Lamina has an appearance and physical characteristics which are similar to porcelain tiles, but it is just 3 mm thin (very thin tiles come

down to 6 mm) and it comes in panels of 90 x 250 cm. The process departs from the current practice in several respects. The press is much smaller but stronger. The kiln is based on electricity, permitting much shorter shut-down times and a better control of the process. The whole production line has an extension of less than a third of a conventional kiln; counting the extension of a normal glazing line as well, the size comes down to one tenth. The new process will be tested for another two years in collaboration with something like five manufacturers and will then be launched commercially.

The response of the tile producers in the cluster gives an idea of their current level of complacency. Five of the large firms jointly asked System for an exclusive contract, promising quick amortization of the investment involved in development of the new technology. At the same time, firms from all over the world are queuing at System to be the first to acquire the new process, and this includes not just tile manufacturers. As the new process invalidates a large part of the tacit knowledge which is one of the advantages of the Sassuolo cluster, it opens a window of opportunity for competitors such as Pilkington or Eternit to enter the tile industry – or whatever this industry will then be called.

Inside the cluster, at the time of the launch the predominant view was that this was not really a product competing with tiles. Current efforts to make sense of the new product point at applications such as surface covering of buildings or use to cover furniture (for instance, in the kitchen). Another suggestion is that the panels may be cut into parts of the usual tile size, but this is not particularly convincing. It is rather likely that the new product will be used for purposes which nobody can imagine right now. It certainly will be very important for technical applications, e.g. floors in airports, train stations, etc. But this is where many industry sources also see a strong growth potential for porcelain tiles. One can conceive that Lamina induces a pro-

cess of cannibalization, seriously cutting into the market for porcelain tiles, i.e. the flagship product of Italian tile manufacturers and the backbone of the Sassuolo cluster.

The trend from glazed tiles to porcelain tiles so far benefits, most of all, the Italian industry since it is the Italian machine producers who dominate this technology. In the Spanish industry, the *colorifici* have a very strong position and are main push element in terms of technological innovation. However, their position is bound to weaken with the increasing use of porcelain tiles.

On the other hand, the advent of new products such as Sinterflex is jeopardizing the Sassuolo cluster. Science-based products and processes erode one of the two locational advantages of Sassuolo tile manufacturers, namely the employees' tacit knowledge, enormous experience, and deep familiarity with tiles; the other advantage is style and design creation, but this follows a product-out logic and may be jeopardized by other clusters which develop a good understanding of final customers' behavior. Initially, all this will put a pressure on tile manufacturers and may induce a major crisis of the Italian tile industry. But since the machine producers very much rely on close interaction with local producers, they are at risk as well.

3.4 Product structure and market segmentation

We have already referred to the fact that Italian tile manufacturers tend to have a broad product spectrum and often parallel brands and sales organizations. There is some degree of product specialization between manufacturers, but this applies more to smaller firms than the large groups. There is a number of smaller producers which clearly opt for a niche strategy. There are two kinds of niches, i.e. a vertical and a horizontal niche. A typical vertical niche are high-end, expensive porcelain tiles. A typical horizontal niche are antique-looking, rustic tiles in small formats.

Current changes in terms of segmentation strategies refer to the issue of branding. There are two distinct manifestations. First, some firms opt for brand image transfer, for instance by launching a tile collection under the Laura Biagiotti name. This is part of an effort to widen the high-end of the market. It is not yet clear whether this is really an important tendency. Second, some large firms are producing private labels for large customers, especially home-centers. This is part of an effort to stimulate growth at the low-end of the market.

Overall, we found it difficult to identify really convincing, sophisticated efforts in market segmentation. Design studios are launching product lines based on overarching style and design concepts. But the tile manufacturers themselves are pretty much pursuing product-out strategies, i.e. are constantly launching slightly modified designs and hope that there are enough people out there who are fond of Italian style.

3.4.1 Sales and after-sales services

The competence of Italian firms in sales and after-sales services is undisputed in the industry. This applies, first of all, to the sheer salesmanship. But it also refers to issues such as quick delivery, punctuality, reliability, and consistent quality. In emerging markets such as the U.S. further features are important, such as training of vendors, product information, and providing general information on tiling. It is obvious that somebody who has been selling carpets for most of his life will need more than just a brochure to give qualified advice on selecting tiles, and Italian firms are offering training in this respect. Also, apart from individual firm advertising efforts it is important to launch generic promotion campaigns for tiles.

<i>Destination Market</i>	<i>Distribution Structure</i>	<i>Italian Position / Strategy</i>
USA (North)	Large intermediaries (Homecenters, Carpet-chains). Product parameters trend to be supply-driven.	Market advantage of “made in Italy”, competent sales force, and design oriented to local taste. Logistic efficiency. Assopiastrelle wants to provide sea cargo in the Atlantic routes.
USA (South)	Rather smaller distributors. Broad network of both Italian and Spanish representatives, which contact directly to retailers. Tastes are more similar to Mediterranean.	Competent sales force to contact retailers. In addition, direct investments of some groups to produce in USA the lower quality tiles. Effort to integrate forward into sales.
South America	Less sophisticated market, price oriented; large importers/distributors	Marginal position, no advantages of Italian product (too expensive)
Germany	Strong tendency of polarization between low- and high-end. Growth of home centers to the detriment of traditional shops and wholesalers	Leadership due to better image of white body tiles and loyalty of customers.
South-West Europe	Dominated by small distributors. In many cases, direct contact between manufacturer and retailer	Strong position in domestic market and Greece. French market is shared with Spanish product.
Central Europe	Dominated by large distributors which serve small retailers. Tastes trend to follow the German market, but there are some differences	Similar to German market, but there are exceptions (Poland)

3.4.2 Exporting and the relevance of international value chains

Italy’s tile export structure is highly concentrated, with about half of total exports going to just three markets (Figure 13). Two of them are static, whereas the U.S. market is displaying strong growth. Italy’s market share in the U.S. is twice that of Spain, its main competitor, and it is essential for Italian firms to defend their leadership in the U.S. market if they want to keep their exports growing strongly.

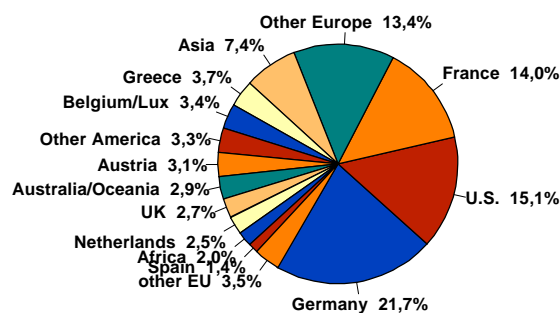
Italian tile manufacturers, especially the leading firms, appear to be relatively powerful actors in international value chains. This does not mean that they can dominate the chain to any extent. But they play an active role in shaping the chain, especially in terms of influencing changes at the commercialization stage. This is particularly evident in the U.S., whereas in Europe it appears that

home-centers are, at least in some countries (such as Germany, the largest market), the more aggressive actors. Table 7 gives a overview of the different constellations.

We have argued above that the concentration process is, among other things, motivated by marketing considerations. It seems that the concentration process in itself is one of the

Figure 13

Italian tile exports by country



in EU, 1999. Source: Assopiastrelle.

factors which contribute to the deterioration of local governance – firms are getting larger and thus more confident to be able to solve problems on their own. But there is a further aspect which connects marketing and local governance. What has been receiving the largest attention in the industry in the last years has been the U.S. market. This market appears to be in a process of profound transformation, and it appears that firms perceive the current situation as a window of opportunity, a kind of now-or-never-constellation. They try to establish for themselves a position which is expected to guarantee them success in the future. The implicit key hypothesis is that there is only so much opportunity to either take over one of the few existing relevant sales chains or set up an own distribution structure from scratch. Those firms who do not establish this kind of position now are facing an uncomfortable future. In other words, a fierce struggle is on, not only putting Italian firms against Spanish ones but also, and most of all, putting the major Italian firms against each other. Our hypothesis is that this is creating a constellation where collaboration between these same firms is unlikely, except for the most pressing issues.

3.5 Structure of supporting institutions

The big event in the tile industry is Cersaie, the annual trade fair in Bologna. Cersaie is being organized by Assopiastrelle, the association of Italian tile manufacturers. Assopiastrelle, which occupies an impressive palazzo in Sassuolo, is one of the two main associations in the cluster; the other one is Acimac, the association of the capital goods manufacturers.

Apart from Cersaie, Assopiastrelle is pursuing a number of activities which can be subsumed under three main headings: services for member firms, representation of the sector, and research and documentation of trends in the industry. The most effective services are those which relate to sales or to immediate problems. Cersaie is an example of the

former, and the organization of a strong Italian presence in trade fairs in other countries is another example.

Regarding immediate problems, there are two of them which Assopiastrelle is currently tackling. One of them is transport, the other one the environment. There are 5,000 trucks which are circulating in the cluster per day, and the sad truth is that much of their time they are not circulating but stuck in congestions. Assopiastrelle has founded Assocargo, which is operating as an independent firm to coordinate transport in the cluster, both for incoming clay and for outgoing tiles. The idea is to use the truck capacity more effectively and thus to reduce the overall number of trucks. In fact, this is also the main environmental challenge these days, since other problems such as hazardous emissions and waste generation have by and large been solved (the latter by developing low-price products based on scrap and residuals of the process). However, it is doubtful whether Assopiastrelle's environmental strategy is particularly promising (see box).

As a matter of fact, the current state of the infrastructure in the cluster casts doubt at the statement one sometimes hears that Assopiastrelle is politically a relatively influential association. One of the firms not related to tiles which is located in the cluster is Ferrari. If Ferrari wants to run a test to figure out how its cars behave under rough road conditions, it has to send a test driver out of the factory and let him turn right at the next crossing. There he enters the main east-west axis of the cluster, and this road is literally breaking apart, being in a state which is comparable to roads in Eastern Germany before reunification. If Assopiastrelle were really powerful one would have expected that it had leveraged its influence to have that road recovered.

Box 1: A hypothetical look into the past from the future

Peaceful Days in the Countryside.

Rediscovering an Old Industrial Region which has Profoundly Changed its Face.

Modena, 10 September 2012. The southern part of Modena province has become increasingly popular with retirees in the recent years. What once was an industrial hothouse is a tranquil, neat area now. Roads that once have been packed with trucks are mostly used by bicycles and tricycles nowadays, and the busy atmosphere of an industrial region has given way to the relaxed culture of a place where recreational activities dominate.

In fact, quite a few of today's retirees remember the old days very well, when they were making pots of money which they now spend on low-fat high-quality pasta meals and in thermal baths. In their view, the change began in the late 1990s. Many of the problems of the earlier days had been solved, such as the massive air pollution which was due to an unbelievable concentration of ceramic tile plants. But then the region was literally suffocated by its success, with enormous queues of heavy trucks occupying most of the place available for transit, emitting huge clouds of exhaust fumes without moving much. The local business community had come up with some proposals to solve this problem, mainly by creating more roads. But since the region was running out of available space anyway, and since new roads have this funny tendency to create new traffic rather than taking up the old one, nobody else found this idea very plausible.

Instead, two things happened which profoundly changed the fate of the industry cluster. First, some of the firms closed down, or at least drastically cut down, their local factories, investing in the foreign markets where they sold most of their product instead. Second, government took a drastic step which was the unintended outcome of a business initiative. Local business associations had proposed to turn the cluster into an ecologically-correct cluster. Unfortunately, their plans in terms of implementation were not exactly inventive, and certainly did not deserve any ecological label: in the end it came down to building new roads and reorganizing the management of the huge fleet of trucks.

When they presented their proposal to the EU, rather than just causing a good laugh they generated a totally unexpected reaction, namely a joint action of the regional government and the EU to turn the region really into an ecological region. The first thing the regional government did was to limit the number of trucks which were allowed to enter into the region, and to create a market for entry tickets which used smart, Internet-based auction techniques. Government quite rightly counted on the inability of the local business community to come up with an effective resistance, since some of the firms which were operating full-steam were desperate to get their inputs and quite willing to pay high sums to get their trucks in. However, since government reduced the number of available tickets on a quarterly basis, it soon became obvious that it was impossible to get the usual amount of inputs in and products out.

What helped the industry for some time was the creation of new types of tiles, which were much thinner and lighter. However, the technology behind this kind of innovation was pretty scientific, and local technicians who had an enormous tacit knowledge on and feeling for tiles but little scientific education were unprepared for this kind of production and product. So it happened that firms from other locations and with a different background entered into this line of the tile business. So in the end the local industry dug its own grave in developing this technology.

The interesting thing to see is that this process created little if any hardships. The specialists from the local tile producers were eagerly hired by manufacturers all over the world, who in some cases paid royally to get hold of the specific knowledge of these tile production artists. Several of the important machine producers had been located elsewhere anyway, so the process did not really touch them, and the others relocated as the region became increasingly uninhabitable for manufacturing industries.

That is, all manufacturing industries except those which make things like eating such a pleasure. The Modena region had always been famous for its Aceto Balsamico and the Parmigiano cheese, and these things are still in production, albeit consistently on a limited scale to avoid the pitfalls of mass production. In fact, little of what is filling the tables in the local trattorias is coming from places more than 50 miles away. But if you look in the high-price high-quality shelf of your local biological food store, you may find one or another of the products manufactured here. But better bring your virtual wallet, since high-price in this case means really high-price.

The other important association is Acimac. Its profile is similar to that of Assopiastrelle, but it appears somewhat more effective. In terms of services, it is promoting the tile machinery

industry, for instance by organizing joint stands at foreign fairs. It is also supporting member firms in terms of information about technical standards and quality issues. Moreover, it is organizing short-term training

courses abroad which cater to employees of customer firms. In terms of interest representation, it is representing the sector vis-à-vis Italian embassies abroad, and it is lobbying in the context of international negotiations about tariff reductions. In terms of information, Acimac is the most important place regarding information about the global tile industry. Since Acimac members sell to firms all over the world, it is essential to be up-to-date with sector trends all over the world. Accordingly, the trade journal which is sponsored by Acimac (*Ceramic World Review*) is a gold mine of information about the tile industry.

Apart from the two associations, the structure of supporting institutions is remarkably underdeveloped. There is one technology institute related to the sector, the Centro Ceramico Bologna (CCB), which recently set up a small affiliate in Sassuolo. CCB is part of the ER-VET system of business support institutions which is maintained by the regional government. It is doing research about several issues related to ceramics, but its main activity is related to testing and certification, and this seems to be clearly separated from research activities. CCB is collaborating with the Universities of Bologna and Modena to offer engineering courses with a specialization in ceramics. In any case, CCB is in no respect comparable with the technology center in the Castellón cluster. Then there is the Scuola de Arte in Modena which is an important source of design talent for the industry, although it is not specializing in tiles. And finally, there is Cerform, the vocational training center in Sassuolo which, after intense negotiation between municipal governments and the two associations, was dedicated exclusively to training of ceramics professionals since the mid-1990s. Its annual output amounts to some 60 graduates, which is short of the needs of the industry.

3.6 Evolution of local governance

There are several examples which show that local governance for upgrading the cluster is

working. The redesign of Cerform is one of them, the creation of Assocargo is another one, and the Cluster-EMAS may become another one in the near future. However, it appears to the external observer that collective action is not what it might, and what it probably ought to be. The cluster appears somewhat complacent, something that is not surprising given the successes of the past. But it may jeopardize the future of the cluster; the box develops a possible scenario of how the decline of the cluster may occur.

In fact, some local actors do complain about the deterioration of the effectiveness of local governance. However, the opinions regarding the underlying reasons are divided. Some people point at traditional rivalries between families. Others complain about a lack of strategic vision, and sometimes relate this to a lack of "hunger" which is supposedly due to the fact that all the founding families are quite rich nowadays. We shall argue below that, even though these arguments are certainly valid, a look at the evolution of value chains provides us with a more rational explanation.

Collective action in the Sassuolo cluster exists, but to a lesser degree than in Castellón. The reason mentioned by local sources (personally motivated rivalries and aversions between families) appears not particularly convincing, since the situation in Castellón is not different in this respect. It makes more sense to assume that there is limited collective action because the key actors believe that this is sufficient. This is even more so as the industry has not really suffered a major crisis (like the one which hit the Brazilian industry in 1990) for decades. The Sassuolo cluster sees itself as the leader in the industry, and there seem to be few actors who have any inclination to consider strategic challenges, let alone suggest preventive action to prepare for those challenges. At the same time, it is difficult to guess what may happen once a major challenge appears. The most likely challenge is a contraction of the U.S. economy with a concurrent severe drop in tile demand. One

might argue that such a situation might hit the Sassuolo cluster much harder than its competitors. But since the institutions are in place and there is probably still some social capital left, one might also conceive a strong collective response of the cluster.

3.7 Competitive advantages and challenges

Upgrading is a permanent feature of the Sassuolo cluster. Table 9 summarizes the main upgrading trends.

Yet upgrading in itself does not necessary create a competitive advantage, as competitors are upgrading as well. We would argue that the Italian tile industry has three main competitive advantages: a strong production competence which is based on tacit knowledge, a product style which is highly valued in many target markets, and very competent salespeople. Let us have a look at each of these factors.

First, Italian producers (more specifically: highly experienced and skilled, albeit often not formally high-trained workers) have a touch and feel for ceramic tiles which is undisputed. It has been accumulated over centuries and may therefore be engrained in the genetic code of the local population. Rather than controlling production in a scientific way, they just know what kind of minor adjustment in kiln temperature, mix of mass or glazing material will create exactly the appearance they want, in particular when it comes to creating a rustic look. Spanish or Brazilian producers are perfectly capable of creating attractive rustic tiles, but they do not quite look as Italian as those from Italy.

Second, there is the Italian lifestyle explanation. Italians, this explanation goes, in general have special sense of aesthetic values, and they are just better in design than most other people. This applies to all sorts of products, including tiles. And in fact there are strong influences between different segments, with trends in fashion and in other areas of industrial design having a strong influence on the

Table 8: Changes in governance patterns in Sassuolo

Aspect	Old Pattern	Current trend
Concentration of industry	low, many SMEs.	Concentration, 15 to 20 big groups, together with 150 SMEs.
Dynamic of innovation	typical of Italian industrial districts, secrets are kept but everybody knows "informally".	increasing leadership of bigger groups. Equipment providers and colorificis are also relevant players.
Institutional support	Assopiastrelle, lobby and export generic promotion; CCB, research and tests. Training and education, no specialized institutions. Agenzia Polo Ceramico (Faenza)	No major changes.
Relationships with Providers	Close ties, with hierarchical prevalence of tile producers, with local machine and equipment providers.	Many providers start to produce in other countries like Spain; radical innovation from machine manufacturers can change power scheme in favor of the latest
Rationalization	Focus on quality and design. "Ceramic is arts" patterns; low productivity standards.	Rationalization to increase productivity: index of sqm/blue collar worker; Lit./employee. Four steps in rationalization process: 1. Automation to save labor costs; 2. Technology to save energy; 3. Technology to save glazing material; 4. E-MAS to production process efficiency improvement

Table 9: Upgrading trends in the Italian tile industry

	<i>Process</i>	<i>Product</i>	<i>Service</i>	<i>Strenghts/Weaknesses</i>
<i>Marketing</i>		Made in Italy continues to differentiate the Italian supply. Presence in all markets. Limited joint efforts (Fairs).	Some marketing functions outsourced to dealers. In US market, Italian industry tries to "educate" the consumer to emphasize its quality advantage.	S: Strong image of "made in Italy" continuously renewed through high quality and fashionable design standards, which set the trends on market.
<i>Raw materials</i>	Italian firms are investing in mines abroad (India). Diversification of origin of RM.	It does not seem to be a factor of differentiation		
<i>Machinery</i>	Better command of technology of Italian producers seems to be a source of differentiation via better elaboration and quality	Strong interaction between users and providers to improve and adapt solutions to market requirements.	Proximity of suppliers used to be an advantage. Machine producers are going to locate in Spain, due to locational advantages.	S: Italy dominates the production of machines. That contributes to optimize the use of technology. W: In the future, many machinery firms will produce also in Spain, and probably they will reproduce the Italian patterns of collaboration with tile producers.
<i>Design</i>	Project to specialize "Scuola di Arte" of Modena in design for tile industry.	Design core competence in: Big tile producers; Colorifici (less than in Spain); independent Studios.		S: Dense network of distributed competences in design.
<i>Production</i>	Strong rationalization of processes. Environmental certification plays a relevant role.	Increase of product portfolio: big producers offer 10 ranges and 500 types of products/year		
<i>Logistic</i>		Broad portfolio enforces improvement in distribution logistic	Increasing importance of logistic support to delivery on time (Home-Centers)	S: Italy seems to take advantage regarding to distribution chains in markets like USA, Germany.
<i>Sales / after-sales</i>		Increasing relevance as source of product differentiation.	Most of them provided by the commercialization chain.	

design of tiles. Moreover, this explanation also includes a further aspect, namely that by purchasing an Italian tile one does not just acquire a piece of floor or wall covering but actually a little bit of the Italian way of life,

something which seems to be highly valued in many countries.

Third, there is what one might ironically call the Latin Tile Lover explanation. Italian firms

have excellent salespeople, who are not just extremely well-dressed and well-mannered but actually extremely competent in creating a feelgood atmosphere which appeals to customers not only of the female gender, whereas for instance the service culture in the Castellón region ranks even behind that of Germany regarding features such as friendliness. Therefore, even if the Italians had just the same product as everybody else, they might be able to sell it for a better price.

Since this case study is part of a comparative research project, we are in a position to compare the Italian tile industry with those which rank second and fourth in terms of global exports, namely the Spanish and the Brazilian. So what would come to mind as an explanation if this were an isolated case study suddenly appears in a different light. There are passive advantages of clustering, but they are present in Spain and Brazil as well. The active advantages of clustering actually are much stronger in Spain, and Brazil probably is not much behind Italy in this respect. There is the strong position of the Italian capital goods industry linked to the sector, but then there is also the strong position of the Spanish glazing materials industry.

Applying conventional instruments such as Porter's diamond would not lead us anywhere close to an explanation of the fact that the Italian industry is the world market leader. The production competence is based on long experience and on a dense local network of exchange of experience, but it is much less based on modern management methods and scientific domination of the production process. The Italian image is a strong but static competitive advantage. And the competence of the salespeople is something which ought to be replicable by important competitors. In other words, the competitive advantages of the industry do not appear overwhelmingly strong.

In fact Italy is being overtaken by Spain in terms of output, and also in terms of technical mastery of the product and important parts of

the production process. In other words, the relative competitive position of Italy, and this means largely Sassuolo, is deteriorating. There can be no doubt that the Italian firms have not mounted any vigorous collective response to the challenge posed by the Spanish industry. Why this is so is much less clear.

We argue that the evolution of the international value chains is one important factor contributing to this. In terms of dynamic competitive advantages the tile industry relies pretty much on the capital goods sector. But the capital goods manufacturers are selling to the whole world, not just the Italian tile manufacturers. Taking this together, the future for the cluster would not appear too bright. However, things look somewhat different if we take the position of the tile producers towards downstream functions of the value chain into account. In this respect, at least some of the larger groups seem to be able to position themselves in a favorable way, much more so than their main competitors.

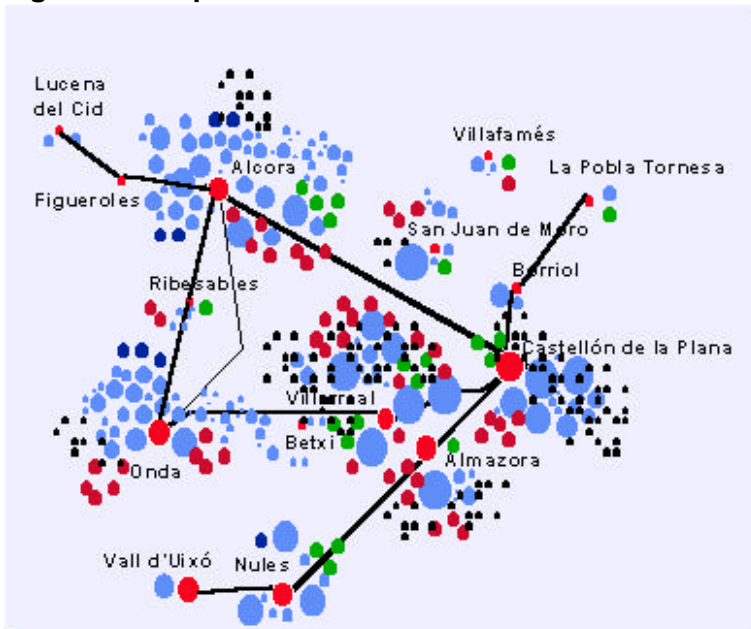
4 The Cluster of Castellón / Spain

In Spain, having a press to form the biscuits of ceramic tiles is almost as good as having a press to print money. What 30 years ago was a rural, craft-based operation has become one of the leading domestic industries, the powerhouse of the economy of the Autonomous Region of Valencia, and the pacemaker in the global tiles industry. It is an industry which has been growing for almost twenty years, with output in square meters doubling between 1981 and 1990, and growing by 168 % between 1990 and 1999. In other words, it is a remarkable case of latecomer industrialization. All this is not only based on strong entrepreneurship and rivalry, but also on a textbook case of passive and active cluster advantages.

93 % of Spanish ceramic tile production is clustered in several small towns around Cas-

tellón. As Figure 15 shows, production in Spain has grown strongly in the 1980s, with total output doubling. In the course of the 1990s, production has virtually exploded, growing almost threefold. In 1998, there were 242 tile manufacturers in Spain, of which 190 were located in the cluster. The overall number of employees in tile firms grew from 16,800 in 1995 to 23,200 in 1999.

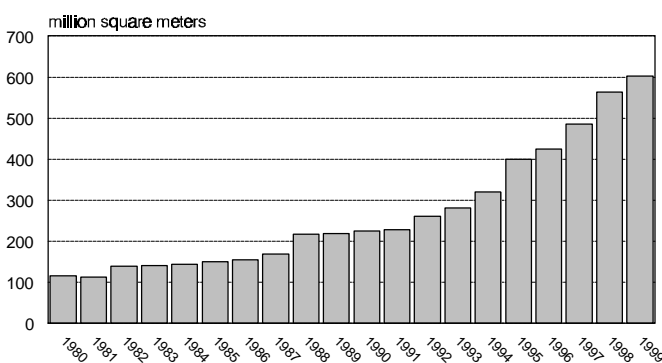
Figure 14: Map of the Castellón tile cluster



Source: Payeras (1999).

Figure 15

Tile production in Spain



Source: Ascer.

© JMS

4.1 The evolution of the Castellón cluster

The Castellón region has a long tradition in tile manufacturing which goes back to the era when Arabs ruled the region. The process of modernization of the industry started in the late 1950s with the introduction of electrical presses which were imported from Italy and which substituted traditional man-powered presses. The next important step, beginning in the mid-1960s, was the introduction of tunnel kilns which substituted the traditional circular “arab kilns”. The tunnel kilns were further upgraded in the 1970s with the introduction of second firing. One of the factors driving demand was the strong expansion of the hotel industry in the region, i.e. the Costa Blanca and the Costa de Azahar. At the end of the 1960s, there were 138 tile manufacturers with 5,500 employees producing 25 million square meters.

After the second oil crisis, firms started to increase their export effort, in particular towards the two neighboring countries, Portugal and France. One factor to motivate this was a drawback scheme introduced by the national government to reduce the deficit in the trade balance. It was important for the tile manufacturers since they continued to depend on imports of capital goods from Italy. Looking back to that period, industrialists admit that the product quality was inferior but improved with increasing exports, reflecting a process of learning by exporting.

The next important landmark in the history of the cluster is the beginning of the 1980s, when several factors converged to improve the competitiveness of the industry:

- Government-sponsored efforts to promote the local capital goods industry led to failure and success

at the same time. The attempt to build-up a local production base for kilns failed, but the effort led to a better bargaining position vis-à-vis the Italian suppliers, which reduced their prices substantially and started to sell latest-generation equipment in Spain.

- In 1981, the region was connected to the pipeline which brought natural gas from Algeria. This was essential to be able to actually employ latest generation kilns, and it implied a massive reduction of energy costs. The earlier generation of kilns had been based on oil.
- In 1984, the single firing production process was launched.

4.2 Upgrading in the Castellón cluster

The story of massive upgrading in the cluster actually starts with the single firing process. This was the first major innovation emerging from the cluster. Before that, the industry was using a double-firing process, firing first the biscuit alone, then glazing it and firing it again. The point of departure for single-firing was the fact that the Spanish clay is red because it has a higher iron content which leads to different sintering characteristics. The Italian kilns were designed to work with white clay, using double firing, and the quality of the Spanish final product did not match that of Italian tiles. Between 1981 and 1983, engineers from a tile manufacturer (Zirconio), a producer of glazing materials (Torrecid), and what was to become the Institute of Ceramics Technology (ITC), first part of the University of Valencia and then in the University of Castellón, developed a new process. It involved the development of different glazing materials and the adaptation Italian kilns. The result was a process which was superior both in terms of production efficiency and quality of the final product.

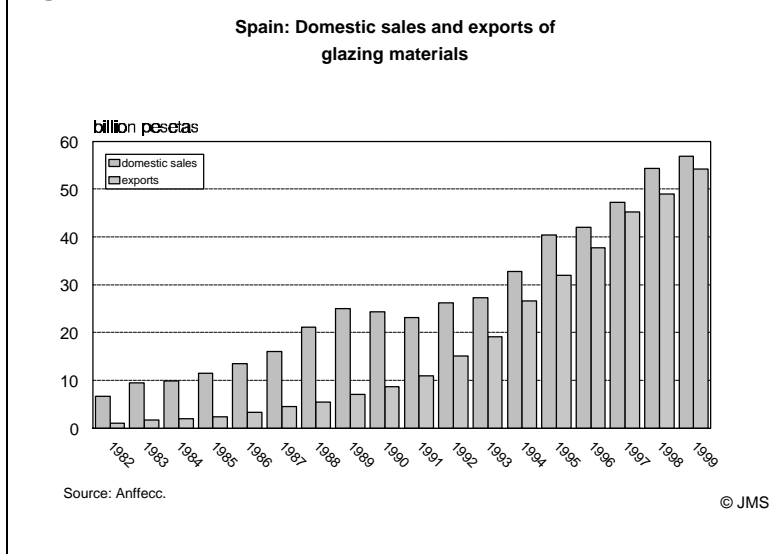
Single firing spread quickly in the cluster, reaching the majority of the firms until the

end of the 1980s. But it was more than a one-time radical innovation. It shaped the paradigm of the cluster, which has three main elements:

- Competitiveness is, first of all, based on technological excellence. It is engineers who rule in the cluster.
- Interaction between tile manufacturers and producers of glazing materials is strong, with the latter being a strong push factor in terms of constant upgrading. Both types of firms are interacting on the base of equality (unlike in Italy, where tile manufacturers are stronger).
- Interaction between firms and local meso-institutions, in particular ITC, is strong and a key element in technological upgrading.

At the same time, the aftermath of the introduction also created a trauma which until today is an important element in the mindset of the cluster actors. With single firing, Spanish producers were launching products which were comparable to those from Italy. The main difference involved the reverse side, which was red rather than whitish. According to the Spanish firms, the Italian industry launched an advertising campaign which claimed that white-body tiles were superior to red-body tiles, an argument which was repeated over and over again by sales staff and thus engrained into the minds of the customers. This campaign apparently was particularly successful in Central Europe, where Italian producers continue to have a dominating position.

Listening to industry representatives, the introduction of single firing appears to have been much more important than anything else, including the accession of Spain to the European Community. Nevertheless, the latter brought some important changes. Existing export incentives had to be phased out. The cultural change which was related to the accession process, implying an overall mod-

Figure 16

ernization of Spanish society, also affected the cluster. Reduced trade barriers facilitated access to European markets. And then there was a government intervention which facilitated upgrading in the tile industry (and apart from that only in some agroindustries), namely the system of “ordenación comercial”. This meant that Spanish exporters were required to export first quality only, and sell only with first-quality price (rather than selling first quality for the price of second quality), so that a low-price strategy became difficult.

The second half of the 1980s lay the ground for the massive expansion of the cluster in the 1990s. Tile manufacturers expanded their production capacity and upgraded their products, and the producers of glazing materials did the same. In the case of the tile manufacturers, the strong growth of the 1990s was due both to a strong local economy and a strong increase in demand from abroad. In the case of the producers of glazing materials, upgrading was even more impressive, since there was not only an extraordinary growth in

exports but also a massive internationalization push. This was not just in terms of exports (Figure 16). Many of the 24 firms from Castellón set up factories or at least distributors in many of the main tile producing countries.

Some further important features of the 1990s were the following:

- There are continuing entries into the cluster, both producers of glazing materials and tile manufacturers. The typical pattern continues to be the family-owned firm. The vast majority of firms are small- or medium-sized businesses. The typical firm has some 200 employees.
- There is only a slow adoption of porcelain tiles. Although the producers of glazing materials have come up with the innovation of glazed porcelain, and at least one local producer is manufacturing porcelain tiles using red clay, the main shift towards porcelain that has been forecasted by Italian industry observers so far has failed to materialize. The share of porcelain tiles in Spanish production is stable at around 4 %.

In terms of technology, the transition to porcelain tiles has not been the kind of challenge to the Castellón cluster the Italian competitors hoped it would be. Investment into the creation of porcelain factories is progressing at a steady but slow pace in Castellón, and the cluster is doing just fine this way. What may become a more relevant challenge is the Lamina/Sinterflex-innovation which was mentioned above. But even this is more relevant for glazing producers than for tile manu-

Table 10: Size structure of tile manufacturers

Size class	< 25	25-50	51-100	101-200	201-500	> 500
Share of firms (1998)	19,4 %	33,1 %	24,8 %	12,0 %	8,7 %	2,1 %
Estimated share of total employees	3 %	13 %	19 %	18 %	31 %	16 %

Source for share of firms: Ascer.

facturers. Lamina will most likely cut into the sales of porcelain tiles and thus hit Italian firms harder. Glazing producers have already found a way of dealing with porcelain, namely promoting glazed porcelain which makes little sense but sells anyhow. At the same time when System launched Lamina, the largest of the glazing producers came up with a radical innovation as well, namely a tile-body which consists largely of glazing materials and frits (and hardly any clay), permitting differentiated designs (“plac-up”).

The only process standard which has been really important for firms in Castellón is ISO 14 000; ISO 9000 apparently never was a big issue. With increasing concerns regarding the environmental impact (which grew with the increase in production), the pressure on firms to reduce their emissions grew. ISO 14 000 came timely in order to facilitate the response to this pressure. Firms have reorganized themselves in order to reduce their environmental impact, introducing, for instance, closed circuits in the use of water and modifying production processes to reduce gaseous emissions.

4.3 Structure of the value chain

Regarding the structure of the value chain, the Castellón cluster shows several differences compared to Sassuolo:

- About 80 % of the clay comes from the larger region, i.e. no more than 150 km away.
- Atomization, and in several cases also the production of biscuits, has been outsourced to specialized firms which usually have been created jointly by some tile manufacturers. There are clear economies of scale in atomization, and an efficient atomization plant would have been too large for most of the tile manufacturers in the 1980s. While this may appear perfectly rational, it is important to note that often the manufacturers which jointly own an atomizing operation otherwise are rivals.
- Spanish firms continue to depend on Italian manufacturers for most types of capital goods, the major exception being glazing equipment, where the proximity to the leading glazing producers created an opportunity for local machinery producers. However, it is a mutual dependency today. Demand for capital goods is stronger in Spain than in Italy, and Spanish producers appear to be more demanding in terms of technology than those in Italy. Moreover, they tend to be very competent in terms of specifying what exactly they want, rather than just purchasing what the Italians want to sell. Accordingly, it is paramount for Italian capital goods manufacturers to have a close contact with Spanish tile manufacturers to remain at the leading edge. An indication of the relationship which is evolving is the fact that Acimac, the Association of Italian firms manufacturing capital goods for the tile industry, is apparently considering to set up a branch in Castellón.
- Producers of glazing materials continue to be very important for constant product upgrading, even though firms try to strengthen their internal design capacity in order to have some unique designs. Nevertheless, design departments at glazing producers continue to be larger than at tile manufacturers, and the top graduates of design courses join glazing rather than tile firms. It appears that the power position of design specialists is stronger in glazing than in tile firms, with the latter being dominated by production engineers.
- So far there is no concentration trend in the tile industry, and as a collateral multi-brand firms are rare. So far, there seems to be sufficient sales potential for everybody, and there is also no generational change which might stimulate mergers or

takeovers. Moreover, there is no internationalization trend in terms of production. There are several reasons for this. First, Castellón displays remarkable locational advantages. It is not by chance that Marazzi, the largest Italian firm, set up its Spanish subsidiary in Castellón. Second, average firm size is smaller than in Italy, and in fact most firms are SME, with insufficient managerial capability to deal with the challenges of managing a multinational operation. Third, there is no necessity since the sector is doing exceptionally well with its current modus operandi.

- The marketing competence and sales system of Italian firms seems to be superior (Generalitat Valenciana et al. 1999, 87), but there seems to be only a limited effort among Castellón firms to upgrade in this respect. What they do is to copy something the Italians started to do in the 1980s, namely promoting a “Tiles of Spain” label. Apart from that, it appears that they can count on the fact that potential buyers turn up to acquire their product, which is one of the reasons why tradings play hardly any role in Castellón.
- There is a strong rationalization potential in logistics, something the tile industry association found out in a recent study. One of the reasons is the fact that delivery lots are getting smaller all the time, as demand becomes more differentiated and distributors reduce their stocks, so that a typical lot size is headed from one container to one pallet to one package. However, so far there seems to be little effort to realize this potential. Stocks at tile manufacturers remain somewhere around three months of output.

4.4 Product structure and market segmentation

The main issues regarding the product structure of Spanish tile manufacturers are the

transition (or not) to porcelain tiles, already referred to, and the red vs white issue.

The main raw materials for most types of tiles is clay, which comes either in white or red. Italian manufacturers used predominantly white clay, whereas the Spanish prefer red clay since it is more easily and cheaply available. Both sides claim that their raw material is superior, but in fact there is no difference in terms of relevance for the quality of the final product (the only exception being many varieties of unglazed porcelain tiles which can only be manufactured using white clay). In fact, the red vs white controversy to some extent appears as a conflict between science and belief-systems. But there is also a real issue involved, namely the capacity of Italian manufacturers to create, by means of an advertising effort, the image that white-body tiles are better. Spanish manufacturers love to complain about this.

A further aspect refers to the product portfolio. The general preference of manufacturers in Castellón is to have a broad spectrum of products, i.e. both floor and wall tiles, low- to high-end, and glossy as well as rustic. This reflects an important feature of the business, namely the fact that distributors tend to deal with a limited number of producers, so that gaps in the product portfolio may lead to a discontinuation of business relations with a given customer. The exception from this role are the producers of special parts. Whereas some manufacturers of normal tiles have an in-house production of special parts, many other outsource this activity to specialized producers.

Some manufacturers pursue some rough market segmentation, other rather a country segmentation (“this kind of product is much accepted in Germany”). However, the segmentation effort inside the industry seems to be very limited so far, the overall pattern being similar to the product-out strategy already observed in the case of Italy.

4.4.1 Sales and after-sales services

The increasing logistics problems due to smaller orders and lots have already been mentioned. Another issue are services related to sales and after-sales, where representatives of the Spanish sector admit that Italian firms are more competent and inventive in this respect.

A serious problem on the domestic market is the low quality of tiling. Consumers complain about the quality of tiles which are breaking apart after installation, but this is due to the inadequate competence of the tiler rather than the quality of the tile. The obvious response is training of tilers, something the industry is currently promoting.

4.4.2 Exporting

Even though the export ratio of the Spanish tile industry is lower than that of Italy, Spain is by far the second most important exporter of tiles. Both production and exports are growing, but since domestic demand is also growing, the export share remains stable at around 55 % of value and 51 % of volume.

Spanish exports are less concentrated than those of Italy, at least so far: the strong growth of the U.S. market, and the strong

presence of Spanish producers there, may change this in the future. In 1999, the 7 largest markets accounted for 50 % of exports, the 14 largest for 66 %.

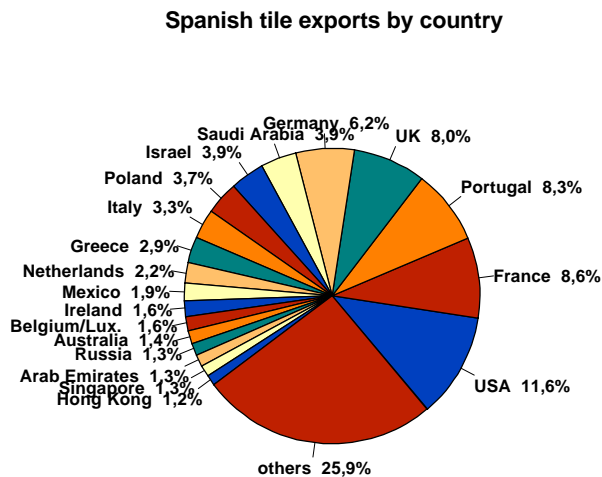
4.4.3 The relevance of international value chains

The Spanish tile industry is involved in a global value chain which has a network structure, i.e. involves neither arms' length relationships nor hierarchical relationships. This applies both to inputs and sales. The problem of one-sided dependency on Italian capital goods manufacturers was solved long ago. The relationships with glazing producers are based on partnership. Local tile manufacturers in Castellón are not exactly happy about the fact that the glazing producers sell their products and give away their know-how and designs to tile producers everywhere, but it is not causing a serious headache, either.

Regarding sales, it seems that tile manufacturers are in a strong albeit not dominating position vis-à-vis buyers. In Spain, there are more than 200 tile manufacturers, and the bigger among them attend the majority of the 3,000 distributors which currently exist in Spain (Bigné 1998). It is difficult to imagine that either side can acquire a dominating position. However, it is notable that – unlike

Italian producers – Spanish firms display little propensity for forward integration into commercialization. Given the fact that there is a clear concentration process at the commercialization stage, this may prove to be a strategic error in the long term. At the same time, it must be acknowledged that even the large Spanish firms probably are too small and do not have the necessary capital to pursue a strategy of forward integration into commercialization, in particular in foreign markets.

Figure 17



in EU, 1999. Source: Ascer

A minor issue which is often mentioned by representatives of the Spanish sector is the fact that ceramics distribution is in the hand of Italian emigrants in many export markets. However, this does not appear to create serious problems for Spanish exporters.

4.4.4 Restructuring of the industry and internationalization

In a diagnostic of the cluster conducted in 1999, the consultants of Cluster Competitiveness recommended that firms should seek a clearer market positioning, forward integration into sales, and internationalization (Generalitat et al. 1999). For an outsider, this appears as a plausible suggestion, not the least since it comes down to replicating the successful recipe of the Italian industry. However, for the cluster firms the suggestion is less plausible. The firms are huge successful with their current business model, so there is not reason to move to an entirely different model which poses all sorts of risks and uncertain benefits, even more so since growth and profitability of the Spanish industry are

stronger than those of their Italian competitors. At the same time, in particular forward integration appears as a risky, costly concept.

At the same time, it is notable that the Cluster Competitiveness diagnostic is an important point of reference for industry actors, especially since it was based on an exercise which strongly involved them. It may happen that in the near future a learning and discussion process occurs in the industry which leads to an re-evaluation of the recommendations, especially in the light of the discernible restructuring of building materials commercialization chain.

4.5 Structure of supporting institutions

One of the distinctive feature of the Castellón cluster is the density and competence of the supporting institutions. First, there are several business associations. Ascer is the association of tile manufacturers. It appears to be the main actor in the cluster when it comes to collective action and strategic initiatives. It provides information for and about the industry. It is articulating the industry's de-

Destination Market	Distribution Structure	Spanish Position/Strategy
USA (North)	Large Intermediaires (Homecenters, Carpet-chains). Product parameters trend to be supply-driven.	Followers
USA (South)	Rather smaller distributors. Broad network of both Italian and Spanish representatives, which contact directly to retailers. Tastes are more similar to Mediterranean.	Direct investments of the larger firms to have their own magazines. Better position to approach the Hispanic population
South America	Markets not so sophisticated, price oriented	Leadership, but it is a relative limited market
Germany	Strong tendency of polarization between low- and high-end. Growth of home centers to the detriment of traditional shops and wholesalers	Marginal position, behind Italy, local supply and Turkey
South-West Europe	Dominated by small distributors. In many cases, direct contact between manufacturer and retailer	Stronger in Portugal, UK and local market. French market is divided, and exporting even to Italy and Greece.
Central Europe	Dominated by large distributors who provide small retailers. Tastes trend to follow the German market, but there are some differences	In some countries like Poland Spanish product has gotten the leadership, due to design and a more dynamic marketing than Italy.

mands vis-à-vis government, from the local to the regional to the national and EU level. It is organizing joint purchasing for gas, electricity, telephony and mobile telephony. Ascer has a staff of about 20 full- and part-time professionals. All the local tile manufacturers are affiliated, and when elections come up, there tend to be more candidates than offices. However, unlike its Italian counterpart in the case of Cersaie, it does not participate in the organization of Cevisama, the Spanish ceramic tile fair.

Anffecc is the association of the 24 glazing producers. It is being administrated by a legal firm, a feature which gives an indication of the fact that it operates in a different way from Ascer. Its role is, first and foremost, as a lobby organization vis-à-vis government. One of the reasons is the fact that glazing production has a serious environmental impact so that constant negotiations with government bodies are essential. For other activities, *Anffecc* convenes commissions with professionals from firms. Two years ago, *Anffecc* also started to organize short-term courses for firm employees. *Asebec* is the association of the capital goods manufacturers. Its status reflects the fact that the local capital goods industry is relatively weak. 35 firms, with an average of 24 employees, are affiliated. The main professional organization is the *Asociación de Técnicos de Cerámica*. Then there is the Chamber of Industry and Commerce (*Cámara Oficial de Comercio, Industria y Navegación de Castellón*). Its activities include, since 1992, the organization of the bi-annual technical-scientific forum *Qualicer*.

Apart from these associations, there is a well-developed set of institutions. First of all, there is the Ceramics Technology Institute, ITC (see box). It emerged from an institute for chemical technology which was founded at the University of Valencia in 1969 and increasingly focused at the tile industry in the 1970s. In 1983, a part of the institute was relocated to the Castellón campus of the university. In 1984, the Research Association of the Ceramics Industry (*Asociación de Investiga-*

ción de las Industrias Cerámicas, AICE) was founded to facilitate cooperation between ITC and firms. In 1991, the first chemical engineers with a specialization in ceramics received their graduation at the institute. In 1992/93, the name changed to ITC, and the institute was integrated into the now-independent University of Castellón. ITC's activities comprise training professionals for the tile and glazing industry, conducting tests for firms, and working independently and with firms on R&D projects. ITC has its own pilot plant for experimentation with tile production issues.

The Institute for the Promotion of Ceramics Design (*Asociación para la promoción del diseño cerámico, ALICER*) was founded in 1993. Its main activities are training and support for firms. ALICER offers a five-year course at tertiary level. The majority of the 20 students which graduate every year are employed by glazing firms. In contrast, joint projects with firms are almost exclusively conducted with tile manufacturers. – Before becoming an independent institute, ALICER was a department within CTI. It was created as the perception was spreading that limited design competence was a severe competitive disadvantage of the Spanish tile firms. As the department grew, ITC's management decided to spin it off since it felt that design was outside the main focus of ITC. However, this spin-off is not necessarily as plausible as it may appear at a first glance. To create, say, a wallpaper design, a doctoral degree in materials science is probably useless. Things are different when it comes to tiles. Even though not being mandatory, advanced knowledge in physics and materials science is highly useful.

Another training institution is the vocational training center (*Escuela de Artes y Oficios*), which is offering, inter alia, basic training in design. It is also involved in the effort to train tilers.

Apart from supporting the training institutions, government has created the *Instituto de Promoción Cerámica*, an institution which

Box 2: Best Practices in University-Industry Cooperation – The Ceramics Technology Institute (ITC)

The Ceramics Technology Institute (Instituto de Tecnología de Cerámica, ITC) plays a fundamental role for the competitiveness of the cluster. Many institutes of this kind have been set up with the mission of technology transfer to industry, and most of them struggle to come closer to companies. Why is ITC such a huge success?

First, there is a clear mission. The ITC sees its mission in the education of the university professionals, chemical scientists and chemistry engineers with a focus on industrial ceramics. In the words of the director of the ITC, "We see our students as future partners in joint research projects with companies in the future; they will be our links in the companies". Seeing students as future clients is not a usual perspective, and the results seem to confirm the success of this strategy in terms of close cooperation with local companies. About 500 university graduates (2% of sector workers) have entered the sector since 1987; 3,100 professionals attended 107 courses delivered since 1983.

Second, ITC has its main business focus quite clear: "our business is technology, to be developed in close cooperation with companies". The machinery is Italian, which led ITC to focus on process technology, development of raw material and frits/glazes. The local industry is qualified to specify the equipment variables necessary to adjust machines to the particularities of the Spanish production process characteristics. And it is accepted, even among prominent Italian manufactures, that Spanish product quality has reached world class standards.

The main lines of action are: natural and processed raw material; manufacturing process; finished product focused on innovations. The increasing number of development projects with companies shows the important role of ITC.

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999
Nr. Projects	10	16	28	25	38	57	44	54	53
Total Revenue from projects (.000 US\$)	399	635	812	877	942	1012	1099	1281	1442

ITC responses to companies' demands are swift. When the sector understood that design should be subject of studying, ITC has started a group work. As it grew, ITC spun it off, thus creating ALICER. Although ITC offers continuous education for professionals, Castellon has its own vocational training center, where correspondent activities are concentrated, when necessary with support of ITC.

Accordingly, there is no destructive competition among institutional service providers.

Third, ITC has managed to overcome the different perspectives of university and companies regarding time, deadlines, practical relevance of results and need of confidentiality. With the creation AICE, a non profit organization, it was possible to manage the cooperation with companies in a more "business oriented" way. ITC's focus on cooperation with companies is paramount, and often the academic output of the center has to be put in second place when confidentiality conditions of contracts make publication of results impossible. Credibility is achieved with hard work and remarkable results, recognized by companies.

Were there no conflicts or shortage of budgets? Yes, plenty of the very normal conflicts between the academic and the "real" world of technology in companies. This is the "everyday conflicts we have to manage", considered in right perspective when compared with the challenges the real world of companies face them with. In other words, ITC has an adequate, rather than a romantic, concept of university-industry interaction.

organizes activities such as expositions about the history of tile production. Then there is the SME promotion agency of the regional government (Instituto para la Pequeña Industria de la Comunidad Valenciana, IMPIVA) which is providing financial support to several institutions. From the side of the national government, the export promotion agency Icx plays an important role in supporting the Tiles of Spain label campaign.

Another important supporting institution is Bancaixa, the region's bank, which is the main source of credit for the firms. Since the performance of the sector is essential for the bank's performance, it is playing a leading role in organizing a process of reflection inside the cluster. For this purpose it organized a series of seminars with key actors from the cluster, but also from Italy, in 1999, and it co-

sponsored the work of Cluster Competitive-ness (Generalitat Valencia, Bancaja & Cluster Competitividad 1999).

Then there is the issue of infrastructure. The truck traffic in the Castellón region is more intense than in the Sassuolo district; in 1998, there were about 10,000 trucks per day, compared to 5,000 around Sassuolo. However, there are notably less congestion problems in Castellón, and the overall quality of the roads is visibly better. This reflects, among other things, the fact that the whole region of Valencia is classified as a Objective 1 region within the EU's structural policy, thus receiving substantial financial support from Brussels (somewhere in the order of magnitude of EU 180 million annually).

An issue which may become a limiting factor in the medium term regards the availability of real estate. When one of the municipalities recently launched a new industrial estate, half of the firms which intended to acquire a piece of real estate were put on a waiting list. Industry representatives complain that the development of estates is seriously lagging behind the existing demand.

4.6 Evolution of collective action

Basically all the tile manufacturers are affiliated with Ascer, and when it comes to elections for offices there are more candidates than posts. Like the other business associations in the cluster, Ascer does not appear particularly fancy, but it fulfills the essential tasks in a very effective way, both in terms of political representation and services to affiliated firms. Regarding the latter, joint purchasing is probably the most tangible service provided. Further evolution of joint purchasing is, however, difficult to predict due to the emergence of e-commerce and the entry of private e-commerce operators into the purchasing business.

Apart from business rivalry between firms, there are two other elements of rivalry which

strengthen cohesion inside the cluster. First, there is rivalry between the production towns. Most of the firms are not located in Castellón, but rather in Onda, L'Alcora, Almassora, and Villareal. Although they are just a few kilometers apart, each of these towns has a distinct history, tradition, and local culture, and there seems to be a strong, albeit not destructive, element of "us vs. them" in terms of collective identity in each of these towns. Second, there is a strong sense of rivalry with Italy. With Italy appearing as the leader in the industry and Castellón being the latecomer, it is an obvious point of reference and a constant challenge for all the actors in the cluster.

One indicator of the importance of social networks for business success in the cluster is the limited success of external investments. Firms such as the manufacturer of bathroom ceramics Roca have set up or purchased plants in the cluster, but they are clearly not a leader in any respect.

4.7 Competitive advantages and challenges

The Castellón cluster enjoys a broad set of competitive advantages. Some of them are quite simple and straightforward, such as the use of regionally available red clay instead of white imports which creates a cost advantage vis-à-vis Italian manufacturers. But then there is the countervailing element of Italian marketing in terms of superiority of white-body tiles.

The essential dynamic competitive advantages largely accrue to cluster effects, and in particular active advantages of clustering. Most importantly, there is a strong scientific and technological competence, which is based on a strong effort in training of professionals at all levels and the existence of competent and business-oriented support institutions. Learning-by-interacting, in particular between tile manufacturers and glazing producers, and informal communication inside the cluster create a strong dynamism of tech-

nological upgrading. The fact that there is little patenting going on, not only by tile manufacturers but also by glazing producers, indicates the prevalence of tacit knowledge and learning.

A further competitive advantage, especially compared with Italy, is the low “Custo España”, i.e. the fact that government seeks to remove obstacles for business ventures and creates a good infrastructure and supporting institutions. In fact, talking to business representatives in the cluster the limited degree of complaints about government is notable. Another feature mentioned by business representatives is the embeddedness of the industry in the society, meaning that it suffers little harassment from environmentalists or other problems.

5 The Cluster of Santa Catarina / Brazil

In earlier research (Meyer-Stamer et al. 1996, Meyer-Stamer 1998) we have pointed at the ceramic tile cluster in Santa Catarina as a successful case of upgrading through effective local governance, lead by the private sector. It was a case that contrasted starkly with the experience of other clusters in the same region. This chapter will update the previous research and, more importantly, re-examine this cluster by drawing on a comparison with clusters in the same sector but other countries. We come to a more differentiated assessment of local upgrading strategies in the context of the national and global value chain in which the Brazilian cluster operates. On the one hand, its achievements look more modest when compared with its European counterparts, in particular as local governance has deteriorated since our first round of field research. On the other hand, the prospects for functional upgrading look brighter than would be expected from reading some of the recent literature on global value chains. The key is that the tile ceramics

chains are much less driven by powerful external lead firms. In this respect, the Brazilian cluster shares an important feature with the Italian and Spanish counterparts analyzed earlier: the scope for local governance is not restricted by the structure of the chain in which the cluster operates.

5.1 The structure of the ceramic tile industry in Brazil

There are three tile clusters in Brazil, one in Santa Catarina (SC), two in the state of São Paulo. The clusters in Santa Catarina and in Mogi-Guaçu, São Paulo, were created in the import-substitution phase, and their expansion was facilitated with financial support of the National Development Bank BNDES. The third cluster, located in Santa Gertrudes, São Paulo, has a completely different history. It started as an informal sector operation and grew producing cheap tiles for poor and lower middle-class households.

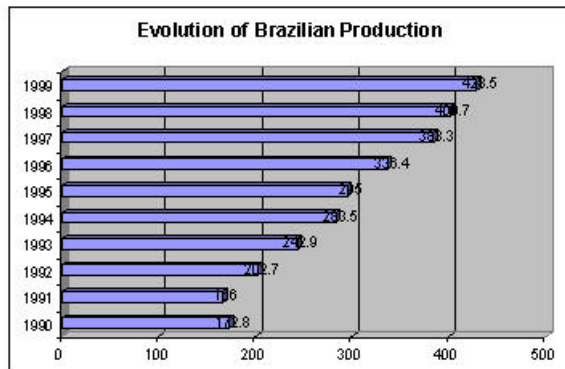
The cluster in SC is geographically concentrated in the southeastern part of the state, around the city of Criciúma. One large and one medium-sized firm are located in the Greater Florianópolis region, about two-and-a-half hours away, and another medium-sized firm is located in the northern part of the state. According to the available statistics (which include only part of the Santa Gertrudes output) the tile producers in SC account for about a third of production and two thirds of exports.

The first firms in SC started operating in the 1950s. The first phase of evolution was between the 1950s and 1970s, when the first firms entered production and were learning the basic features of tile production. The second phase, in the 1970s and 1980s, was marked by expansion of production capacity in order to be able to satisfy a growing market (which is today the western world's largest market), regardless of product quality. The third phase began when the sector stumbled into a deep crisis in 1989. By 1991, sales had

Table 12: Cost Structure

Cost item	% of total cost
Labor	23
LPG + other fuel components	15
Electricity	3
Raw material	37
Other	22

Source: Gorini and Correa 1999

Figure 18

dropped by a third, one of the large firms filed for chapter 11, and other firms came close to following suit. The firms reacted by defining technological upgrading as the way out, opting for quality instead of quantity; collective action played an important role in this context. Production capacity in SC has increased only slightly in the 1990s.

5.2 The SC cluster

The ceramic tile cluster in the Brazilian State of Santa Catarina is currently passing through a phase which can best be described as "trying to figure out". One might be tempted to call this, using management-speak, "strategic repositioning". But the firms give a strong impression that they are involved in search-and trial-and-error-process rather than an analytically well-founded activity. This is partly due to the fact that the firms' main concern refer to challenges "outside the factory", meaning marketing, sales and distribution. They are moving from a "product out" to a "market in" commercialization strategy. Convinced that they have achieved a reasonable production competence, companies focus

very much on the market place, where they perceive little latitude for cooperation among each other, and mistrust is pervasive, much more than with respect to process-related technical matters. The market evolved towards a buyers' market for the companies located at the cluster, and they do not see a perspective for cooperation in the near future.

The cluster faces competition from the Santa Gertrudes cluster, located in São Paulo, but the perception of individual companies in SC varies a lot in this respect. Asked about the differences between both clusters, the three main firms (domestic medium prices ranging from US\$ 4 to 6) rather underestimate the threat, pointing out their superior product quality level and the different customer target segment. The medium sized companies see the Santa Gertrudes cluster (domestic medium prices ranging from US\$ 1.5 to 2.5) as a real threat; they recognize the fast upgrading process going on, stating that their superiority in product quality is technically undisputed (their domestic medium prices are about US\$ 3.5), but unfortunately not perceived as such by end customers, whose purchasing criteria are visual appearance and brand/price. How to sell superior quality, making it visible for customers, is the challenge number one.

Figure 18 shows that production has been growing continuously since the crisis of 1990/91; in the last three to four years this has been mostly based on the expansion of the Santa Gertrudes cluster, whereas Santa Catarina has rather stagnated in the domestic market, increasing its export sales, as will be explained later.

As profit margins are small, firms name reducing production costs and increasing utilization of installed production capacity (companies estimate to be working some 10% under the target 95%) by increasing market share, as the main short-term targets. From the total turnover, 18% is the cost of commercialization and 27% transport and logistics, an evidence of the importance of the lat-

ter for the cluster. The cost structure of the end product is given in Table 12.

One of the main problems of the firms is that some of them are technically bankrupt (Table 13). Tile production is a capital-intensive business, and therefore firms rely on credit to expand or modernize production facilities. At the same time, a sound business strategy in Brazil is to minimize, and preferably to avoid, any long-term credit. As the country is hovering from one macroeconomic crisis to the next, real interest rates are unpredictable, except for the fact that they never come down to single digit figures. In the two most recent crisis, the central bank charged close to 50 %. As the companies' representatives point out, the only business viable with such credit cost is drug trafficking. So companies are facing a tough choice. Basically, their solution has been to constantly renegotiate their debt with the National Development Bank. Nevertheless, this solves their problems only partially, since they stay indebted and are occasionally in arrears, with the latter creating obstacles in obtaining further credit, for instance for export financing. Moreover, the firms also tend to be in arrears with the public utilities, something that further increases their vulnerability.

5.3 Upgrading in the SC cluster

What is going on in SC is a specific variety of what Michael Porter (1996) has described as

the search for strategy which follows the realization that applying leading-edge technology and lean manufacturing practices often is not sufficient to establish a competitive advantage. The tile firms have passed through a profound change process in terms of technological upgrading and application of new management concepts, especially total quality strategies.

A substantial investment in ISO 9000 certification was made in the search for higher productivity and product quality, when companies in the cluster faced a demand crisis at the beginning of the 90's, as a consequence for the breakdown of the government's popular housing financial system. Nowadays, companies admit that their expectations towards the benefits of ISO standards were overstated; the ISO label failed to establish a competitive advantage in the market place, since customers' main decision criteria is either price or the aesthetics and the company's brand. Some firms have decided not to renew their ISO 9000 certification. ISO 14 000 is an issue for the bigger exporting companies, seen as a possible future barrier in the export markets rather than a further opportunity to improve process efficiency.

There is a strong belief inside the firms that the production process is under control and technology upgrading is a matter of updating the equipment, which is not a priority due to financial constraints. The real upgrading challenge is seen in the commercialization stages, which have been subject of much less

Table 13: Leading ceramic tile producers in SC

Company	Locality	Net Turnover (Real\$ th.)(99)	Gross Profit (99)	Net Assets (Real Th.)(99)	Cash Flow (Real\$ th.)(99)	Employees(98)	Liability (Real\$ th.)(99)
Cecrisa	Criciúma	203.325	74.260	141.380	3.560	1.435	135.392
Portobello	Tijucas	177.873	65.495	89.225	2.449	1.393	81.461
Eliane	Criciúma	141.092	18.200	11.707	5.351	1.827	8.871
Itagres	Tubarão	39.090	14.817	9.347	26	281	21.089
Ceusa	Urussanga	26.941	12.136	60.309	2.224	200	6.136
Icisa	Imbituba	19.619	886	6.935	9.267	452	5.636

Source: BNDES (1988); Projeto Plataforma (IPEN/USP); Balanço Anual da Gazeta Mercantil (1 US\$ = 1,60 Real\$)

Box 3: Acquiring vs fine-tuning technology

After presenting the findings of this report to one of the large firms in SC, we had the opportunity to visit their recently launched porcelanato factory. Some observations we made during this visit illustrate the technology-related issues of tile producers in SC.

1. A substantial part of the factory is dirty. More specifically, it is very dusty. A substantial amount of the mass escapes from the presses and gets blown around inside the factory. We did not observe this kind of phenomenon in Spain, whereas Italian factories give a similarly dusty/dirty impression.
2. Related to this is the observation that losses along the production, due to loss of mass and breakage of biscuits, amount to 6 % of the total input. If we assume, conservatively, that inputs contribute one third to total cost, this loss means that 2 % of total cost is just wasted.
3. Next to the kiln a plate explains what is happening there. It indicates that inside the kiln temperature is around 1220° centigrade. However, during a visit to the control panel we could observe that the maximum temperature at that moment was 1208°, and that at most sensors inside the kiln the temperature was below 1200°.

These observations indicate a lack of effort to improve the operation of the production line and to get the maximum yield and quality out of it. The problems we observed reinforce each other: Inadequate operation of presses is one of the important reasons for losses, and it is also an indicator that the overall control of the pressing process is inadequate. This, in turn, contributes to the high incidence of breakage at later stages. Moreover, lack of control at the early stages leads to variety of quality at the later stages, in particular inside the kiln. This is reinforced by the variation of temperature inside the kiln, which causes an even larger variety of quality, and a high incidence of second rate tiles which receive a much lower price.

The firm is clearly immensely proud of its new baby. This pride seems to distract the executives from the fact that acquiring a production line of the latest generation is one thing, whereas operating it efficiently is something quite different.

investment than the production technology. In the following subsection we will see that this perception does not entirely fit with the finding of a benchmarking exercise; Box 3 also indicates something different. Nevertheless, there is a shift of focus downstream in the value chain, and the upgrading is expected to be driven by marketing and sales. Investments have been already made in inventory management and distribution logistics, with stock levels being much lower than those of the European clusters, an example of how a financial crisis can drive upgrading, since there is no money available to immobilize in three months stocks, as it is common in Italy and Spain.

Upgrading in marketing and sales means helping the customer at the point of sales to perceive the value of the product. Every company is investing in the exhibition space (show-rooms) and in the training of the sales force, both inside the company to improve the commercial relationship with the sales reps and at the point of sale to better advise the end customer. Evidence is the decision to select the best ceramics technicians to work in

the sales department, whereas some years ago this people were put in the supervision function in the shop floor. Since the demand in the domestic market is stagnant, it is expected that upgrading will focus on sales and exports for the time being. Training of sales and export professionals is an issue for the cluster, but no collective action is in course so far.

The most significant tendency in product upgrading is the set up of plants to produce porcelain tiles by the three biggest companies. One of them has been producing porcelain tiles since 1996; the other two will start production soon. Furthermore, these companies are rebuilding some of the structure their design departments used to have in the middle of the 1990s, when design was perceived as an important source of competitive advantage. They keep a small group of professionals to define a product portfolio identity, trying to differentiate themselves from the competition, since the strong outsourcing of product design, mainly to glazing producers and some design studios, led to products which increasingly looked the same, independent of who produced them.

5.3.1 Benchmarking on Ceramic Tile Manufacturing Companies in Santa Catarina

What makes a world class manufacturer? Many executives are striving to develop world-class manufacturing operations to ensure that they become or remain competitive in increasingly global markets. To do this, they are adopting a range of manufacturing practices, from organisational changes such as empowerment and teamwork to the use of techniques such as just in time and pull production.

Most companies in the Criciúma ceramic cluster share this view and have focused on technological and management upgrading to increase competitiveness. Starting in the early 90s, during a severe crisis in the construction sector, companies respond with increasing productivity, investments in new equipment and total quality management, as well as ISO 9000 standards. The initiative was strongly supported by the National Development Bank (BNDES), which financed the modernisation initiative of companies that had already received loans and were not always able to service them.

The question of how far companies have moved towards world-class manufacturing is at the heart of the Made in Brazil project, a benchmarking study of manufacturing practice and performance. It is linked with the Made in Europe project comprising similar studies in Britain, Germany, The Netherlands, Finland and Switzerland, co-ordinated by the International Institute for Management Development (IMD) in Lausanne. It has been coordinated by Instituto Euvaldo Lodi-SC, an institution affiliated with the Federation of Industries of the State of Santa Catarina, and the professional in charge was Silene Seibel.

The central hypothesis of the study is that the adoption of best practice leads to high performance. The studies, which are highly structured, examine six areas of manufacturing practice and performance in detail.

Figure 19: The benchmarking model

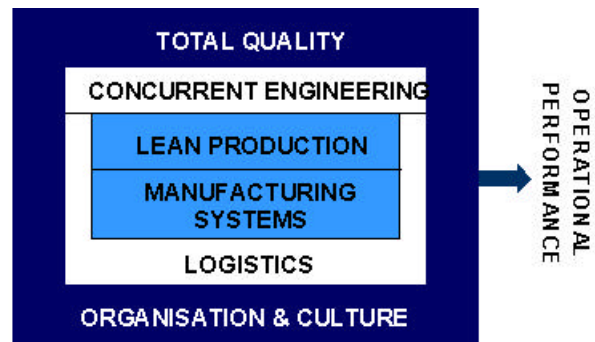


Figure 20: Practice vs. Performance relative to the ceramic industry in Europe

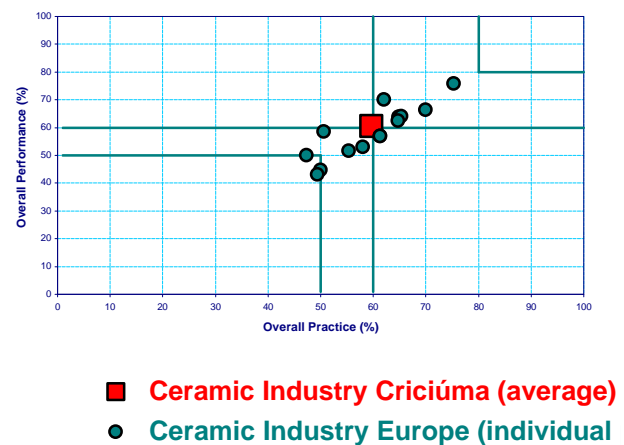


Figure 19 shows the areas covered. The external part of the model comprises the organisation as a whole: total quality and organisation and culture; the interface between the plant and the market: concurrent engineering and logistics; the internal plant organisation: lean production and manufacturing systems.

The benchmarking questionnaire was recently applied in 6 of the 13 most important companies in the Criciúma cluster. We present the key findings and discuss the introduction of best practice and the achievement of superior performance. The questionnaire comprised 48 indicators in all the six areas mentioned above. The indicators were assessed in a participatory approach with the plant management, and audited at the plant site by accredited specialists.

Figure 20 shows a scatter diagram of practice and performance, positioning the company in the following categories: a world class company is considered to be the one which presents an overall score of at least 80% of manufacturing best practice and performance; if the company scores between 60-80%, it is considered to be a contender to world class; scoring between 50-60% the company is considered to be a “makeweigh”, and less than 50% is a critical score, putting the company in the category “punchbag”.

Figure 21 shows the average positioning of 6 ceramic tile companies located in the Criciúma cluster in relation to companies of the corresponding European sector (comprising manufacturing companies of clay and concrete products; Spain and Italy did not participate in the European initiative that comprised 816 plants in all sectors). The average score is about 60% both in practice and performance situating them in the contender category; this position shows that the sector in Criciúma has a reasonable level of manufacturing best practices in place and performance achieved. The position of the individual plants at the chart shows also that the central hypothesis of the study can be confirmed, with higher level of practice leading to higher performance scores.

Comparing the average scores of the Criciúma ceramic tile plants with the scores of the 10% best plants (leaders) of the European sector, as shown in Figure 21 and Table 14, one can see that overall the manufacturing plants in Criciúma lie about 9% behind their European competitors, both in practice and performance. Logistics display the most significant difference, with a distance of about 14% and 12% respectively in practice and performance; a critical point is customer delivery performance, with companies having difficulty to meet customer delivery commitments, caused in part by a lower level of lean production techniques in place, which reflects on longer total business cycle time (customer order to delivery).

Lean production lags by 10% and 11%, with companies in Criciúma working with bigger batch sizes, in the well-known struggle between higher productivity and market flexibility. Another point to regard is the key business performance measures used to manage the business. While in Criciúma success is measured comparing established goals with end results concerning a few indicators like cost reduction, production output, productivity and profit, companies in Europe include indicators like customer satisfaction, market share and focus on business processes rather than individual business functions. Although the claim that the “challenge is at the market place” is frequently heard, the performance is still measured in physical and financial indicators.

The differences in organisation and culture are concentrated in the time horizon and links between manufacturing strategy and business strategy planning. In Criciúma, manufacturing strategy planning is rather short time (less than a year and seldom documented). Employee participation is a reality in the sector, and investments in education and training are a standard practice. A further relevant point is customer orientation, with European companies being ahead in the introduction of customer satisfaction measurements and communicating customer needs throughout the organisation. Although the customer is not any more a unknown entity for companies in Criciúma, they recognize that the great challenge they have to face is outside the plant. Later we will compare this reality with the challenges business managers face to implement their visions.

Regarding manufacturing systems, one can confirm that manufacturing practices are very similar, laying behind by only 5%, whereas performance lay 10% behind; it means that although companies in Criciúma have access to the same technology as their European competitors, they are not able to get the same results; the main difference relate to production process control and the information systems in place, where companies in Criciúma

Figure 21: Spider chart against the leaders in the ceramic industry in Europe

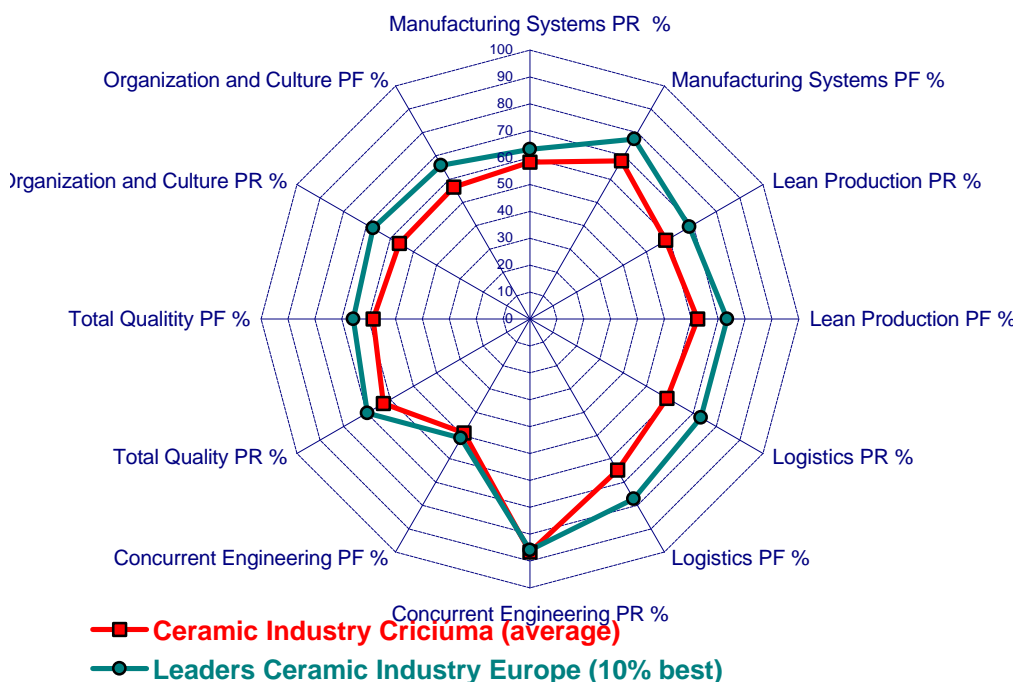


Table 14: Comparison of indices between the ceramic industry in Criciúma and the leaders in the ceramic industry in Europe

Areas	Criciúma	Leaders Europe	Difference
Manufacturing Systems PR %	58,3	63,0	-4,7
Manufacturing Systems PF %	67,8	77,3	-9,5
Lean Production PR %	58,3	68,3	-10,0
Lean Production PF %	62,3	73,3	-11,0
Logistics PR %	58,9	73,3	-14,4
Logistics PF %	65,1	77,2	-12,1
Concurrent Engineering PR %	86,6	86,0	0,6
Concurrent Engineering PF %	48,9	51,3	-2,4
Total Quality PR %	62,9	69,7	-6,8
Total Quality PF %	58,3	65,8	-7,5
Organization and Culture PR %	55,9	67,3	-11,4
Organization and Culture PF %	56,6	66,0	-9,4
Overall Practice (PR) (%)	59,7	69,1	-9,4
Overall Performance (PF) (%)	60,5	69,4	-8,9

present a lower level of integration of their information systems along the process.

What total quality management is concerned, the Criciúma ceramic tile companies lag by about 7%, presenting a lower level of ISO

certification than the competitors. Although most companies have quality processes in place, several have discontinued the ISO certification, claiming that the burden and costs of keeping the system is very high compared with the benefits at the market place, specially in the internal market, where it does not represent a differentiation factor. Companies recognise the importance which ISO standards have had to organize their processes and improve quality, and are assessing its necessity in their main export markets.

Looking at Figure 21 one realises that the distance in manufacturing best practices between the average of companies in Criciúma and the European leaders in the sector is not too far. There is a regular distance between both lines, showing a comprehensive approach to the modernisation of manufacturing, not limited only to the hardware aspects; furthermore, this results confirm the general observation that modernisation of manufacturing has been a central issue and is reasonably accomplished. There is of course a way to go, but surely the main issues are focused in the market place.

Let us look at the second group of questions referred to the personal opinions of general managers regarding their business vision. The responding companies export on average 15% of their turnover. First they were asked about their conditions to compete successfully with the best competitors anywhere in the world. They responded they are satisfactory (50%) or partially (50%) able to compete globally. Asked about how long it would take to prepare themselves to successfully compete with the best competitors anywhere in the world, 33% responded they don't know, 16% would need at least 1 year and 50% stated they would need at least 5 years. This is evidence that although export is an important issue and they intend to increase their export share up to about 20 – 30% of turnover, none of them feels mostly or completely prepared to compete globally, neither know very well how to prepare themselves to this challenge.

The inhibitors in achieving the business vision are mainly external factors, like foreign exchange rates, international competition and government policy (35%). These factors reflect that export is a priority in the business agenda on the one side, and that companies are aware of the difficulties of having success in the activity on the other. Although the external factors are the most critical obstacle to exports and the “Custo Brasil” is very high (and even mentioned by Italians and Spanish competitors as the main inhibitor to a successful Brazilian export strategy), it is notable that there is very little joint initiative to mobilise the political actors to change the situation; availability of money (33% but mentioned at the first place by all companies) was the main internal factor mentioned, reflecting the critical internal cash flow situation.

The main priorities in achieving their business vision are external factors such as to maximise market share, to be a leader in customer service and in product innovation (61%). Internal factors such as to be world class, reduce manufacturing costs and invest in technology and engineering are far less important (33%), as well as product quality issues and time to market (11%).

The most valuable source of external advice in the present are fair and exhibitions (27%), followed by suppliers (22%) and customers and clients (16%); in the future, companies see customers and clients (33%) as the main source, followed by benchmarking the competitors (22%), suppliers (16%) and universities/management consultants (16%); this change underlines the shift in priorities from internal plant matters to the external factors that determine their competitiveness. Having relied on the suppliers of manufacturing equipment and glazing materials in the past, companies see the need of a more proactive attitude towards getting information first hand from the customers and clients, and having access to innovation and knowledge in the universities and from management consultants.

5.3.2 The relevance of standards

Most of the tile manufacturers are ISO 9000 certified, even though this does not seem to establish a competitive advantage, either domestically or abroad. The advantage rather lay in the reorganization of the production process, leading to improved efficiency. Some firms are ISO 14 000 certified, or preparing for certification, and one of the large firms is preparing for BS 8800 certification, which is a standard for occupational health and safety. Again, this effort is part of the firm's philosophy of constant upgrading rather than reflecting an acute or imminent pressure from customers.

Another standard which firms presented as being very important in 1996 is ISO 13 006 which defines the features of a tile. Firms in SC were keen to be certified, and to create an infrastructure for efficient certification, since they hoped that this might establish a decisive competitive advantage vis-à-vis their competitors from Santa Gertrudes. However, things did not quite work out that way, and this for two reasons. First, final customers did not pay that much attention to the certification and rather made their decisions according to design and price. Second, some of the competitors from Santa Gertrudes also got their products certified. As firms from SC point out, products from Santa Gertrudes just barely stay within the limits established by the standard, but this detail does not make any difference in terms of competitiveness. Representatives from some firms in SC are fantasizing about stricter standards to keep Santa Gertrudes out of end product certification; this reflects their unwillingness to take their competitors seriously rather than it is a viable option, especially since standards such as ISO 13 006 are defined by industry bodies in Europe without any participation from Brazil.

5.3.3 Structure of the value chain

The companies in the Santa Catarina cluster have a very high degree of vertical integration. In 1996 the field research showed no readiness for outsourcing, justified by companies by the lack of specialized suppliers in the cluster. In the meantime, this situation has changed remarkably for design, maintenance and transport. The machinery is Italian and the glazing and frits are mostly Spanish, although local suppliers are in place (the third biggest glazing producer is a local firm, a spin-off of one of the big local producers, selling about half of its production to Santa Gertrudes). From 3 multinational suppliers present with sales offices in the cluster in 95, holding the business in a monopoly-like way, the cluster counts with 7 glazing producing companies and a total of 28 companies in Brazil, associated in the recently founded national association ABRACOLOR. The glazing producers supply the same range of services they do in the European clusters, due to the pressure of the companies to have the presence of suppliers within the cluster, but also since competition between glazing producers is fierce and each one is constantly searching ways to differentiate itself.

The tile producers see the main challenge in the development of the competencies in the market place, with a forward integration into distribution, commercialization, and tiling, as a part of the strategy of convincing the customer of the superior value of products from the Santa Catarina cluster.

5.3.3.1 Market segmentation

The traditional way of market segmentation in Brazil is by income range: class A = households with an income of more than 20 minimum wages (i.e. the rich and the really well-off), class B = households with an income of 11 - 20 minimum wages (i.e. the upper middle class), class C = households with an income of 6 - 10 minimum wages (i.e. the lower middle class), and class D = house-

holds with an income of 3 - 5 minimum wages (i.e. poor households with some disposable income). The reasoning of tile firms from SC still is very much linked to this classification. They assume that the homogeneity of consumption behavior within each of the classes is more important than cross-class lifestyle issues. More specifically, they argue that it makes sense to cater to each of the classes through a specific marketing channel:

- A promising way of catering for class A appears to be specialized, classy shops. Two of the large firms are setting up exclusive franchising networks. Inside the shops, well-trained salespeople are attending customers, and architects are offering, free of charge, design proposals, involving combinations of floor- and wall-tiles.
- Customers from class B, firms assume, are more likely to enter multi-product shops for construction material, a segment where a major change seems to be underway. Traditionally, the dominant pattern were small- and medium-sized, family-owned shops. In the recent years, some large foreign chains started to establish themselves in Brazil (Castorama and Le Roy Merlin from France) or are in the process of evaluating the market potential (Home Depot from the U.S.), and some domestic chains are being set up which follow the same pattern. It is a common expectation that the construction product sales will experience a concentration, professionalization and upgrading process similar to the one which happened in the super- and hypermarket-segment, although the evidence in this respect so far is mixed. Large chains such as Wal-Mart already had to learn that they cannot simply transfer their model to Brazil, and it is possible that the necessity to adapt is even larger in construction products.
- It is even less clear what customers from classes C and D are going to do. Sales in

this segment are to a certain degree informal, i.e. without sales taxes. Small neighborhood shops play an important role in this segment. Firms from SC see class D as a lost case, since these customers will usually opt for cheap products from Santa Gertrudes, whereas there may be some sales potential in class C.

5.3.3.2 Sales and after-sales services

In analyzing customer complaints, firms realized that there is little sense in producing high-quality tiles if the tiler is not sufficiently competent to place them. The most radical manner of dealing with this problem is consequent forward integration: producing not only tiles but also making sure that they get set in the correct way. There are three stages through which firms get to this point:

1. Firms start, at their own cost, to train tilers, organizing courses both at their home location and elsewhere in the country. In some cases, this includes fitting the tiler with a box of tools.
2. Firms not only train but also certify tilers, and offer customers a 5 - 10 year warranty in case they employ the certified tiler to set the tiles using the firm's own argamassa and rejunto. This full package is especially offered by one of the large firms with own shops, so that the customer has only the shop to deal with, paying only one bill.
3. Firms start to train and employ their own tilers, offering the full package to construction companies. This is not only based on quality considerations but also on the observation that the cost of setting the tiles is higher than the cost of producing them, so that the full package opens up the opportunity to increase the margin.

5.3.3.3 Exporting

Firms from SC have been increasing their exports over the course of the 1990s (Figure 22), even though some observers claim that they were losing money due to the overvaluation of the Brazilian currency. The Brazilian exports is by far dominated by the companies located in the cluster (Figure 23).

Exporting probably became profitable after the devaluation in January 1999. The term "probably" refers to the fact that ever since international shipping companies, on which Brazilian exporters rely, have been increasing the freight-rates, which grew from about US\$ 900 per container to US\$ 1,400 to 2,000; the precise rate differs according to the overall volume, with volume exporters getting lower rates. Some firms claim that exports to certain regions, especially the Caribbean that used to be an important market, are no longer viable. The main target markets are the U.S., Mercosul, and other parts of Latin America. Less important foreign markets include South Africa and Australia. Europe is no target market; one of the large firms actually closed the sales office it used to have in Brussels.

Firms are organizing exports in different ways:

- The most frequent pattern is the employment of representatives in key markets.
- The second option is collaboration with trading firms in the target markets.
- One of the large firms has a wholly owned subsidiary in the U.S. which is taking the role of a trading firm.

Exports have been growing recently, after fluctuating in the years before. The decrease in 1990/91 reflected the chaotic economic situation in Brazil, the decrease after 1994 the effect of the appreciation of the Brazilian currency. In any case, exports represent no more than 10% of total production, far behind the Italian (69% in 1998) and Spanish (about 50% in 1998) export share. Companies in the

SC cluster are working hard to increase their export share, the most successful firm achieving an export share of about 20% of production and 25% of turnover. Export medium target prices are about US\$ 4 per square meter.

There is a governmental export promotion program (EXIM), but access to export credits is difficult due to the arrears mentioned above. ANFACER has recently approved an export promotion program with the federal export agency APEX, aiming at the promotion of the Brazilian product at target markets and the joint presence in important international fairs.

Figure 22

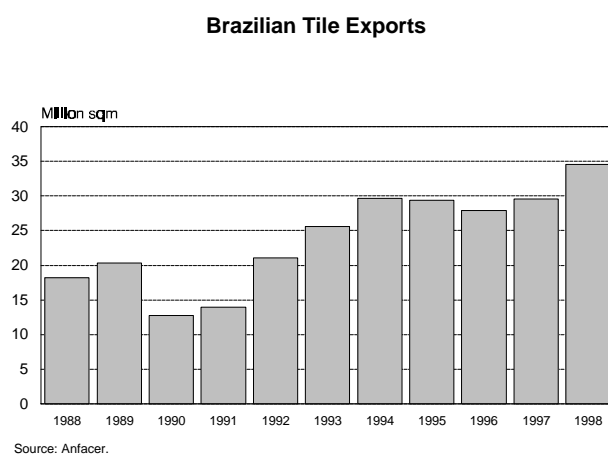
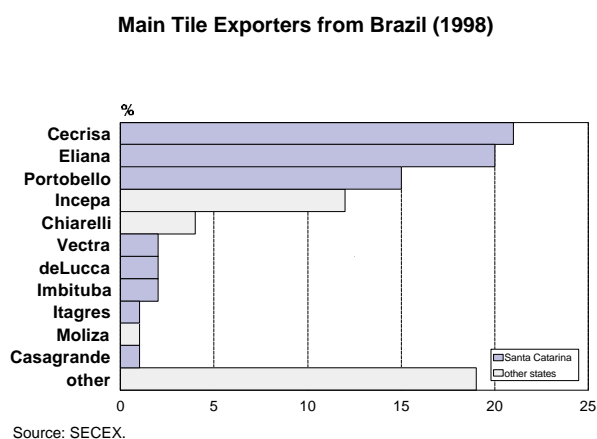


Figure 23



5.3.3.4 The relevance of international value chains

Brazilian tile firms are integrated into international value chains, but in a completely different way than, say, footwear or garment manufacturers. Whereas the latter rely on foreign firms in the downstream part, i.e. when it comes to commercializing products, the tile firms rely on foreign firms in upstream activities, i.e. capital goods and crucial inputs.

Dependence on foreign suppliers of capital goods is not a particularly unusual feature for an industry in a newly industrializing country. In fact, in the tile industry apparently everybody depends on Italian capital goods manufacturers, including firms in Spain. The capital goods producers are one of the two main technology drivers in the industry. Machine producers offering new options stimulate a substantial part of product innovation. In fact, product change in tiles is more rapid, and more fashion-prone, than one might expect, reflecting a circle which may be seen as virtuous as well as vicious, involving machine producers and tile producers which both see product innovation as the main competitive weapon against their respective competitors. Firms in Brazil report that access to latest vintage equipment is not restricted, though machine producers tend to collaborate with some Italian tile producers during the final phase of machine development. A representative of the machine producers' association confirmed that, to the dismay of Italian tile manufacturers, machinery is sold to whoever is able to pay. The latter is the much more acute bottleneck for firms from SC than access to production technology.

Input manufacturers, especially coloríficos (producers of glazing materials), are the other technology drivers in the tile industry. Whereas Italian firms are the undisputed leaders in capital goods, Spanish firms have a very strong position among coloríficos, with their Italian competitors having dropped to a distant second place. The second half of the 1990s saw a profound change regarding the

structure of the colorífico business in Brazil. Until the early 1990s three TNC affiliates were producing glazing materials in Brazil (from Italy, Germany, and the U.S.). With the strengthening of the Spanish tile cluster, and the growing competitiveness of producers of glazing materials, Spanish coloríficos founded affiliates in Brazil, mostly in SC. Today, there are about a dozen important and a few more small coloríficos operating in Brazil. Competition between them is intense. In order to create a competitive advantage, they changed their behavior in a profound way. According to tile manufacturers, in the old days a colorífico would come up with a new glazing variety, drop it at the porter's and leave it to the tile manufacturer to figure out what exactly to do with it. During the last three to four years, the coloríficos have set up development and design teams, offering a full service to tile manufacturers – the design, the glazing material needed to produce it, and technical assistance in mastering new designs and solving problems in the production process. We found no indication that Brazilian tile manufacturers are discriminated. It rather seems to be the other way around, i.e. Spanish coloríficos draw on know-how available at headquarters and at Spanish R&D centers if they cannot solve production problems locally.

5.3.4 Structure of supporting institutions

One of the main features of the 1990s was the strong effort in the cluster to upgrade the supporting institutions. In fact, it is a showcase in two respects. It shows how a cluster can organize the creation of active advantages, and it shows how a cluster can screw things up by failing to find adequate institutional solutions.

The upgrading effort involved three institutions:

- One of the large firms had its own technical school, operating at secondary level,

the Colégio Maximilian Gaidzinski. It opened the school for students from other firms.

- A Center for Ceramics Technology (CTC) was founded as part of the SENAI system. It was modeled after ITC in Castellón and was supposed to offer testing and certification services to firms as well as conduct research projects with firms. One of the rationales of firms in demanding the foundation of the CTC was to achieve economies of scale in testing of inputs, and to have a local institution for technical certification of final products, thus saving time and money.
- The local university (UNESC) set up a course in ceramics technology in 1996 and another course in materials engineering in 1998. The course in ceramics technology leads to a certificate, but not to a formal graduation. It has been formulated in close cooperation with the firms, and there is a supervisory council with firm representatives specifically for this course which is tailor-made for the tile industry. The material engineering course leads to graduation, and it caters both to the tile industry and the plastics industry which has a relatively strong base in the region.

Even though each of these institutions is up and running, the effect is falling short of the expectations. This has to do with two conflicts which erupted or materialized in the creation of these offers.

First, there is the way CTC was organized. It is administrated by SENAI. SENAI is the main organization in vocational training in Brazil, and it is administrated by the private sector, being part of the system of the state-level Federation of Industries. Yet it has a high degree of independence, and it is often perceived as a governmental institution by firms, a perception that reflects, among other things, the fact that SENAI schools are rarely run in a business-like manner. SENAI is fi-

nanced via a levy paid by each industrial firm (1 % of the wage sum). But as formal employment is constantly decreasing, SENAI's income is decreasing as well, and therefore the organization has been involved in efforts to secure survival for quite some time. In the case of Santa Catarina, this took the shape of upgrading. SENAI is phasing out what used to be its main task, namely apprenticeship training, and is creating course offers for short- and long-term courses at secondary and tertiary level which it is selling to firms. Furthermore, SENAI is setting-up technology centers in each of the main clusters in SC, something that is even further away from its traditional mission. Managing these centers is pretty much based on learning-by-doing, and thus depends to a high degree on the individual characteristics of the director. Since it is not sure that a director of a SENAI school has frequently set his foot into a firm or worked there, it is a challenge for a director of a technology center to have a clear and updated notion of business management and the kind of demands a firm may have.

To make bad things worse, the CTC was not just run by SENAI but involved a partnership with the Materials Laboratory of the Federal University of Santa Catarina (UFSC) in Florianópolis. While the engineering departments of UFSC have an excellent record in quality of training, their record in terms of cooperation with the private sector is anything but. So the CTC ended up with a double directorship – a SENAI person with no industry background, and an UFSC professor with no industry background, either, but strong academic aspirations. So rather than emulating the experience of Castellón's ITC, the actors in the cluster managed to create exactly the opposite. Up to this day CTC suffers from lack of credibility with the firms. One element, which is not at all helpful, is the fact that there are hardly any full-time employees; even the current director is another person on loan from UFSC who spends at best three days per week at CTC. Most of the researchers are postgraduate and doctoral students financed with postgraduate scholarships, and

for their personal career perspectives it is essential to achieve academic excellence, rather than selling services to firms or helping them in solving their everyday problems. Accordingly, interaction between ITC researchers and firms is complicated; just one of the minor problems involved in technological development work is the fact that what a CTC researcher perceives as a prototype appears as a rough sketch of a possible idea to a firm person.

Second, there is the position of UNESCO and its relationship with CTC. It is important to know that UNESCO is a private university, deriving its income mainly from the fees paid by students, so that offering courses which are locally in high demand is essential for the economic viability of the university. The curriculum of the ceramics technology course had originally been developed by SENAI, only to be transferred to UNESCO after the intervention of one of the main cluster actors. One needs little creativity to imagine the kind of feelings SENAI/CTC had for the university afterwards, and it is not surprising that the relationship has been somewhat cool ever since.

Another important element in terms of the supporting institutions are business associations. They went through a process of upgrading in the first half of the 1990s, both at the cluster and the national level. The national association of the sector, ANFACER, has become more active in organizing conferences, seminars, and statistical work. Firms from SC play a key role in the association; currently, ANFACER's president is the son of the founders of one of the large firms. ANFACER also set up a national center for the sector. At the cluster level, the employers' association, Sindiceram, broadened its scope towards organizing seminars and playing a key role in organizing the lobby effort. However, its profile has dropped significantly in the recent past.

5.3.5 Evolution and deterioration of collective action

Collective action was very strong in the first half of the 1990s. It was aimed at solving acute problems:

- Tests and certification, to be done by the CTC,
- Higher education course, to be created at the local university,
- The provision of natural gas through an extension of the Bolivia-Brazil pipeline,
- Political lobbying to revive the construction sector.

The deterioration of collective action which was observable over the past three or so years can be traced back to several factors:

- The main technology and production problems are considered to be solved.
- Challenges are emerging at the marketing/sales/distribution stages, but this is a very competitive subject where companies are not ready to cooperate. To phrase it differently, in the categories of our research: The increasing importance of governance and rivalry inside the value chain, in particular downstream from production, militates strongly against collaboration between producers.
- With respect to the management problems in CTC, it is important to note that creating a physical structure is simpler than managing the interface university/academic research vs. applied technology. What remains is the question why the original role model, Castellon's ITC, has not been analyzed in a more profound way.
- Regarding the change in the sector association, it is important to see that individual leadership is highly important in associations with a low degree of profession-

alization, such as Sindiceram – and the current president never aspired this position and is actually much more gifted in leading his firm than the association.

- Finally, there is the issue of party politics. In Brazil, *política partidária* means not just party politics. The connotation of the term outside the political system is strictly negative, as it describes a Machiavellian conceptualization of politics, based on zero-sum games, where any initiative launched by Party A will face fierce resistance by Party Z for the simple reason of having been launched by that party, even if it is a meaningful initiative. Accordingly, a business association where key actors belong to competing parties is effectively paralyzed. This seems to have been another problem affecting Sindiceram, as well as the local business chamber which played a constructive role in the early 1990s but ceased to do so later on.

5.3.6 Competitive challenges

Even though firms in SC display quite different views regarding the competitive threat Santa Gertrudes establishes, it became quite obvious during the interviews that firms in SC are worried, and that the Santa Gertrudes factor figures heavily in their competitive strategies (and certainly much more than Mogi-Guaçu). The main point made by firm representatives is that low-price strategies, which had been pursued by some firms from SC in the past, are no longer viable. But the real issue is a different one and the irritation of firms in SC may be explained by this. For them, the days of a seller's market are over, and they are looking with a mixture of envy and disgust at firms from Santa Gertrudes which were still very much operating in a seller's market (views differ as to whether this situation continues). This cluster received a major boost after the Plano Real stabilization program in 1994. As the purchasing power of poor households increased, the demand for

small lots of cheap tiles increased as well. Being at best semi-formal, there are no reliable data available on the cluster, but insiders estimate that production grew tenfold in the 1990s. According to recent estimates, the average price of a tile from Santa Gertrudes amounts to R\$ 3 / sqm., whereas firms from Santa Catarina rather get R\$ 9 / sqm. Firms in SC have to enter into a serious marketing effort to convince consumers to pay a higher price, and they find that this is no easy task.

This leads us back to the observation of different phases in the cluster's evolution. The third phase, in the 1990s, was about production, and much less about marketing. These days, the main challenges in the production process have been mastered, but things are not going as well as expected. But the firms are not quite prepared, in terms of human resources, to deal with the marketing challenge. They mounted a major effort in terms of upgrading of human resources in the 1990s, but this was mostly directed at technological issues rather than marketing, sales, and after-sales services.

So what exactly are firms trying to figure out? First, they try to figure whether, and how, they can come to adequate market segmentation. Second, they try to develop sales and after-sales services to create a competitive advantage. Third, they are looking abroad, trying to expand their export share.

5.4 Further perspectives for upgrading

5.4.1 Production technology and management

Even though most firms have gone through a profound technological upgrading process, the sector will have to confront two major challenges: improved control of the production process and management upgrading.

Regarding the production process, there seem to be two problems. First, control of the process is to a large degree based on trial-and-

error and learning-by-doing, as opposed to a profound understanding based on scientific insights. Under normal circumstances the firms control the production process reasonably well. However, when they switch from one type of tile to another one (e.g. a different size), or when they introduce a new product altogether (e.g. using a new kind of glazing material), there seems to be an extended experimentation process which involves substantial amounts of scrap.

Second, control of the production process has in the past been focused at the firing process, i.e. starting after the press. The process of milling and mixing the argile was much less under control. Part of the trial-and-error and scrap involved in process changes appears to be due to insufficient control of the first production stages. Increasing control of this part was often mentioned as an important step forward in increasing quality and reducing costs.

A highly disputed issue regards the process of preparation of the mass. Firms in SC are using a wet process, whereas most firms in Santa Gertrudes are employing a dry process. The wet process is more costly but the mass resulting from it is more homogeneous, thus permitting higher quality tiles. However, specialists argue that it is possible to reach a comparable degree of control of mass using the dry process, thus getting a good-quality tile at lower costs.

Regarding management upgrading, there is a consensus among firms that the recent upgrading efforts have focused at the technical side of the business, neglecting the commercial side. A typical story would be that firms have upgraded to produce high-quality products, but that the sales department and representatives fail to understand the specific characteristics of the improved product, thus continuing their traditional way of doing business, i.e. selling based on lower prices. It is notable that, even though virtually all the firms we interviewed mentioned this problem, there is so far no discernable effort to

solve it, e.g. repeating the successful experience which led to the creation of the ceramics technology course. The explanation given by the firms was that it is difficult to imagine any kind of collaboration when it comes to sales, even though several firm representatives confirmed our observation that in, say, a course to train sales personnel 80 - 90 % of the content would be generic.

5.4.2 Product technology

Given the fact that it is usually perceived as a mature industry, the speed and degree of technological evolution of the tile industry is surprisingly large. Major product innovations in the recent past were gres porcelanato and gres polido. Both products try to emulate, or in fact improve upon, the visual appearance of natural stones, especially marbles and granite. Gres porcelanato started to appear in Italy in the second half of the 1980s and became widespread in the second half of the 1990s. One of the large firms in SC started to manufacture it in 1996; the other two will launch production in 2000. Gres porcelanato is a high-value product, with the ex-factory price three- to tenfold higher than that of ordinary tiles.

Gres polido targets a similar market segment, has a slightly different appearance and a price in-between that of conventional tiles and gres porcelanato. Italian producers in the mid-1990s first introduced it. The first (medium-sized) firm in SC started production two years ago, and other medium-sized firms launched gres polido in 2000. The price so far is between two and four times higher than that of ordinary tiles, but it is likely that this premium will decrease as supply increases.

Nobody mentioned any innovation which might be the next big thing after porcelanato and polido, but given the experience of the recent past it is likely that something new will appear. However, this kind of radical innovation depends on suppliers of machinery and glazing material rather than the tile producers.

5.4.3 Restructuring of the industry

It is not unlikely that the near future will bring increased specialization in the cluster, including a new division of labor between firms. As one firm representative put it, there are firms which are good at producing but bad at selling. Since the large firms are moving forward into strengthening brand images and integrating retail sales and services, one may speculate that they may opt for outsourcing of production. For medium-sized firms, especially those which currently are struggling to survive, this may open a road to survival. It is interesting to note that none of the interviewed firm representatives formulated such a scenario, but that they confirmed it as a likely evolution when we presented the hypothesis in the interview.

5.4.4 Options for renewed collective action

We found a substantial degree of collective action to improve competitiveness in our field research in 1996, whereas today there is little activity in that respect. This is certainly not due to the fact that there are not obvious options. We see at least two such options. First, there is management upgrading. Local universities in other parts of SC offer, for instance, courses to train professionals specialized in foreign trade, or management updating courses with teachers drawn from leading MBA programs. There is no such activity in and around the tile cluster. Accordingly, it would make sense if firms suggested such courses to the local university, and committed themselves to liberate their professionals to take part in them. Second, there is training of sales personnel and representatives. As mentioned before, there seems to be a major gap in this respect. There also exist obstacles, especially secrecy considerations. However, as many firm representatives confirmed, a large part of such training would have a generic content, and the advantages in terms of economies of scale, quality, and flexibility ought to be obvious.

6 Conclusions

In the first part this section we will start with a summarizing comparison of the three clusters. In the second part we will discuss mental models, an issue which is helpful in understanding the tile industry in two different senses. By presenting and questioning some mental models, we throw a light at some of the issues industry insiders love to discuss, and they are certainly issues of some importance. Therefore discussing them is helpful to better understand some tendencies in the sector. At the same time, in our view they are not the key issues, but rather camouflage them, in particular the ongoing struggle for supremacy in the sector, which is something industry insiders do not like to discuss.

In the third part of this section, we will address what in our view are the key issues in the sector at large. They relate to upgrading, the governance structure, and the relevance of value chains and standards to better understand this sector.

6.1 Comparing the clusters

The differences between the three clusters, and in particular between Sassuolo and Castellón, are remarkable (Table 15). Sassuolo and Castellón reflect nothing less than different paradigms, something that can not be explained by the different stages of evolution. Sassuolo is the more mature cluster, and yet it stands for a model of industrial organization that appears less advanced than that in Castellón. Sassuolo is still very much experience-based (as opposed to science-based), and tacit knowledge plays a much larger role than a scientific approach. Castellón moved from craft to industrial production at a later point in time. The technology-oriented paradigm which is one of its main features was not deliberately chosen but rather emerged out of necessity. From a technology- and production-angle Castellón appears as the most competitive place in the tile industry.

	<i>Italy</i>	<i>Spain</i>	<i>Brazil</i>
Cluster paradigm	Style, design, image, tacit knowledge	Technology, scientific understanding of production process	In search of paradigm -- forward integration?
Main competitive advantage	Design Brand image, Made in Italy Competence of sales reps Customer service; quick delivery	Aggressive business culture Price/quality ratio Specific design Reliability	Price/quality ratio Forward integration Knowledge of domestic market
Cluster weakness	Collapsed infrastructure (transport); limited effectiveness of collective action	Dominance of technology-based paradigm	Deterioration of collective action
Technological competence / domination of production process	Tile producers: Experience-based, profound tacit knowledge Capital goods: Strong technology base	Technology understood as process technology; leaders in glazing and frits	Strong role of Spanish colorifici Limited understanding of production process
Competitive strategy	Technological leadership (capital goods) Design leadership New applications for tiles Forward integration Internationalization Mergers and acquisitions – economies of scale in production, diversified brands	Product / design differentiation Production competence Fast follower	Design and innovation follower Forward integration
Product diversification strategy	To complete the product scope to supply a larger range of end markets; implemented by acquisition of medium sized specialized firms	To complete the product scope to supply a larger range of end markets, with different demand levels; only local investment in expansion of production capacity	Same as Spain; focused in lower market end
Vertical integration of tile firms	Medium to high	Low	Very high
Industrial structure	Holdings of several specialized, legally independent firms	Few groups, mostly independent family-owned firms	3 large and about 10 medium-sized firms
Internationalization strategy	Global presence in all potentially relevant markets FDI in main markets	FDI by glazing producers No FDI in tile production	Reps in main markets

It would thus appear that Castellón is better prepared for the future, even if production technology is to an important degree driven by Italian capital goods producers. But they are working closely with Spanish tile producers. If there are doubts regarding the future of Castellón, then they are due to the evolution of global value chains. Italian firms are more aggressive in their move forward into distribution, and in this way they may establish a decisive competitive advantage.

There is evidence that the move into distribution is one of the factors militating against effective local governance for improved competitiveness in Sassuolo. In this respect, it

would appear that the dense institutional fabric in the Castellón cluster so far benefits from the firms' decision to focus at production rather than distribution. This is even more plausible if we look at the Brazilian cluster, where the firms' increasing attention to the final section of the value chain is again an important explaining element in deteriorating local governance (Table 16).

Talking about governance, it is important to make explicit that it was no omission that the role of government has only rarely been addressed in this paper. The tile industry clusters illustrate that in terms of locational strategies governance and government can be very different things. In the cases of Brazil

and Spain, government policies have been important in earlier phases of the evolution of the sectors; in both cases it was central government policies. But over the last years, in the clusters in Italy and Brazil government has played hardly any role, and in Spain it has rather managed to remove obstacles than trying to be a strategic actor. Upgrading in the clusters had a lot to do with collective action and the creation of locational advantages, but this was largely driven by the private sector.

6.2 Mental models of industry actors

To better understand the industry, it is useful to have a look at some mental models which are very strongly developed in the sector, i.e. come up in almost any conversation. Some of them are outright myths, whereas some others are at least distorted representations of a reality. All of them, however, in one way or another refer to the evolution of the industry in the past three decades, which was the period of transition from handicraft to industry in tile production. All of them also distract from what the key issues in the industry are, namely governance issues along the value chain.

6.2.1 Wall vs. floor tiles

Tiles may be used to cover their walls or floors. The appearance of both is often the same, but the physical characteristics are not. Floor tiles have to be more resistant, especially if set in places with a lot of traffic. Therefore, they usually have a lower water absorption, i.e. they are denser and thus less subject to abrasion. Creating a denser tile is more costly, so it makes little sense to put a floor tile at a wall.

A common statement to characterize the industry is that Italy is specialized in floor-tiles and Spain in wall-tiles. A glance at the numbers does not really verify this. Italian industry has a product mix with a share of more than 80 % for floor tiles, while in the case of Spain the ratio is about 50/50. What is behind this statement is, in fact, a perception which has to do with the style traditions in the two industries. Italian tiles often were rustic, whereas Spanish tiles often were glossy. The first was perceived as more appropriate for floors, the second for walls. However, this distinction is making ever less sense.

The real issue is the marketing strategy. Spanish producers typically offer their customers a complete assortment of style-

Table 16: Cluster Comparison – Governance Issues

	<i>Italy</i>	<i>Spain</i>	<i>Brazil</i>
Organization of value chain	<ul style="list-style-type: none"> - local machine producers - mostly Spanish colorifici - local tile producers - sales reps 	<ul style="list-style-type: none"> - Italian machine producers - mostly local colorifici - local tile producers 	<ul style="list-style-type: none"> - Italian machine producers - foreign colorifici with local production - local tile producers - some firms integrating forward into retail
Commercialization structure	Own distribution network seen as key by leaders; own managers present in main markets; specialized retailer shops offer specification and installation services	Leaders target high-end segment by own distribution network building; brand development; specific design	Specialized shops offering complete service to higher end customer; show rooms, specification and installation recommendation at point of sale for high-medium product ranges
Power structure in the cluster	Strong position of tile manufacturers Power struggle between machine and tile manufacturers	Strong but not dominant position of glazing producers	Strong position of three large firms, fierce rivalry between them
Role of government	Very limited	Supportive role of national, regional and local government	Limited support from regional government
Evolution of institutional fabric	Strong business associations Limitations in terms of other supporting institutions	Very strong environment of supporting institutions	Effort to build supporting institutions, but inadequate management led to low effectiveness

compatible wall and floor tiles, whereas many Italian producers focus much more at floor tiles. This reflects to a large extent preferences in the home market and some key export markets.

6.2.2 Red vs. white body

The main raw materials for most types of tiles is clay, which comes either in white or red. Italian manufacturers used predominantly white clay, whereas the Spanish prefer red clay since it is more easily and cheaply available. Both sides claim that their raw material is superior, but in fact there is no difference in terms of relevance for the quality of the final product (the only exception being many varieties of unglazed porcelain tiles which can only be manufactured using white clay). In fact, the red vs white controversy some extent appears as a conflict between science and belief-systems. But there is also a real issue involved, namely the capacity of Italian manufacturers to create, by means of an advertising effort, the image that white-body tiles are better. Spanish manufacturers love to complain about this.

6.2.3 Italian tiles are more expensive than Spanish tiles

The statistical data are indisputable: The average price per square meters of Italian tiles is somewhere around EU 8, whereas for Spanish tiles it is something like EU 5. What is disputable, however, is the sense that this calculation makes. The prices of standard tiles and *graniti di fabbrica* differ by a factor of ten, or even more, and so-called special parts (used, for instance, for ornaments and other kinds of decoration) are even more expensive. Moreover, an important element in explaining the different averages is the overall product structure of the Italian industry, with a much higher share of porcelain tiles which not only sell for a higher price but also use more expensive raw materials and are more costly to produce. In fact, Spanish sources claim that

firms from Castellón achieve higher margins, and are more profitable, than their Italian competitors.

6.2.4 Increasing size vs. differentiated small sized designs

In particular in Brazil, it is common to hear the statement that increasing the size of tiles leads to higher prices and better margins. However, the overall validity of this statement is highly dubious. There can be no doubt that tile sizes are getting larger all the time. 20 by 20 and 30 by 30 cm continue to be standard sizes, but sizes such as 60 by 60, 90 by 90 and 60 by 120 are increasingly available, especially with porcelain tiles. But this does not mean that small formats are always cheap. A simple white 20 by 20 tile may cost next to nothing, but a set of 10 by 10, 20 by 20 and 10 by 20 tiles, some of them decorated and creating an aged rustic appearance achieves a much better price per square meter than a standard 40 by 40 porcelain tile. Therefore, not size is the issue but design, differentiation and marketing. As a matter of fact, in Italy the dominating format, with almost 50 % of production, is 30 by 30 and 33 by 33.

6.2.5 Wet vs. dry mixture

Another issue which comes up in particular in Brazil involves the preparation of the mass, which may or may not involve the use of water. Currently wet grinding leads to a superior control of the overall process and thus to a better product. But there is some evidence that this difference will fade in the near future, as Italian manufacturers of capital goods are starting to refine the dry grinding process. This is a response to increasing environmental concerns, in this case in particular the high consumption of water in the production process.

6.3 Evolution of the tile industry

In this subsection we take a look at the international tile value chain at large. Remember that the three clusters which we have investigated produce about 70 % of the tiles which are traded across borders. One may speculate that this may change drastically in the future if the Chinese manufacturers seriously enter into the world market. But so far knowing the three clusters is sufficient to understand the production side of international value chains in the tile business.

6.3.1 Upgrading

For the external observer, what is one of the most remarkable features of the tile industry is the constant upgrading. One is used to this phenomenon in other industries, especially those denominated as “high-technology”, but one would not necessarily expect it in a sub-sector of the construction materials industry. In fact, there are four different aspects to upgrading.

First, there is incremental change in products. There are annual or even semiannual launches of new products, responding to changes in fashion, creating new colors, surface structures, and design concepts. The life-cycle of many tiles is short, just 2 - 3 years.

Second, there is product differentiation:

- A given firm tends to expand its product spectrum, which today is far beyond the rustic vs. glossy difference.
- The production of special parts has been very dynamic, creating an enormous variety of options.
- Many firms come up with dedicated designs for important markets, reflecting country differences in terms of style and color.
- Tiles are launched for new purposes: façades, public places, etc.

Third, there is radical product innovation. Right now, what is coming up is lamina and plac-up. In the year 2000, the big thing was *marmi* and *graniti di fabbrica*. Before, it was *gres polido* and porcelain, and before that *monoporosa* / single firing.

Fourth, there is radical change in the way the value chain is being organized. E-commerce is only just coming up, but innovation such as moving forward into commercialization or even going into tiling are spreading rapidly. In fact, this is something where Brazilian firms have leap-frogged Italian and Spanish companies. They have achieved a high level of development of the final stage of the value chain, in terms of creation of ambiances, ambience-related advice to customer, and the availability of architects at showrooms who give advice for free.

6.3.2 Governance structure

Looking at the tile industry as a whole, there are two different axis where governance issues are currently at stake. First, there is the Italy vs. Spain axis. The relationship between the two leading clusters is marked, at the same time, by strong rivalry and by co-operation. Both clusters share certain interests, such as the development of new markets and the reduction of import barriers in potential markets, and there is even some degree of direct co-operation between the clusters, i.e. between Assopiastrelle and Ascer. But the rivalry is also notable. In fact, Italians tend to have a somewhat patronizing way of talking about their Spanish competitors, whereas the Spanish speak with respect about the Italians without hiding the pride about their own achievement. For the external observer, there is strong evidence that the Spanish cluster has overtaken the Italian, not only in terms of production volume. The Castellón cluster is a showcase of upgrading via fierce local rivalry, collective efficiency, and effective collective action, whereas the Sassuolo cluster is not. The Spanish tile producers are hungry, whereas their Italian competitors some-

times appear as if they had just finished a typical Emilia-Romagna five course dinner.

But the real issue in terms of governance and Italy vs. Spain is the contest between the capital goods industry and the glazing materials producers about who will be the dominating force in the future. Both industries are the main process and product technology and design drivers, and both struggle to establish themselves as the leading force. It is unlikely that either will succeed in doing so in the near future. We may rather look forward to ongoing upgrading.

The second axis involves the tile manufacturers vs. tile sellers issue. Currently, both sides are only at the beginning of a concentration process, and power seems to be widely distributed. It is difficult to forecast which side stands a better chance of gaining the more powerful position, especially since there is a lot of reflection going on in the tile industry, looking at the experience of other industries where commercialization is strongly concentrated and thus powerful. Many actors in the industry have a clear notion of what is at stake. Restructuring of the final section of the value chain is not so much governed by the invisible hand of the market but rather by constant analysis, reflection, and power games. But it must be noted that even the large tile producers are at a disadvantage vis-à-vis competent national sales chains. We have seen that the structure of the retail channels in the main target countries differs. Unlike in other industries, such as fashion or furniture, it is unlikely that any tile manufacturer can establish a single model of distribution and sales across very different countries and markets. The experience of one of the big Brazilian firms, which is moving to an exclusive franchise network is instructive: It is too big to sell all its production this way; but if it were much smaller, it would not have the financial clout to set up a franchise network.

So what is the main pattern of evolution of governance in the tile value chain? So far the predominating pattern is network governance,

with hierarchy playing a very small and markets a somewhat larger role. It is network rather than market since the value chain is both a negotiation system, with commercial negotiations not occurring anonymously at some exchange but rather over an espresso and some petit fours at Cersaie or one of the other fairs, and a discourse community, with constant reflection going on, not just about fashion/style trends but also about the restructuring of the sector, in particular the evolution of the distribution system. At the production stage, it is notable that there is regular interaction between the business associations, which recently started to organize "World Meetings", where representatives of associations of all major producer countries meet.⁵

Speculating about the future evolution of governance, we would suggest that it is likely that network governance will prevail for quite some time. There can be no doubt that many actors in the industry would like to move towards quasi-hierarchies, and everybody would like to call the shots. But as power resources appear to be relatively evenly distributed along the value chain, it is unlikely that any single actor or group of actors will succeed in establishing a quasi-hierarchy.

6.3.3 Global value chains

In the context of the tile industry, the issue of global value chains has to be addressed in a different way than, say, in the garments, footwear, or furniture industry. For a representative of a large sales chain, there are less places to go shopping for tiles than for furniture, even though in each of the places there are many firms to choose from. But then there are also more purchasing representatives than

5 At the meeting in Modena in May 2000, presentations were given by representatives from Italy, China, Spain, Brazil, Turkey, Mexico, India, Portugal, and the U.S. The meeting was organized by Acimac (see Acimac 2000).

in other industries since the degree of concentration is lower, and there are more distribution channels (Figure 5). Therefore, the powerful global buyers who have such a strong position in other industries do not exist in the tile industry.

What is currently going on is a process of restructuring of international value chains which emanates from both manufacturers and sellers. Each of them wants to position himself as the player who calls the rules of the game. As we have seen in the case of Sassuolo, this is a game that involves rivalry not only between sellers and buyers, but also among sellers who are competing for dominance in scarce marketing channels. This rivalry is compromising collective efforts to enhance competitiveness in the Italian cluster. A similar process, albeit along the domestic rather than the international value chain, is going on in Santa Catarina, with the same effect of weakened local governance.

6.3.4 Standards

Standards are less important in the tile industry than in many other industries. Product certification does not play much of a role so far, be it technical, environmental, or social standards. Many products are certified according to technical standards, but this does not create a competitive advantage and is not even expected by customers. ISO 9000 plays hardly any role at all. Many firms are certified according to ISO 14 000 or EMAS, and they expect that this will be expected by customers in the future; right now, it is no issue. Social standards do not play any role since the level of technological sophistication in the clusters we have investigated is so high.

6.4 The Interaction of Global and Local Governance: Implications for Industrial Upgrading

Where does all this leave us in terms of the lead questions of the research project to

which this paper makes a contribution? Several observations come up:

- The process of concentration of commerce has not occurred to the same degree in all industries and types of products. Whereas it is very strong in most areas of consumer non-durables, it has made less progress in certain durables. Construction materials is one of them.
- The international commercialization of tiles clearly does not involve arms-length transactions, so the question for governance patterns in the value chain is a valid one. But the distinction between buyer-driven and producer-driven commodity chains does not make much sense for the tile business. The tile value chain currently is pretty much organized in a network-like way, with power resources being distributed more widely than in other value chains.
- A very strong position of a leading cluster in a given industry does not necessarily impede the development of latecomers. The cluster in Castellón has, at least for the last 20 years, had full access to innovation emerging from capital goods producers in Italy. The cluster in Santa Catarina has enjoyed access to both Italian machinery and Spanish glazing materials, and we did not find evidence that there are obstacles in terms of transfer of latest design.
- Upgrading is, first and foremost, driven by rivalry. The extent to which localized competitors can overcome their rivalry and embark on successful joint action, for instance to create supporting institutions, depends to a large extent on the collective self-definition of the cluster. In the case of both Spain and Brazil, catching-up with the Italians was a sufficiently strong motive to overcome personal animosities.
- Locational strategies, based on collective action inside the cluster, are viable even if

external actors play a decisive role. In the case of Castellón, the dynamics inside the cluster are so strong that Italian machinery producers are gradually strengthening their local base, in the same way the foreign glazing producers did in the past. In the case of Santa Catarina, the strong inflow of foreign glazing producers may, in an indirect way, have contributed to the weakening of collective action, but other factors were much more important in this respect.


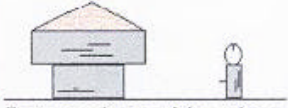
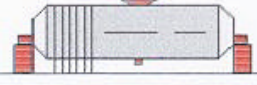
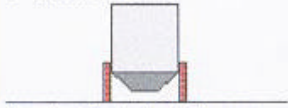
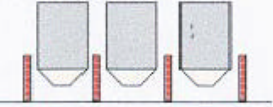


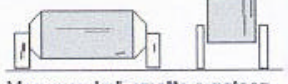
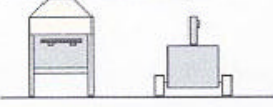
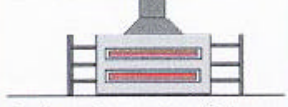

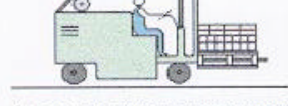
Taking these findings together, we see that combining the cluster / local governance and the value chain / global governance perspective leads to valuable insights into the functioning of industries. Cluster research tended to focus at core production activities, whereas value chain / commodity chain research paid little attention to local / cluster issues. In the case of the tile industry, it becomes obvious that production is not the main issue when it comes to understanding rivalry and competitiveness. They are rather determined by actors and through interaction along the value chain – upstream from production by capital goods and glazing materials producers, downstream by access to distribution channels. Sophisticated production technology and domination of the production process are basic conditions in this sector. They do not establish a competitive advantage. It is rather based on design competence, logistics, marketing and access to distribution channels. It is notable that the cluster which is the latecomer in this respect, the one in Santa Catarina, is a pioneer when it comes to creative approaches to distribution channels, and perhaps logistics. It is also notable that the fierce local rivalry, which is being intensified by value chain issues, makes local governance difficult but not impossible. Even in the Santa Catarina cluster we found that there would still be options for local governance to enhance competitiveness, if local leadership were stronger. And the case of Castellón demonstrates the enormous dynamism which can be created through effective local governance.

7 Bibliography

- ACIMAC, various Annual Reports
- ACIMAC (2000): 2° Meeting Mondiale della Ceramica. Atti del Convegno / Conference Proceedings. Modena, Italia, 26 Maggio 2000.
- ASCER (1999): Informe. El sector español de fabricantes de baldosas cerámicas 1998. Castellón.
- Assopiastrelle, various Annual Reports
- Bertini, Silvano (1999): The Ceramic Cluster of Sassuolo (Italy). Presentation given at the Competitiveness Institute Conference, Varese, November.
- Bigné, Enrique (1998): Obstáculos al comercio. Remoción de obstáculos comerciales. Foro de Debate entorno a la Industria Azulejera, Bancaixa Obra Social, Segunda Sesión, 10 de noviembre de 1998.
- BNDES, (1995): Segmento de Revestimentos Cerâmicos. BNDES, Informe Setorial, , No. 7.
- Bursi, Tiziano (1997): Strategie di crescita ed acquisizioni nell'industria ceramica italiana. Giappichelli, Torino
- Bursi, Tiziano, & Marchi, Gianlucca (2000): L'Evoluzione dei Rapporti di Subfornitura nel Sistema della Tecnologia per Ceramica. Il Distretto di Sassuolo. Modena.
- Burzacchini, Piergiorgio (2000): Porcelain tile, its history and development. In *Ceramic World Review*, No. 37, pp. 96-103.
- Campos, Renato Ramos, Nicolau, José Antônio, & Ferraz Cário, Silvio Antônio (1998): O Cluster da Indústria Cerâmica de Revestimento em Santa Catarina: Um Caso de Sistema Local de Inovação. Mangaratiba: (mimeo).
- Ceramic World Review, various issues
- Generalitat Valenciana, Bancaja & Cluster Competitividad, (1999): Iniciativa de refuerzo de la competitividad. El cluster azulejero en Castellón. Valencia.
- Gereffi, Gary (1996): Global Commodity Chains: New Forms of Coordination and Control Among Nations and Firms in International Industries. *Competition and Change*, Vol. 4, pp. 427-39.
- Gorini, Ana Paula Fontenelle, & Correa, Abidack Raposo (1999): Cerâmica para revestimentos. BNDES Setorial, No. 10, pp. 201-252.

- Meyer-Stamer, Jörg (1997): *Technology, Competitiveness and Radical Policy Change: The Case of Brazil*. London: Frank Cass.
- Meyer-Stamer, Jörg (1998): *Path Dependence in Regional Development: Persistence and Change in Three Industrial Clusters in Santa Catarina / Brazil*. *World Development*, Vol. 26, No. 8, pp. 1495-1511.
- Meyer-Stamer, Jörg, Adam, Bernhard, Bantle, Stefan, Lauer, Alexandra, & Mohaupt, Daniela (1996): *Industrielle Netzwerke und Wettbewerbsfähigkeit. Das Beispiel Santa Catarina / Brasilien*. Berlin: Deutsches Institut für Entwicklungspolitik.
- Nadvi, Khalid (1999): *Collective Efficiency and Collective Failure: The Response of the Sialkot Surgical Instrument Cluster to Global Quality Pressures*. *World Development*, Vol. 27, No. 9, pp. 1605-1626.
- Pavitt, Keith (1984): *Sectoral patterns of technical change: Towards a taxonomy and a theory*. *Research Policy*, Vol. 13, pp. 343-373.
- Payeras, David (1999): *Mature Clusters: Crisis and Regeneration. The Case of the Castellón Ceramic Tiles Cluster*. Presentation given at the Competitiveness Institute Conference, Varese, November.
- Piore, Michael J., & Sabel, Charles F. (1984): *The Second Industrial Divide. Possibilities for Prosperity*. New York: Basic Books.
- Porter, Michael (1996): *What is strategy?*, in: *Harvard Business Review*, Vol. 74, No. 6, pp. 61-78
- Pyke, F., Becattini, G., & Sengenberger, W. (1990): *Industrial districts and inter-firm co-operation in Italy*. Geneva: International Institute for Labour Studies.
- Romero, Luiz Lauro, et al. (1994): *Cerâmica para revestimento*. Rio de Janeiro: BNDES (Relato Setorial).
- Rowley, Chris (1996): *Flexible specialisation: some comparative dimensions and evidence from the ceramic tile industry*. *New Technology, Work and Employment*, Vol. 11, No. 2, pp. 125-136.
- Russo, Margherita (1985): *Technical change and the industrial district: The role of interfirm relations in the growth and transformation of ceramic tile production in Italy*. *Research Policy*, Vol. 14, pp. 329-343.
- Schmitz, Hubert (1989): *Flexible Specialisation - A New Paradigm of Small-Scale Industrialisation?* Brighton: Institute of Development Studies.
- Schmitz, Hubert (1995): *Collective Efficiency: Growth Path for Small-Scale Industry*. *Journal of Development Studies*, vol. 31, No. 4, pp. 529-566.
- Schmitz, Hubert (1998): *Responding to Global Competitive Pressure: Local Co-operation and Upgrading in the Sinos Valley, Brazil*. Brighton: Institute of Development Studies (Working Paper, 82).

Annex: Production process of ceramic tiles (Source: Gorini and Correa 1999)

<p>1 - Box de Matérias Primas</p>  <p>Estocagem de matérias primas para base.</p>	<p>2 - Balança</p>  <p>Pesagem das matérias primas conforme a formulação.</p>	<p>1 Raw materials store Stock of basic raw materials</p>
<p>3 - Moinho de Bolas</p>  <p>Moagem via úmida das matérias primas. Produção de barbotina.</p>	<p>4 - Atomizador</p>  <p>Atomização da barbotina para obter pó.</p>	<p>2 Weight Weighting of raw materials according to formula</p>
<p>5 - Silos de pó Atomizado</p>  <p>Armazenamento e Homogeneização do pó atomizado.</p>	<p>6 - Prensa e Secador</p>  <p>Formatação e secagem da Base</p>	<p>3 Ball mill Wet milling of raw materials to get paste</p>
<p>7 - Estoque de matérias primas para esmalte</p>  <p>Pesagem de esmalte conforme formulação.</p>	<p>8 - Moinho de Esmalte e Tanque com agitação</p>  <p>Moagem de Esmalte e estocagem.</p>	<p>4 Atomization Atomization of paste to get powder</p>
<p>9 - Linha de Esmaltação</p>  <p>Aplicação de esmalte e decoração sobre o piso crú.</p>	<p>10 - Forno de Monoqueima</p>  <p>Queima do revest. cerâmico e esmaltado a $\pm 1.160^{\circ}\text{C}$.</p>	<p>5 Powder silos Stockkeeping and homogenization of powder</p>
<p>11 - Escolha e Embalagem Automatizada</p>  <p>Escolha, classificação e embalagem.</p>	<p>12 - Expedição</p>  <p>Armazenamento e carregamento.</p>	<p>6 Press and dryer Formatting and drying of biscuit</p>
		<p>7 Stock of glazing materials Weighting of glaze according to formula</p>
		<p>8 Glaze mill and moved tank Milling of glaze and stockkeeping</p>
		<p>9 Glazing line Application of glaze and decoration</p>
		<p>10 Kiln Firing of tile</p>
		<p>11 Selection and automated packaging Selection and classification of grade, packaging</p>
		<p>12 Expedition Stock and transport</p>