Jörg Meyer-Stamer, Claudio Maggi and Silene Seibel[1], 2003,

'Upgrading in the tile industry of Italy, Spain and Brazil: Insights from cluster and value chain analysis',

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1 Field research for this case study was conducted in 2000. It involved interviews with firms and institutions in Italy, Spain and Brazil and visits to the construction materials fair in Brazil and the tile fair in Italy.

1 Introduction

The chapters in this book investigate the relationship between clusters and value chains, and in particular the effect that the integration of clustered firms into value chains has on collective upgrading efforts inside clusters. This focus was chosen because we observed that earlier research on clusters, including our own, did not systematically explore the external connections, and because we observed that value chain researchers did not systematically analyse options for local action within clusters.

In this chapter, we will address these issues in the context of a case study on the wall and floor tile industry. We chose this industry for three reasons. First, it is a strongly clustered industry. A large part of world production originates from just two clusters - Sassuolo in Italy and Castellón in Spain, and these two clusters dominate the technological evolution of the industry. Second, it is a highly internationalised industry. The two clusters have a very strong export performance, both in terms of final products, and capital goods and key inputs. Third, there are emerging clusters in advanced developing countries, and the technologically dominant position of developed country clusters does not seem to translate into an ability to stem the upcoming competitors.

Addressing the tile industry exclusively from either the cluster or the value chain perspective would provide relevant data, but in the end it would neglect crucial features and thus not lead to an adequate understanding of its evolution and upgrading perspectives. A cluster perspective would tend to focus on horizontal and vertical linkages and co-operation within the location, but overlook the external linkages. A value chain perspective would focus on the vertical linkages, irrespective of location and would try to determine whether, in the terminology introduced by Gereffi (1996), this industry is a supplier-driven or a buyer-driven chain. But even though value chains are very important for its understanding, the tile industry does not fit into either of these chains introduced by Gereffi. The tile value-chain is not dominated or driven by global buyers or strong multinational corporations. The relationships are more even and combine network and market relationships. Gereffi and others have advocated the analysis of power, but in the tile value chain strong power positions have been at best transitory. There is little space for rents except for innovation-based rents, which tend to be competed away very quickly. We will interpret the recent restructuring of the tile value chain as the result of atomised efforts to create rents based on market-power. This, we will argue, involves a process that erodes the conditions for successful local network governance without actually creating dominant players among the actors. We will show that the struggle for dominance within the value chain is reinforcing local rivalry and eroding existing institutions that execute localised collective action. In fact, it appears that the struggle for domination among the established actors is creating favourable conditions for latecomers who can, to some extent, play the incumbents against each other. Underlying both the changes in the clusters, in particular the Italian cluster, and the value chain is a process of consolidation that can be interpreted from an industrial life cycle perspective. This adds a third dimension, apart from clustering and value chains, which we did not consider at the outset of the research but which turns out to be an important factor in explaining the changing governance of the tile industry.

The structure of this chapter is as follows. Section 2 gives an overview of key features of the tile value chain. Sections 3 and 4 analyse the evolution of the two leading clusters in Italy and Spain. Section 5 addresses the issue of latecomer development by examining a cluster in Santa Catarina, Brazil. The final section draws together the main conclusions. The empirical material on which this chapter is based is set out in a detailed research report (see Meyer-Stamer et al 2001).

2 The structure of the tile industry

China is the largest world producer of tiles, and it is also the biggest consumer. However, imports and exports are extremely low. As a result, it has little influence on the global tile value chain. In order to understand this global value chain, it is important to look at the five leading tile markets (next to China), namely Brazil, Spain, the US, Germany and Italy. Three of these markets are major producers, i.e. Italy, Spain, and Brazil, while Germany and the US are the main importing countries. Italy and Spain are by far the most important exporters of tiles.

2.1 Key facts about the supply side of the tile value chain

In order to understand the evolution of the tile value chain, it is useful to know a few technical facts. Tiles consist of clay and glazing materials. The production process starts with the milling of clay. Fine clay powder is shaped into the tile body by extremely powerful presses. In the conventional production process, the tile body is covered with glazing material which gives the visual appearance. Apart from conventional tiles, there are porcelain tiles which are not glazed; their visual appearance depends on the consistency of the powder (which includes additional inputs, apart from clay) and the quality of the pressing and burning process. Both glazed and porcelain tiles pass through kilns where they are burned at temperatures beyond 1200° C.

There are two types of supply industries which play the main role in pushing the technological frontier of the tile business forward.[2] First, there are suppliers of capital goods. They are located almost exclusively in Italy. They have in-house development departments for both machinery and tiles, and the large ones also have experimental production lines. They constantly develop incremental innovations for each step of the production process.

Second, there are producers of glazing materials. Technically, this is a subsector of the chemical industry. It is a sector that has undergone profound restructuring in the past 20 or so years. Until the 1980s, glazing manufacturers came from different countries, and not always from places with strong tile industries. Leading glazing manu-

2 Other suppliers, such as producers of clay, are not discussed here because they neither shape the technological evolution of the tile industry nor are they particularly powerful.

facturers were Colorobbia (Italy), Degussa (Germany),[3] and Ferro and Johnson (US). Today the sector is dominated by Spanish firms, all of whom have their headquarters and main laboratories in the Castellón region. The four firms mentioned above have also located their main tile-related operations there. Both types of companies have production or sales affiliates in several other countries as well.

Competition within and between these two supplier industries is defining a key pattern in the tile business, namely frequently changing products. Incrementally different designs are now launched on a quarterly basis, while radically different designs are launched annually.

2.2 The demand side

In order to get an adequate understanding tile distribution and sales it is essential to recall that tiles are part of the construction material industry. Second, tiles are competing with other materials used to cover floors and walls, be they inside or outside buildings. This gives rise to two issues, i.e. who is the customer and who attends the customer.

- 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 specialised tiling firms). Each of these have different criteria for making a purchasing decision. Consumers, with limited information, make their decision based on aesthetic and price criteria, as well demand basic advice at the point of sale. Architects are well-informed, they require more sophisticated information, and have a more refined set of aesthetic criteria. In this respect, they are the most sophisticated customers. Construction companies are mostly interested in low prices. This diversity creates challenges for tile producers in terms of advertising and product information.

- There are three, and in some countries four, types of points of final sale. First, there are independent shops specialising in tiles. They cater to the medium- and high-price segment. They often have alliances with tiling firms, some even have their own tilers. Second, there are home-centres 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 US there are floor covering shops which used to sell mainly carpets and vinyl but have started to sell tiles as well. All of these points of final sale may purchase tiles from wholesalers, but it is increasingly common for manufacturers to deal directly which final sellers, especially large chains of home-centres and DIY shops.

What are the main tendencies in terms of commercialisation? So far, commercialisation of ceramic tiles is not particularly concentrated. A large tile manufacturer may have as many as 4,000 customers. However, industry insiders are anticipating, and in mature markets such as Germany they are already clearly discerning, a concentration

3 In August 2001, Degussa sold its glaze-related business unit to Ferro.

process in commercialisation, in particular a strong growth of home-centre chains and DIY shops. This process would have two consequences. First, intermediate actors, such as import agents and wholesale traders, may suffer or even disappear. Second, it is likely that there will be a polarisation in tile demand, with a strong demand both for cheap tiles (sold in home-centres and DIY shops) and for fashionable, design-intensive, high quality tiles (sold in specialised shops), with the middle segment slowly disappearing. As regards brands, few firms found it worth creating a brand image with individual customers. In terms of shops, brand image seems to be more importance.

3 The evolution of the Sassuolo cluster

Ninety per cent of Italy's tile production capacity is located in the Emilia-Romagna region, with 80 per cent being concentrated in 80 km² of ten municipalities around Sassuolo in the province of Modena. The industry builds upon a centuries-long tradition in craft-based ceramics 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 agriculture, and the availability of clay on a rural estate sometimes generated the idea to start tile production. Today, the Sassuolo cluster is mature. A consolidation process has been going on for many years. Consolidation leads to a change in upgrading strategies and an emphasis on value-chain related issues when it comes to creating a competitive advantage. It also leads to erosion of local network governance.

3.1 Stage of industrial evolution: Consolidation

As shown elsewhere (Meyer-Stamer et al 2001), Sassuolo became a mature cluster in the 1990s. The number of mostly family-owned small-medium sized enterprises peaked at around 480 in the mid-1970s and dropped to 260 by the late 1990s. In contrast, the number of employees has been more or less stable. 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. However, although this is the dominant trend, it is not the only one. Restructuring of the cluster also displays a tendency towards polarisation between large producers with a broad product portfolio and producers that are catering for niches, in particular special parts (for instance, small tiles for reliefs and decoration).

There are two typical patterns of concentration. First, minority cross-holdings between firms were transformed into more formal ties, creating a holding or group. The second pattern arose because most 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.

One would expect that concentration would involve an attempt to create economies of scale. This has been the case regarding production, but much less so in terms of branding and sales. Instead, the formation of a group typically led to the better

utilisation of existing production capacity. As overall demand tended to grow, firms expanded. However, competitive pressure forced the groups to improve on efficiency of production. With the formation of a group, the production of a given brand of tiles could take place in any of the groups factories, leading to improved utilisation of production capacity.

Recent changes in terms of segmentation strategies refer to the issue of branding. There are two distinct manifestations. First, some firms experiment with brand image transfer from other industries. 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 trend. Second, some large firms are producing private labels for large customers, especially home-centres; this appears to be an important trend. It is part of an effort to stimulate growth at the low-end of the market. In other words, producers have a clear notion that upgrading by moving exclusively towards the upper end of the market is not a viable option. Instead, they are trying to widen both the high- and the low-end, to the detriment of the medium segment.

The process of concentration has implications for collective action inside the cluster. As outlined earlier, until the 1980s, the predominant pattern was one of small and medium-sized family-owned companies. At that time, collective action was crucial to overcome competitive disadvantages due to small size, for instance in terms of building a brand image for Italian tiles and accessing foreign markets (Russo 1985). Nowadays, more than half of the employees in the cluster work in companies which are part of a group (Brioschi, Brioschi and Cainelli 2001), i.e. no longer qualify as small and medium-sized enterprises, and with increasing size they rely less on collective action.

3.2 Structure of the value chain: Downstream activities

For the Italian tile producers, a key issue in upgrading has been the restructuring of downstream parts of the value chain. Starting in the 1970s, Italian firms systematically began to explore export markets. Some leading firms undertook serious efforts to create a brand identity abroad, but it was mainly the Tiles from Italy label which made the difference, because Italian tiles generally have both a different appearance and a more diversified size than those produced locally in target markets. Tile manufacturers also started to collaborate with external designers and artists to create innovative designs. At this time, this was essentially achieved by combining such a superior production technology and efficiency with superior production design and marketing that the Italian tile industry established a clear leadership position, driving traditional competitors such as German firms out of the market.

More recently there has been a causal link between concentration and internationalisation. Exports have doubled in the 1990s. Italian firms argue that there are minimum size requirements for a company to be able to be present in several export markets, which are due to production capacity and size of the sales force. Internationalisation so far means having sales representatives, and in many cases distribution warehouses, in target markets. Internationalisation of production, however, is so far an unusual phenomenon and limited to a handful of the largest groups.

Italy's tile export market is highly concentrated, with about half of total exports going to Germany, France and the US. There has been low growth in European markets, whereas the US market displayed strong growth during the 1990s. Italy's market share in the US is twice that of Spain, its main competitor. It is essential for Italian firms to defend their leadership in the US market if they want to increase their exports. In order to do so, they are increasingly concerned with the downstream part of the value chain.

Italian tile manufacturers, especially the leading firms, play an active role in shaping international value chains, especially during the commercialisation stage. This is particularly evident in the US, whereas in Europe (especially Germany), home-centres seem to be the more aggressive actors. The differences in market sophistication strongly influence the power of distributors vis-à-vis tile producers. In the German market, where tiles have a long tradition, the sales structure is much more mature than in the US, which is an emerging market in terms of tiles. In the US, Italian tile producers are systematically training sales personnel to deal with customers, who are starting from a low level of sophistication. In a mature market like Germany, this kind of approach would not be promising, but in the US this kind of service promises to create a competitive advantage over rivals like Spain.

What then is the governance structure in the downstream part of the value chain? Despite the differences we emphasised above, the common feature across different national markets is the prevalence of network relationships. There are few spot markets for tiles; the predominating pattern is one of long-term supplier-customer relationships. The relative power of suppliers and customers differs between countries. Customers are stronger in the mature markets, but even there no side has a dominant role. Therefore, following the definition offered by Humphrey and Schmitz (2002: 26), the downstream-part of the value chain is neither characterised by market relationships, nor is it a quasi-hierarchy.

3.3 Structure of the value chain: Upstream activities

Now we examine the downstream relationships and their importance for upgrading among tile firms. The most important actors on this side are producers of glazing materials and capital goods. Today, Spanish producers dominate glazing materials production. Even the single remaining important Italian producer, Colorobbia, has moved central functions to Castellón. This is because Italian tile manufacturers have only outsourced routine production of glazing materials. With the strong tendency to produce porcelain tiles, there was less demand, and in particular less sophisticated demand, for glazing materials in Sassuolo.

More relevant to the understanding of the evolution of the Sassuolo cluster, and very important for the overall tile value chain, is an analysis of the specialised capital goods producers. In fact, Italian firms are dominating the production of capital goods for the tile industry. More than 56 per cent of their productive capacity is located inside the Sassuolo cluster, and many of the other firms are not far away (for instance SACMI, the largest manufacturer, is located in Imola, some 40 km away). Thus, capital goods are not only a crucial part of the tiles value chain but also of the cluster.

Since the 1970s, capital goods producers developed major innovations such as wet grinding, pressing with high tonnage machines, roller kilns, and increasingly sophisticated control instruments (Burzacchini 2000). Wet grinding allowed a much better control of the mass that enters into the press, thus homogenising product quality. Improved pressing had the same effect. The introduction of roller kilns shortened the firing process, thereby not only improving quality but also reducing production costs and improving the control of the firing process. Another important innovation (albeit pioneered by tile producers in Spain) was the single firing process that replaced the traditional two firing processes. More recently, in 2000, a machinery company in the cluster launched a revolutionary new product and production technology, called Lamina, which may pose a serious threat to conventional tiles.

The development of such radical and incremental innovations occurred during a process of close interaction between tile manufacturers and capital goods firms. Although the capital goods manufacturers are the driving force when they come up with new types of equipment, they often install it at one of the tile factories and refine it through on-site experimentation. This will involve the free acquisition of a new piece of equipment, 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 many turnkey plants to Chinese firms, and there is no indication that this involved any outdated equipment.

One might expect that there are highly conflictive relationships between capital goods and tile manufactures, since the former are very active in creating competitors for the latter. But this conflict has not become too manifest. Even though Chinese or Brazilian firms may have the same equipment as Italian tile manufacturers, the style and elaboration of their products do not come close to that of Italian producers. The reason lies in tacit knowledge. First of all, tacit knowledge by definition is difficult to transfer. The importance of such knowledge is underrated by competitors. For example, Brazilian producers conceptualise 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 a lot of training. But the suppliers are happy to leave customers abroad in the dark rather than enlightening them since this reduces the level of conflict they have with domestic customers who are concerned about the emergence of new competitors using Italian technology. The relationship between capital goods and tile manufacturers in Sassuolo can be characterised as a mixture of networks and market-based relationships. There is clearly a very strong element of learning-by-interacting, but this normally involves a given capital goods producer and a limited set of pilot customers. These innovation networks are not eroding. Despite the fact that Italian machinery is sold to competitors all over the world, the interaction between capital goods and tile manufacturers remains strong and plays a crucial role in creating a competitive advantage for either side.

3.4 Local governance and the structure of supporting institutions

While Sassuolo came close to the textbook model of Italian industrial districts until the 1980s, this is no longer the case. Large firms and groups are emerging, which are vertically integrated. Informal horizontal collaboration between tile producers is limited and seems to be declining. There is close, informal collaboration between machinery manufacturers and tile producers, but then the machinery manufacturers sell to customers from all over the world. To what extent is there formal collaboration to create the active dimension of collective efficiency?

The two main associations in the cluster are: Assopiastrelle, the association of Italian tile manufacturers; and, Acimac, the association of capital goods manufacturers. By seeing Assopiastrelle's impressive headquarters and realising that Cersaie, the annual trade fair in Bologna, is the big event in the tile industry, one may get the impression that the Sassuolo cluster is good at collective action, thus verifying what is commonly perceived as a strong point of Italian industrial districts. Yet a closer look supports this expectation only in part. With the exception of Cersaie, Assopiastrelle is pursuing a number of activities that can be subsumed under three main headings: (i) services for member firms; (ii) representation of the sector; and, (iii) research and documentation of trends in the industry. The most effective services relate to marketing. Cersaie is an example of collective marketing, particularly because Italian producers notoriously obtain much larger and more conveniently located stands at the fair than their foreign competitors. The organisation of a strong Italian presence at trade fairs in other countries is another example. However, there are collective failures, particularly in physical infrastructure. The decay of the Sassuolo infrastructure casts serious doubt on the alleged effectiveness of Assopiastrelle as a politically influential association.

Acimac is also an important association. Its profile is similar to that of Assopiastrelle, but it appears more effective. In terms of services, it promotes the tile machinery industry, for example, by organising joint stands at foreign fairs. It is also supports member firms by providing information on technical standards and quality issues. Moreover, it organises short-term training courses abroad which cater to the employees of customer firms. In terms of interest representation, it represents the sector vis-à-vis Italian embassies overseas and it lobbies at international negotiations about tariff reductions. In terms of information, Acimac is the most important place to access 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 an excellent source of information on the tile industry.

With the exception of these two associations, the structure of supporting institutions is remarkably underdeveloped. There is a modest 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 ERVET system of business support institutions which is administered by the regional government. It carries out research on 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 specialisation in ceramics. There is also the Scuola de Arte in Modena which is an important source of design talent for the industry, although it does not specialise in tiles. Finally, there is Cerform, the vocational training centre in Sassuolo which, after intense negotiation between municipal governments and the two associations, was devoted exclusively to the training of ceramics professionals since the mid-1990s. Its annual output amounts to some 60 graduates, which falls short of industry requirements.

Collective action in the Sassuolo cluster exists, but, as we will see, to a lesser degree than in Castellón. The reasons are hard to pin down. Complacency seems to be one cause. The other explanation could lie in changes in another part of the value chain, namely in distribution and sales. As argued above, the concentration process in the tile industry is driven in part by marketing considerations. The concentration process in itself appears to contribute to the deterioration of local governance, i.e. firms are getting larger and thus more confident to be able to solve problems on their own. But there is a further aspect that connects marketing and local governance. As mentioned above, the US market is the main source of growth. A fierce struggle is going on in this market as Italian firms compete against Spanish firms and particularly strong competition occurring between Italian firms. Our hypothesis is that this is creating a constellation that erodes the trust accumulated in earlier periods and creates a situation whereby collaboration between these firms is unlikely.

4 The evolution of the Castellón cluster

The Castellón cluster differs from the Sassuolo cluster in three important respects:

- It is not yet a mature cluster, i.e. there are still entries, there is little if any concentration, and companies are predominantly small- or medium-sized.

- Collective action inside the cluster, in particular among tile producers, is strong.

- Glazing manufacturers play a very important role in cluster upgrading, whereas the local capital goods industry is weak.

Tile production in Spain has grown enormously in the 1980s, with total output doubling. During the course of the 1990s, production grew almost threefold. In 1998, there were 242 tile manufacturers in Spain, of which 190 were located in the Castellón cluster (accounting for 93 per cent of Spanish production). The overall number of employees in tile firms grew from 16,800 in 1995 to 23,200 in 1999.

The Castellón region has a long tradition in tile manufacturing. The process of industry modernisation started in the late 1950s with the introduction of electrical presses that 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 that substituted the traditional circular 'Arab kilns'. The tunnel kilns were further upgraded in the 1970s with the introduction of second firing.

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

4.1 Industrial evolution

The turning point for the cluster was 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 both failure and success. Attempts to build-up a local production base for kilns failed, but this effort led to an improved bargaining position vis-à-vis the Italian suppliers, who reduced their prices substantially and started to sell the latest-generation equipment in Spain.

In 1981, the region was connected to a pipeline that brought natural gas from Algeria. This was essential in order to 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. The story of massive upgrading in the cluster actually starts with the single firing process. This was the first major innovation to emerge from the cluster. Before that, the industry used a double-firing process, first firing the biscuit alone, then glazing and firing it again. Spanish clay is red because it has a higher iron content which leads to different sintering

characteristics. This was the point of departure for single-firing in the Spanish industry. Italian kilns were designed to work with white clay, using double firing, therefore, 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) (originally part of the University of Valencia and then the University of Castellón), developed a new process. It involved the development of different glazing materials and the adaptation of Italian kilns. The result was a process that was superior to previous Spanish and Italian processes both in terms of production efficiency and quality of the final product.

Single firing spread quickly throughout the cluster, reaching the majority of firms by the end of the 1980s. However, it was more than a one-off radical innovation. It shaped the paradigm of the cluster, which has three main elements:

- Competitiveness is originally 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 an important push factor in terms of constant upgrading.

- Interaction between firms and local supporting institutions, in particular ITC, is strong and a key element in technological upgrading.

The second-half of the 1980s lay the foundation for the massive expansion of the cluster in the 1990s. Tile manufacturers and producers of glazing materials expanded production capacity and upgraded products. In the case of tile manufacturers, rapid growth during the 1990s was due to both a strong local economy and a strong increase in demand from abroad.

Producers of glazing materials and tile manufacturers continue to enter the cluster. The typical pattern of family-owned firms also continues. The vast majority of firms are small- or medium-sized businesses. The typical firm has some 200 employees.

So far there is no concentration trend in the tile industry, and multi-brand firms are rare. There appears to be sufficient sales potential for everybody, and there has been no generational change that might stimulate mergers or take-overs. Moreover, In terms of production, an internationalisation trend is not apparent. There are several reasons for this. First, Castellón displays remarkable dynamic locational advantages, particularly in terms of both formal and informal communication and collaboration between firms. It is not by chance that Marazzi, the largest Italian firm, set up its Spanish subsidiary in Castellón. Second, the 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 to internationalise since the sector is doing exceptionally well with its current modus operandi.

Despite their smaller size, manufacturers in Castellón prefer to have a broad spectrum of products, i.e. both floor and wall tiles, low- to high-end, and glossy as well as rustic. To explain this, manufacturers point to the fact that distributors tend to deal

with a limited number of producers, as a result gaps in the manufacturer's product portfolio may lead to a discontinuation of business relations with a given distributor.

Some manufacturers pursue some form of rough market segmentation, others 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 is similar to the product-driven strategy that can be observed in Italy.

The marketing competence and sales system of Italian firms appears to be superior (Generalitat et al. 1999, 87), but there seems to be only a limited effort among Castellón firms to upgrade in this respect. They have, however, copied the Italians by promoting a 'Tiles of Spain' label.

4.2 Structure of the value chain: Downstream activities

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

Spanish exports are less concentrated than those of Italy. However, the rapid growth of the US market, and the strong presence of Spanish producers there, means that this may change in the future. In 1999, the seven largest markets accounted for 50 per cent of exports, the 14 largest accounted for 66 per cent.

The Spanish tile industry is involved in a global value chain that has a network structure, i.e. it involves neither arms' length relationships nor hierarchical relationships. This applies both to inputs and sales. It seems that tile manufacturers are in a strong albeit not dominant position vis-à-vis buyers. In Spain, there are more than 200 tile manufacturers, and the largest among them attend the majority of the 3,000 distributors that currently exist in Spain (Bigné 1998), as well as a number of customers abroad. It is difficult to imagine that either side could acquire a dominating position. However, it is notable that, in contrast to Italian producers, Spanish firms display little propensity for forward integration. Given the fact that there is a clear concentration process at the commercialisation 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 are probably too small and do not have the necessary capital to pursue a strategy of forward integration into commercialisation, particularly in foreign markets.

In an analysis of the cluster conducted in 1999, the consultants of Cluster Competitiveness recommended that firms should seek a clearer market position, forward integration into sales, and internationalisation (Generalitat et al 1999). For an outsider, this appears to be a plausible suggestion, not least because it would replicate the successful Italian strategy. However, the suggestion is less plausible for the cluster firms. The firms are already hugely successful with their current business model. The growth and profitability of the Spanish industry is higher than those of their Italian competitors.

At the same time, it is notable that the Cluster Competitiveness analysis is an important point of reference for industry actors, especially since it was based on an exercise which strongly involved them. In the future, however, a learning and discussion process could occur in the industry that leads to a re-evaluation of the recommendations, especially in the light of the discernible restructuring of the building materials commercialisation chain.

4.3 Structure of the value chain: Upstream activities

When comparing Sassuolo, differences also arise in Castellón's upstream activities. Whereas Italian manufacturers used predominantly white clay, the Spanish prefer red clay since it is cheaper and more readily available. Atomisation (milling), and in several cases the production of biscuits, has been outsourced to specialised firms that have usually been jointly established by tile manufacturers. There are clear economies of scale in atomisation, and an efficient atomisation 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 the manufacturers that jointly own an atomising operation are often rivals in all other respects. There is, in other words, less vertical integration in Castellón than in Sassuolo.

Spanish firms continue to depend on Italian manufacturers for most types of capital goods, the major exception is glazing equipment, where the close proximity to leading glazing producers created an opportunity for local machinery producers. However, today this is based on mutual dependency. Demand for capital goods is higher in Spain than in Italy, and Spanish producers appear to be more demanding in terms of technology than producers in Italy. Moreover, they tend to be very competent in terms of specifying their requirements, rather than just purchasing what the Italians want to sell. Accordingly, it is paramount that Italian capital goods manufacturers have a close contact with Spanish tile manufacturers in order to remain at the cutting edge. The fact that Acimac is considering setting up a branch in Castellón is a good indication of the relationship that is evolving.

Just as the interaction between tile producers and capital goods manufacturers has shaped the evolution of the Sassuolo cluster, the interaction between tile and glazing producers establishes the paradigm of the Castellón cluster.

The producers of glazing materials have gone through an impressive upgrading process since the 1980s. Not only was there an extraordinary growth in exports, which grew six-fold between 1990 and 1999, but also a massive internationalisation push. Many of the 24 firms from Castellón set up factories or at least distributors in many of the main tile producing countries.

Glazing materials producers 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, the design departments of glazing producers continue to be larger than those of tile manufacturers, and the top graduates of design courses join glazing rather than tile firms. It appears that the power role of design specialists is stronger in glazing than in tile firms; production engineers dominate the

the latter. Therefore, the core competence in design is moving from tile to glazing manufacturers. While a typical tile manufacturer in Castellón may have three designers, the leading producer of glazing materials has 40 in Castellón and even more when affiliates are included. The total number of employees is less than one thousand. They are distributed across factories in eight countries with representative offices in a number of others.

4.4 Local governance and the structure of supporting institutions

One of the distinctive features 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 and all local tile manufacturers are affiliated. It appears to be the main actor in the cluster in terms of facilitating collective action and strategic initiatives. It provides information for, and about, the industry. It also articulates the industry's demands vis-à-vis government, from the local through to the regional, national and EU level. Furthermore, it is organises joint purchasing for gas, electricity, telephone and mobile telephones. Ascer recruits approximately 20 full- and part-time professionals. However, in contrast to its Italian counterpart in the case of Cersaie, it does not participate in the organisation of Cevisama, the Spanish ceramic tile fair.

In a similar way to other business associations in the cluster, Ascer does not appear demonstrative, but it fulfils its 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. However, further evolution of joint purchasing is difficult to predict due to the emergence of e-commerce and the entry of private e-commerce operators within the purchasing business.

Anffecc is the association of 24 glazing producers. It is administered by a legal firm; a feature which indicates that it operates differently to Ascer. It primarily operates as a lobbying organisation vis-à-vis government. This is because glazing production has a serious environmental impact, therefore, constant negotiations with government bodies are essential. In terms of other activities, Anffecc acts as a convenor at commissions with professionals from firms. Two years ago, Anffecc also started to organise 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. Thirty-five firms, with an average of 24 employees each, are affiliated. The main professional organisation is the Associación de Tecnicos de Cerámica. There is also the Chamber of Industry and Commerce (Cámara Oficial de Comercio, Industria y Navegación de Castellón). Since 1992, its activities include organising the biannual technical-scientific forum Qualicer.

Apart from these associations, there is a well-developed set of other institutions. The Ceramics Technology Institute (ITC) emerged from an institute for chemical technology that was founded at the University of Valencia in 1969 and increasingly focused on the tile industry in the 1970s. In 1983, part of the institute was relocated to the Castellón university campus. In 1984, the Research Association of the Ceramics Industry (Asociación de Investigación de las Industrias Cerámicas, AICE) was founded to facilitate co-operation between ITC and firms. In 1991, the first chemical engineers to

have specialised in ceramics received their graduation at the institute. In 1992/93, the name changed to ITC, and the institute was integrated into the newly independent University of Castellón. ITC's activities comprise training professionals for the tile and glazing industry, conducting tests for firms, and working both 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 include training and support for firms. ALICER offers a five-year course at tertiary level. Glazing firms employ the majority of the 20 students that graduate every year. In contrast, joint projects with firms are almost exclusively conducted with tile manufacturers. Before it became an independent institute, ALICER was a department within ITC. It was created because the perception was spreading that limited design competence was a severe competitive disadvantage for Spanish tile firms. As the department grew, ITC's management decided to spin it off since they felt that design was beyond the main focus of ITC.

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 plays a leading role in organising a process of reflection inside the cluster. In 1999, it organised a series of seminars with key actors from the cluster, as well as from Italy, and it co-sponsored the analytical work of the Cluster Competitiveness consultancy firm (Generalitat et al 1999).

Taking all this into account, a picture of strong local governance structures emerges. The upgrading of the cluster is driven by a collective effort, with the private sector taking the lead.

5 Latecomer industrialisation and value chains in the tile industry: The case of Santa Catarina, Brazil

In this section we will investigate upgrading in the tile cluster in Santa Catarina (SC), Brazil. What does the evolution of the SC cluster tell us about the functioning of the global value chain in the tile business, particularly in terms of the interaction between the elements that are further upstream? We have mentioned that there is an internal tension in the clusters of Sassuolo and Castellón. The producers of capital goods and glazes appreciate the existence of customers in emerging countries, whereas the tile producers are unhappy about the emergence of new competitors. We will show that in a place like Brazil the rivalry among and between capital goods and glaze producers creates a constellation that benefits the emergence of a competitive tile industry. As firms in the cluster pursue a similar competitive strategy to the one we observed in the Italian case, i.e. forward integration, upgrading is based on individual company efforts, not on collective action.

5.1 Value chain restructuring and competitive advantage

The state of SC is Brazil´s most significant tile cluster. Located in the city of Criciúma, there are a total of three large tile producers, approximately ten medium-sized producers and seven glaze producers. The first phase of evolution was during the 1950s to 1970s, when local firms acquired a basic production capability. The second phase, in the 1970s and 1980s, was marked by an expansion of production capacity in order to satisfy a growing market (today this is the western world's largest market), regardless of product quality. The Brazilian tile market was a seller's market at this time. The third phase began when the sector fell into a deep crisis in 1989, caused by macroeconomic crisis. By 1991, sales had dropped by a third, one of the large firms filed for debtor's protection, and a number of other firms nearly followed suit. Firms reacted by defining technological upgrading as the way out, opting for quality instead of quantity. As shown elsewhere (Meyer-Stamer 1998), collective action played an important role in this upgrading of processes and products.

Since the late 1990s, the companies' upgrading effort has concentrated on marketing and sales. The basic idea was to create a structure that persuaded the customer of the superior quality of tiles from SC when they were at the point of a sale, thus creating a competitive advantage vis-à-vis two other clusters in the state of São Paulo. SC companies have invested in training the sales force, evidenced by their decision to select the best ceramics technicians to work in the sales department, whereas in the previous period these people would have been placed in a supervisory role on the shop floor. Most of the companies have also invested in exhibition space (show-rooms) and, to some extent, specialised, up-market shops. Two of the large firms have set up exclusive franchising networks. Inside the shops, well-trained salespeople attend customers, and architects offer design proposals free of charge that involve combinations of floor- and wall-tiles.

By analysing customer complaints, firms realised that there was little sense in producing high-quality tiles if the tiler was not sufficiently competent at selling them. The most radical manner of dealing with this problem is forward integration: producing not only tiles but also marketing and technical assistance. There are three stages through which firms arrive at this point:

1. Firms start to train tilers at their own expense, organising courses both at their home location and elsewhere in the country. In some cases, this includes providing the tiler with up-to-date tools.

2. Firms not only train but also certify tilers, and offer customers a five to ten year warranty in case they employ the certified tiler to set the tiles using the firm's own special cement. In particular, this full package is offered by one of the large firms with their own shops, so that the customer only has the shop to deal with, hence, they pay only the 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, hence, the full package opens up opportunities to increase margins.

5.2 Upgrading and local governance in Santa Catarina: a value chain perspective

Brazilian tile firms are integrated into international value chains, but in a completely different way than, say, footwear or garment manufacturers in the same country. Whereas the latter rely on foreign firms in downstream activities, i.e. when it comes to commercialising 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 industrialising country. In fact, in tile production almost all firms depend on Italian capital goods manufacturers, including firms in Spain. Firms in Brazil report that access to the latest vintage equipment is not restricted, though machine producers collaborate with Italian tile producers in the development of new machines. 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.

Input manufacturers, especially producers of glazing materials, are the other technology drivers in the tile industry. The second half of the 1990s saw a profound change in terms of the structure of the glazing business in Brazil. Until the early 1990s, three trans-national corporation (TNC) affiliates produced glazing materials in Brazil (from Italy, Germany, and the US). With the strengthening of the Spanish tile cluster, Spanish glazing manufacturers founded affiliates in Brazil, mostly in SC. Today, the cluster comprises seven companies that produce glazes locally; two of them are local firms. There are a total of 28 glaze companies in Brazil. This means there are more glaze producers in Brazil than in Spain. As a result, total Brazilian tile production is lower; this means there is intense competition between glazing manufacturers. In order to create a competitive advantage, they changed their behaviour in a profound way. According to tile manufacturers, in the old days a glazing manufacturer would come up with a new glazing variety, drop it at the reception and leave it to the tile manufacturer to figure out what to do with it. Beginning in 1996/1997, the glazing manufacturers set up development and design teams, offering a full service to tile manufacturers, i.e. 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 face discrimination. Instead, it appears to be the other way around, i.e. Spanish glazing manufacturers draw on know-how available at headquarters in Castellón and at Spanish R&D centres if they cannot solve production problems locally.

Drawing on all these observations, it becomes clear that Brazilian tile producers benefit from the fierce rivalry among Italian machinery and Spanish glaze producers. As firms from both groups are constantly looking for new ways to broaden their customer base and establish a competitive advantage, the idea that they might withhold up-to-date technology from Brazilian customers is unlikely. To phrase it differently, the tile sector in SC benefits from the structure of the upstream part of the international value chain in tile production.

The pattern of interaction with machinery producers differs from that of glaze producers. The relationships with machinery manufacturers appear to be mostly market-based, i.e. there is little if any joint development (learning-by-interacting). The

situation differs with respect to glaze producers. There is relatively close co-operation between tile and glaze producers, with technicians from glaze producers often included in solving production problems at their customer's site. The pattern of interaction between tile and glaze producers is thus predominantly of the network-type (though it is important to note that this is not about innovation networks; the pattern of interaction in Brazil is different from that in Spain).

Looking at the internal structure of the cluster in the course of the 1990s, there was a strong shift in the relative importance of intra-company and collective upgrading efforts. Collective action was important in the first half of the 1990s but decreased thereafter. This is closely related to the companies' effort to move further downstream in the value chain. The competencies required for this are localised within the companies and they try to keep their specific efforts secret. There is little collective action left. The joint initiatives of the early 1990s either achieved their objective or fizzled out. Successful collective efforts, documented elsewhere (Meyer-Stamer 1998), did not create a lasting 'collective efficiency' mindset inside the cluster. The reorganisation and strong competition in the marketing stage of the value chain have undermined this.

6 Conclusions

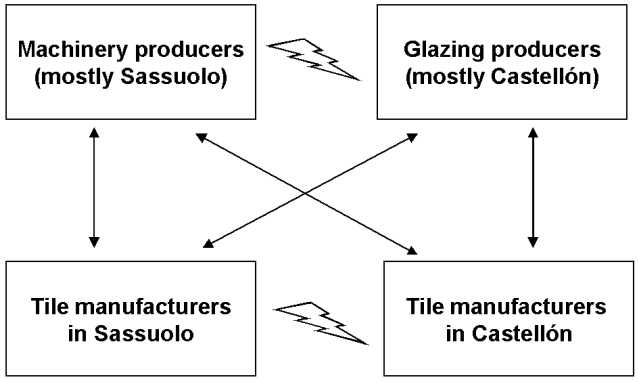
Analysing the tile industry from a combined cluster and value chain perspective is a useful exercise. The cluster perspective is helpful to understand learning-by-interaction and the creation of locational advantages. The value chain perspective is helpful in putting the evolution of the industry into perspective, as efforts to create a competitive advantage are increasingly chain-related, whereas the relative importance of locational advantages created through deliberate collective action is declining, at least in Italy and Brazil.

This chapter has shown that product and process innovation in the tile industry is to a large extent driven by suppliers. This does not only apply, as one would expect, to the suppliers of new machinery that encourage process and product innovation. It also applies to glaze producers that facilitate product innovation. Two groups of suppliers play a key role in innovation, namely Italian capital goods manufacturers and Spanish glaze producers. Their goal is to create demand for their products:

- Machinery producers do not only come up with new machines to do the same things better. They also develop new products that require new machinery. A machinery producer that comes up with a new product in this way creates the demand for its machinery. In some cases the machinery producer even creates a captive market for subsequent services.

- Glaze producers do not just produce standardised glazing materials. Rather, they have large in-house design departments which offer entire design collections to tile producers, usually for free. Accepting a glaze producer's design proposal means purchasing their glazing materials as well.

Figure 1: Key Actors and Interaction in the Tile Industry



This innovation behaviour is creates a situation that involves four groups of actors (Figure 1). They are the tile manufacturers in Sassuolo, the tile manufacturers in Castellón, the machinery producers that are mainly located in Sassuolo and the glaze producers that are mainly located in Castellón. There are four types of interaction:

- Strong localised rivalry within each of the four groups.
- Competition between the tile manufacturers from the two different locations which are essentially competing for the same markets.
- Formal and informal co-operation between groups. This does not just happen locally but also, as indicated by the diagonal arrows in Figure 1, between clusters.
- Rivalry between the machinery producers and glaze producers. The machinery producers prefer to develop innovation that reduces the relevance of glazes for a differentiated product, and ideally makes glazes altogether unnecessary. The glaze producers concentrate on innovations that permit new, differentiated products without major investment in new equipment. In other words, one group tries to undermine the other groups market position. Latecomers such as the cluster in Santa Catarina benefit from the rivalry within and between the leading clusters. While these latecomers are rarely partners of the machinery and glazing material suppliers in their experimentation of new products, they have access to the new products with only minor delays.

It is important to recognise that the competitive strategies of suppliers induce a profound restructuring of the value chain. There was a time when innovative, differentiated design, based on an in-house effort, was the main competitive weapon of tile manufacturers. However, much of the design function has been taken over by machin-

ery and glaze producers, which are thus expecting to develop additional sources of innovation- and differentiation-based rents. For the tile producers this means that they have to look for other ways to create competitive advantage and rents, and they find them downstream, in terms of customer services, distribution and sales. From this perspective, there is a tendency by the main groups of actors in the tile business to follow a generalised movement downstream.

Tile manufactures do not only perceive that a stronger position at the distribution and sales stage improves their competitive position vis-à-vis their competitors. They also perceive that the margins at this stage tend to be higher, so that a strong position here may enhance the company's profitability. In the end, one may also interpret forward integration as an effort to create the conditions for rent that is based on controlling access to the final customer. This pattern is clearly discernible in the cases of the Sassuolo and the Santa Catarina cluster.

However, it remains doubtful whether the tile producers can sustain this strategy. Any change in the structure of the value chain is not the outcome of individual action alone. One of the characteristic features of the tile business is reflexive structural change:[4] There is constant discussion, both inside the clusters and between them, organised by Acimac (e.g. Acimac 2000). This discussion is not just about general industry, technology and market trends but also about changes in the structure of distribution and sales. As the construction materials retail sector is something of a latecomer in terms of consolidation, actors in the tile industry closely observe trends in the distribution and sales segment of other industry's where restructuring is more advanced. They also try to pre-empt a kind of structural change which would weaken their competitive position and strengthen that of other actors; the obvious adversary are large retail chains. At the same time, it is unlikely that the efforts of tile producers to build up a dominating position in commercialisation will go unnoticed. As there is more than a handful of large players in the construction material sector, one might expect that they would pre-empt any single competitor's effort to establish themselves as a dominant actor.

While the outcome of the tile producer's functional upgrading strategy remains uncertain, the importance of another analytical dimension becomes more visible. Rivalry within and between key stages of the value chain leads to chain restructuring. This is most clearly discernible in the Italian case, where the industry is reaching maturity. These two elements, chain restructuring and maturation of the industry, are causally linked. Maturation coincides with consolidation, i.e. the creation of large companies or economic groups. In contrast to small or medium-sized companies, they have the resources that are necessary for forward integration into distribution and sales. This changes the pattern of relationship between tile manufacturers and makes co-operation less likely. Forward integration creates a pattern of competition with winners and losers, quite different from the mostly-winner-pattern of a past with high growth rates. Some manufacturers may succeed in their attempt to establish captive sales chains, but most of them will not. Moreover, as producers consolidate, they perceive less necessity for hori-

4 This relates to the concept of reflexivity as formulated by Giddens (1984, 3): "... it is useful to speak of reflexivity as grounded in the continuous monitoring of action which human beings display and expect others to display".

zontal co-operation. Both factors weaken local network governance inside a cluster. Spanish producers have not yet opted for forward integration, and from this perspective it is no coincidence that collective action is still strong inside this cluster or that the cluster is still in a growth phase, i.e. an earlier stage of the life cycle.

The evolution of the tile industry thus reinforces one of the key points of this book, namely that analysing clusters from only a local collective action perspective is not advisable. By including the value chain perspective, it takes us an important step further in understanding the latitude of local upgrading efforts. It is essential to introduce further concepts into cluster research, and the life cycle concept is perhaps the most relevant one. As shown by Grabher (1993) and Staber (2001), some clusters decline. This underlines the importance of understanding the life cycle of clusters. Research on Italian industrial districts has emphasised the profound change in internal structures and external relationships that occurred in the 1980s and 1990s (Belussi 1999). The evolution along the life cycle has implications not only for the internal governance structure of clusters but also for the structure of the value chains they are part of. Investigating this kind of inter-relationship may take the understanding of the dynamics and potential of clusters an important step forward.

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