# Will Industrial Districts Exploit B2B? A local experience and a general assessment.

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**Abstract**

When production is carried out by many geographically clustered small firms specialized in particular production phases that subcontract one another, what are the prospects of B2B electronic commerce?

Prato, Italy, is home to thousends of textile firms as well as the locus of an early and innovative experiment of a local Internet in the mid-1980s. This experience suggests that, since they fear to be imitated by their geographical proximates, geographically clustered firms may lag behind in the the exploitation of information and communication technologies. Analysis of today's web sites of Pratese firms confirms this intuition.

A similar analysis of web sites is carried out for fabrics producers worldwide. Contrary to Europe, in Asian countries geographically clustered firms exhibit little fear of information leakages. Differences in the organization of production may explain this puzzle.

**Keywords**: ICT, e-Commerce, B2B, Textile industry, Industrial clusters, Industrial districts, Prato.

**JEL**: D82, F29, L67, L23, R12.

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# 1 Introduction

The Internet is affording unprecedented possibilities to establish and maintain commercial relationships with distant partners. At the same time, transportation costs and trade tariffs are falling. How do these developments impact the traditional pattern of geographical clusterization of many industries?

Economics knows two concepts to discuss agglomeration economies. One is that of industrial clusters, which is common in business economics [24] and refers to positive externalities between proximate firms in terms of availability of specialized labour, of suppliers, and provision of knowledge base. The other concept, industrial districts, originates from Marshall's observation of Sheffield's cutlery industry in the late XIX century [23]. The concept of industrial districts identifies a subset of industrial clusters, in the sense that industrial districts are industrial clusters that are characterized by complex relationships of competition and collaboration between firms that originate from extensive subcontracting. Both concepts will be used, but they will be kept separated.

This article is concerned with business-to-business (B2B) electronic commerce (e-commerce). This includes any commercial arrangement between firms prompted or eased by the Internet, but excludes relationships between firms and consumers (B2C). Since the Internet is able to provide business-to-business information at a fixed cost regardless of physical distance, one may speculate that geographical agglomerations may give way to virtual agglomerations in the cyberspace. This article aims at answering a subset of this question, namely, which firms and which local productive structures are better suited to advertise their products on the Internet and possibly create sorts of virtual clusters?

Many such speculations implicitly assume that the Internet is a neutral meeting point for small and large businesses alike. On the contrary, the institutional arrangement of e-commerce does influence its success.

Random encounters of firms in the cyberspace is only the simplest, possibly not the most common possibility (No. 1). The litterature singles out three other ones [21]. A second arrangement consists of matching buyers and sellers by providing directories either for a fee, or drawing an income out of advertisement, or simply in order to fulfill the broader mission of an institutional actor (No. 2). Thirdly, certain economic agents may want to buy or sell particular goods by means of an electronic auction (No. 3). Finally, it is possible to arrange electronic exchanges of standardized goods pretty much like a stock market (No. 4).

The two last arrangements are not neutral with respect to market power [20] [26]. Suppose, as it is actually the case, that Daimler-Chrysler, Ford, GM, Nissan

and Renault join to arrange an electronic auction to buy automobile components. Or suppose, as it is actually the case, that International Paper, Georgia Pacific and Weyerhaeuser join to sell paper and forest products through an electronic exchange. Clearly, these arrangements are liable to further enhance the market power of the most powerful side.

Economic theory prescribes competition between equals, not profit-squeezing of a competitive sector by an oligopolistic one. Thus, rational competitive firms should simply avoid entering the above electronic arrangement, for if they would, they would reach zero profits very soon.

Nevertheless, let us suppose that some companies on the competitive side of the market accept bad deals in order to survive. Even so, it would be rational for the others not to enter the electronic bargain and wait for their weakest competitors to disappear. Thus, an electronic marketplace of this kind is liable to make the most competitive side of the market less competitive than it used to be.

Moreover, after the once competitive side of the market has been turned into a small number of traders, surviving firms may use the electronic marketplace in order to communicate cartel prices. Consequently, electronic marketplaces of this kind raise the concern of antitrust authorities. In fact, in the end they might impair the very competition they were designed to foster.

Apparently, experience is showing that firms on the competitive side are wise enough not to enter electronic auctions and electronic exchanges except for selling excess inventory stocks or for exceptional purchases of out-of-stock materials. Business analysts do forecast growth for electronic marketplaces, but either for the limited scope of smoothing inventories or for trading very differentiated goods, those for which a number of features matter besides price [27].

This last remark is particularly important, because industrial districts are good at producing small amounts of qualitatively different lots. Their competitive advantage lies in flexibility, not in economies of scale. Electronic auctions (No. 3) and electronic exchanges (No. 4) may increase the concentration of industries that produce standardized goods, but they are unlikely to affect the very existence of industrial districts.

However, brokers (No. 2) or even random encouters (No. 1) may offer an outlet to the final products of industrial districts that is not bound to the need of an international buyer to physically move to a specific place. Thus, firms that are not located in well-known industrial districts have a chance. At the same time, firm that are located in well-known industrial districts but that do not exploit the new means of communication, they loose a chance. What determines a firm's ability to enter this kind of electronic marketplaces?

The textile industry is particularly interesting in this respect. It is often low-tech, but it can be high-tech when outdoor fabrics are produced. It often produces low-quality standardized goods for the lowest segments of the market, but it can also produce high-class goods in a huge variety of colours and designs. Most importantly, aesthetical variety can be attained with low-tech machinery, which makes the high segment of the market affordable even to small firms located in poor countries. Consequently, the textile industry is spread across all over the world and a large potential for gathering specific producers into electronic marketplaces exists.

Not all of the worlds textile industry is organized in industrial districts. However, this is the most common organization of production in Asia and Southern Europe.

Prato is a large Italian textile district that moved from low-quality standardized fabrics to a huge variety of high-quality fabrics for the fashion industry. For our investigation, Prato is particularly interesting because as early as 1986 an experimental district-wide Intranet was introduced.

The rest of the paper is organized as follows. Section 2 expounds the story of this Intranet, or local Internet. Section 3 illustrates the results of a research on the information content of the web sites of Pratese textile firms. Section 4 extends the previous investigation to the world fabrics industry. Finally, section 5 concludes.

# 2 Pratel

Prato is a town of about 200,000 inhabitants located in Tuscany, central Italy, whose textile industry dates back to the Middle Age. After developing along large woollen mills until the mid XX century, the local economy entered a peculiar track of development after World War II [9] [14].

In fact, during the 1950s the industrial structure of Prato initiated a process of vertical disintegration that accelerated in the 1960s and 1970s, creating thousands of small family businesses specialized in tiny parts of the production process. One such family business would typically entail one single handworker, who would mobilize his whole family at demand peaks. Competition between these minuscule businesses enabled the intermediaries with the fashion industry, often the very same woolen mills that had spun off their workers, to produce at low cost. At the same time, geographical proximity and the cultural orientation of workers enabled collaboration between small businesses in order to arrange flexible chains of production. Since the economic development of Prato was opposite to the pat-

tern of increasing industry concentration that was being observed in the 1960s and 1970s, Prato became the prototypical and successful example of an industrial structure based on competition and collaboration between small productive units [7].

In the 1980s Prato underwent a deep structural crisis, from which it slowly recovered during the 1990s by developing quite a different productive structure. On the one hand, a certain degree of industry concentration took place, especially in the sense that a lot of the smallest businesses had disappeared [6] [17]. On the other hand, the competitive advantage of Prato had shifted from low-price of a few standard products to the high-variety of fabrics that a system of many small production units is able to offer [4] [5] [1] [17] [18].

In the context of this article, Prato is interesting because it is the locus of a unique experiment of early introduction of electronic communication technologies in an industrial district. In fact, in an attempt to react to the crisis of the 1980s, a Government agency (ENEA) designed a series of interventions that aimed at revitalizing the district. Among them, ENEA offered *videotel* terminals at a reduced price to all Pratese firms.

*Videotel* (teletext) is an early technology that allowed its users to publish offers and requests of particular commodities as well as to view information that was made available by local organizations such as the industrialists union, the handworkers union and others [2]. In Prato, it was called *pratel*. In principle, it was very much akin to what later became the Internet, except that it was restricted to a small geographical area. Computer terminals were provided to businesses of any size and they were connected to the telephone network. Since this was in 1985-86, it was much ahead of its time.

*Pratel* was introduced in the belief that the industrial district could be handled just like one single large firm. Consequently, it was assumed that each single business would broadcast to the whole district which operations it was ready to carry out on behalf of other businesses, as well as which operations it required from other businesses [12] [10] [22]. After a short experimentation it had become clear that this aspect of the project was not working as expected. In fact, firms were using the terminals for receiving information from unions and other associations, they eventually made use of the computers in order to carry out accounting procedures, but they never broadcast information B2B. Commentators ascribed this failure to the inability of electronic communication to match face-to-face communication in terms of richness of information, but also to certain perculiarities of the organization of production of an industrial district [3] [25] [8]. This second order of reasons is particularly interesting for the present study.

Production in Prato is organized by agents of a specific kind. These are the only agents who are acquainted with the fashion industry, the only who are able to make strategic plans and, of course, they are also those who harvest most of the profits. To some extent, they are (relatively) large woollen mills that find it profitable to contract handworkers and smaller firms at demand peaks. However, they may themselves be small businesses, in which case they are called *impannatori* in the local jargon. Since both *impannatori* and woollen mills derive their profits from intermediation, I shall lump both of them under the label 'middlemen'.

The reason why small businesses were not willing to tell the whole district that they were awaiting for orders from other firms, is very obvious. It is the same reason why B2B auctions and exchanges (No. 3 and No. 4) are deserted by the actors on the more competitive side of the market. On the contrary, the reason why Pratese firms did not place orders either, is an intriguing one.

Since the fabrics that are produced in Prato are not technically advanced, it is easy for any firm to imitate what any other firm is doing. Thus, nothing is more crucial to middlemen than that the identity of the final buyer remains unknown to the firms that they contract and, more in general, that the world from which they draw commercial orders and fashion trends remains opaque to them [8] [19]. Since Prato is a small town where bits of information easily leak, middlemen feared that by broadcasting information on which fabrics they needed would enable potential competitors to enter the business. More precisely, the point is not that the information broadcasted by *pratel* was crucial in itself, but that it could be combined with information available from a number of informal local sources to reconstruct private information. Thus, we see here a specificity of geographical agglomeration with respect to electronic communication.

The very same argument that holds for middlemen can be applied to the firms that they contract. In fact, contracted firms that lack sufficient productive capacity eventually contract other firms in their turn [8]. Thus, similarly to middlemen they may also be concerned about the privacy of relevant information. Moreover, since their buyers reside in the same geographical area, privacy of information is even more difficult to maintain for them.

Imitation is a common and distinctive feature of textile industrial districts [13]. Nobody wants information to leak, but in the end it does. This has positive consequences for the whole productive system. In fact, by means of imitation all firms in the district are able to follow the vagaries of the market, whereas isolated firms would not be able to do so.

The above arguments receive further insights from an empirical investigation of the structure of information exchanges that was carried out just before instal-

lation of *pratel* [11]. During 56 days, researchers recorded all communications entertained by 12 woollen mills (i.e. middlemen) by mail, telephone, telex and face-to-face meeting. The 15,286 communications collected in this way were sorted according to content and business partner. Table 1 shows a selection of the results.

| *Content of Communications* | *Partners of Woollen Mills* | | | |
|---|---|---|---|---|
| | **Independent** | | **Contracted** | |
| | **Customers** | **Suppliers** | **Firms** | **H.workers** |
| **Offers and Requests of Products** | 32.0 % | 22.2 % | 19.8 % | 16.2 % |
| **Bargaining, Economic Aspects** | 22.2 % | 28.4 % | 6.6 % | 8.4 % |
| **Information on Ongoing Activities** | 32.5 % | 29.3 % | 60.4 % | 65.5 % |
| *Number of Communications* | 4,219 | 1,190 | 2,286 | 1,281 |

**Table 1**. Four categories of the trading partners of woollen mills (customers, suppliers, contracted firms and contracted handworkers) with the corresponding share of communications according to content (offers or requests of products and services, bargaining and other economic aspects, information on on-going activities and other information). Percentages sum up along columns; the difference to 100 are communications on miscellaneous topics. The number of communications is the sample size. Data source: [11].

The entries of table 1 have been selected among all those available from the empirical investigation with the purpose of highlighting the difference between business partners that are common to any firm (customers and suppliers) and partners that are specific to firms that operate in an industrial district (contracted firms and handworkers), with respect to the flows of information that is needed to organize production (offering or requesting products and services, bargaining, checking the advancement of operations). As a matter of fact, for any row the first two

columns are very similar to one another and the last two columns are very similar to one another, but the first two columns are very different from the last two.

In fact, the first row tells us that contracted firms and handworkers require a proportionally lower communication effort in order to arrange for the provision of goods and services than customers and suppliers do. The second row tells us that they proportionately require a much lower communication effort in order to settle economic matters. Finally, the third row tells us that they proportionately require a much higher communication effort in order to get the job done.

These reflect the typical information flows in an industrial district. They highlight that woolen mills work with a limited set of contractors with whom they have long-standing relationships in order to minimize the cost of economic transactions. However, contractors need to be monitored to a much larger extent than customers and suppliers do.

Thus, woolen mills may have an interest in advertising their needs for raw materials in order to increase competition among suppliers, but they may not be interested in exchanging well-established long-term relationships with well-known contractors for *ad hoc* relationships with new, possibly unreliable contractors. Historically, new middlemen and new woolen mills always arose out of the rank of contracted firms. For a woolen mill, it is more sensible to rely on a small number of contractors with little management capability — as the amount of communication spent on checking on-going activities demonstrates — than risking to breed a powerful competitor for a temporary reduction of production costs. Consequently, they have little interest to tell everybody which fabrics they make.

# 3 Neither Too Normal, Nor Too Special

In the previous section we examined the failure of hierarchical e-commerce (No. 3 and No. 4), in Prato for even stronger reasons than elsewhere. Is there a possibility for a firm to use the Internet in order to reach new customers instead of attempting to strangle its suppliers, and of doing so without leaking private information to competitors?

Electronic marketplaces need not be organized as auctions or exchanges. As it was pointed out in the introduction, the cyberspace may simply enable random encounters of complementary firms (No. 1) or, more likely, encounters may be fostered by brokers who provide directories of firms operating in a particular industry (No. 2). Let us see to what extent Pratese firms are doing this.

Prato has two portals where firms can advertise themselves. The first one is

provided by the industrialists union (UIP, *Unione Industriale Pratese*), which has a web site entailing a section where its member firms can display their name, address and a link to their own web site (http://www.ui.prato.it). The second one is tex2tex, a local portal that provides a list of Pratese textile firms and other services (http://www.tex2tex.it). Since some firms have a functioning web site on the UIP portal but the corresponding link is missing on tex2tex, this second portal is probably less popular. Examination of the entries to these portals provides a picture of the extent to which Pratese firms are interested in B2B e-commerce.

Within each portal, a few entries have been deleted because they referred twice to the same firm in the same category. On the contrary, multiple listing of the same firm in several categories has been accepted as reflecting genuine multiple production. Finally, it is good to remind the reader that since one firm may advertise itself on both portals, the ensuing sets of data partially overlap.

Tables 2 and 3 illustrate the features of the entries found at UIP and tex2tex, respectively. All observations have been made in January 2003.

Rows reflect the classification categories adopted by UIP and tex2tex, respectively. Not all categories have been reported, but only those concerned with firms directly involved in the production of textiles (e.g. producers of machinery for the textile industry have been excluded). Non-woven fabrics for industrial use (e.g. insulation) have been excluded as well.

The meaning of rows is as follows:

- *Raw Materials, Processes* (table 2). Producers of raw materials for the textile industry, firms contracted for particular production processes (e.g. dyeing).

- *Spinners, Weavers* (table 2). Small businesses performing very basic operations on contract.

- *Embellishment* (table 2). Firms that are contracted in order to perform very crucial operations, that enhance the quality of fabrics. Finishing operations are the most typical ones.

- *Yarn Producers* (table 2), *Yarn* (table 3). Firms that produce an important intermediate good, yarn. Yarn is not necessarily sold in Prato.

- *Fabrics Producers* (table 2), *Fabrics* (table 3). Firms that produce fabrics, the most common output of this industrial district.

- *Knitwear, Apparel* (table 2), *Knitwear* (table 3), *Apparel* (table 3). Firms that produce knitwear and apparel. In Prato a far less common output than fabrics, yet equally capable of a huge variety.

Columns display the information that has been obtained by examination of the above portals. Their meaning is as follows:

- *Number of Entries*. The number of firms in the category to which the row refers.

- *Web Site Available*. The number of firms in column 1, that have a functioning web site. This number may be much lower than the number of entries because, particularly on the UIP portal, many firms simply do not have a web site. Other causes are that a web site may have existed but the corresponding link is broken, or that the site is under construction. However, web sites "under construction" but that provided at least the name and address of their owners, have been considered as "available".

- *Web Site Accessible*. The number of available web sites in column 2, for which all information required by this investigation was freely available to everybody. Thus, web sites having sections that can only be reached with a password, but where the secret section refers to issues that do not pertain to this investigation (e.g. a customer may have the possibility to check the state of advancement of his order by means of a password) have been included.

- *English Version*. The number of web sites available without password, column 3, that have an English version. This indicator should give an idea of the desire of a firm to establish commercial relations beyond the district and abroad.

- *Product Information*. The number of web sites available without a password, column 3, that provide detailed information on products. Information on products and services may concern the availability of particular machinery (mainly for production processes to contract), it may consist of technical specifications (very common for yarn, but sometimes available for fabrics as well) or of information on aesthetical design conveyed by a series of pictures (both yarn, fabrics and clothes). This indicator should give an idea of the extent to which a firm relies on its web site as an essential means to manage commercial relationships.

- *Information in English*. The number of web sites that provide detailed information in English, i.e. those that appear in columns 4 and 5. This indicator should give an idea of the extent to which a firm relies on its web site as an essential means to manage commercial relationships abroad.

| | *UIP* | | | | | |
|---|---|---|---|---|---|---|
| | | **Web Site is** | | | **Web Site has Information** | |
| *Firms* | *No. of Entries* | **Avail.** | **Acces.** | **in En.** | **in It.** | **in En.** |
| **Raw Materials** | 20 | 8 | 8 | 2 | 4 | 2 |
| **Spinners, Weavers** | 33 | 8 | 8 | 1 | 1 | 0 |
| **Embellishment** | 60 | 30 | 30 | 13 | 5 | 4 |
| **Yarn Producers** | 50 | 28 | 27 | 23 | 17 | 14 |
| **Fabrics Producers** | 128 | 89 | 88 | 55 | 16 | 12 |
| **Knitwear & App.** | 24 | 11 | 11 | 8 | 3 | 3 |

**Table 2**. The entries in the UIP portal. Information regards the processes and machinery employed, technical specifications or a series of pictures of the products.

| | *tex2tex* | | | | | |
|---|---|---|---|---|---|---|
| | | **Web Site is** | | | **Web Site has Information** | |
| *Firms* | *No. of Entries* | **Avail.** | **Acces.** | **in En.** | **in It.** | **in En.** |
| **Yarn** | 28 | 25 | 25 | 16 | 10 | 9 |
| **Fabrics** | 85 | 66 | 65 | 38 | 8 | 6 |
| **Knitwear** | 14 | 12 | 12 | 7 | 2 | 2 |
| **Apparel** | 2 | 2 | 2 | 1 | 1 | 1 |

**Table 3**. The entries in the tex2tex portal. Information regards the processes and machinery employed, technical specifications or a series of pictures of the products.

Given that Prato is a district with thousands of textile businesses, tables 2 and 3 tell us that those caring about a web site are really few. They are particularly few

among small family businesses of spinners and weavers, none of which has a web site providing detailed information in English. More in general, the first two rows of table 2 tell us that firms that operate on the early steps of the production chain are not very much interested in establishing world-wide relationships.

Firms performing embellishment operations (row 3 of table 2) enjoy a peculiar status, since they appear to be quite interested in having a web site but, in the majority of cases, they do not use it in order to communicate information. A possible reason is that the operations carried out by these firms may span too many dimensions to be meaningfully represented by means of text and pictures — in particular, the tactile characteristics of fabrics that are produced by embellishment operations cannot be conveyed by the Internet.

Nonetheless, web sites must entail detailed information in order to become a marketing tool [15]. Table 4 repeats the data of tables 2 and 3 in percentage terms. It focuses on yarn and fabrics, for which the Internet can be useful in order to communicate at least some product features. The percentage of web sites providing detailed information in English has been computed with respect to the number of entries in the portal (column 1), to the number of web sites that can be accessed without password (column 2) and to the number of web sites with English version (column 3).

| | | *Information in English with respect to* | | |
|---|---|---|---|---|
| *Producers of* | *No. of Entries* | **Entries in the Portal** | **Accessible Web Sites** | **Web Sites in English** |
| **Yarn (UIP)** | 50 | 28 % | 52 % | 61 % |
| **Yarn (tex2tex)** | 28 | 32 % | 36 % | 56 % |
| **Fabrics (UIP)** | 128 | 9 % | 14 % | 22 % |
| **Fabrics (tex2tex)** | 85 | 7 % | 9 % | 16 % |

**Table 4**. Some of the entries of tables 2 and 3 expressed in percent terms.

Table 4 highlights a striking difference between yarn and fabrics in terms of readiness of their respective producers to broadcast information on the Internet. In fact, data from UIP and tex2tex agree that yarn producers are much more prone to provide information on their products to the whole world.

Producers of raw materials have not been included in table 4 because it was already clear from table 2 that they are not very much interested in e-commerce.

The obvious reason is that since they produce standardized goods, they fear that their profits could be squeezed by increased competition.

Fabrics producers have a less evident reason for avoiding to broadcast information on the Internet, which has been explained in section 2. Essentially, since their competitive advantage is embedded in the aesthetical features of their products, they risk to be imitated by other firms in the district.

However, yarn lies not only in the middle of the production chain, but in the middle of a scale of specificity as well. In fact, yarn is sufficiently differentiated not to risk to be auctioned in a global exchange. At the same time, it is not subject to the vagaries of fashion and, as such, it does not risk to be imitated. Neither too normal, nor too special. Yarn appears to enjoy the right degree of specificity to exploit the possibilities of e-commerce.

Knitwear and clothing have a very limited scope in Prato, which reflects into the very small numbers of web sites. Percentage values make little sense on such a small sample, yet their calculation suggests that the category of "Knitwear and Apparel" may behave in a way that is intermediate between yarn and fabrics. A possible explanation might be that, since Prato is not an apparel district, the danger of being imitated is relatively small.

# 4 Navigating the Wide World

In the previous section we saw that Pratese producers broadcast information if it regards products that are neither too standardized (in order not to compete with too many other producers), nor too idiosyncratic (in order not to be imitated by other firms in the district). Is this a general pattern of behaviour throughout the world?

Obviously, it would be impossible to repeat the analysis carried out in Prato for all textile districts of the world. However, it is possible to focus on the relatively few firms who care about advertising their web sites on the most popular portals. Since our aim is to assess the potentialities of e-commerce, only those who care about making themselves visible should be screened.

Furthermore, it is possible to restrict the number of web sites to be examined by focusing on a specific class of goods. Fabrics are potentially very interesting because of a variety that spans from high-tech fabrics for sporting wear to fashion fabrics to fabrics employing precious materials or special manufactures. Since all these varieties are already contained in the category of house- and apparel fabrics, industrial fabrics will be excluded.

Let us step in the shoes of an international buyer who, instead of flying to Prato and examining available fabrics, decides to navigate the Internet to see whether it makes better sense to spread his purchases worldwide. In an attempt to get an idea of which information is available to one such buyer, I explored the first five hundred web sites yielded by the word "fabrics" on a popular search engine (*Google*), plus all the portals devoted to textiles that were reached thereby. Out of the thousands entries obtained in this way, I examined the web sites of firms that declared to produce home- and apparel fabrics. I excluded web sites made out of a template, since they may not reflect a firm's real intentions to communicate information. Web sites in languages other than English were excluded as well.

Let us think of all the web sites of all fabrics producers of the world as nodes of a graph. Edges are established by portals that collect web sites of fabrics producers, in the sense that each web site is connected to all other web sites in the portal: in the graph, this is an area of tightly connected nodes. Furthermore, many portals entail links to other portals: these are edges towards other areas of tightly connected nodes. Probably, most nodes in the graph are isolated. However, web sites that belong to portals correspond to clusters of tightly connected nodes in the graph. Not all of these clusters are connected to one another — for instance, the two clusters created by the two Pratese portals are isolated, since there is no entry connecting these portals to other ones. However, some clusters are connected to one another and form larger clusters of nodes. The above procedure has the purpose of examining what is probably the largest connected component of this graph.

The idea is that, if anything like a virtual cluster of fabrics producers will ever emerge in the Internet, it will emerge from there. Clearly, this investigation does not provide any clue of what commercial flows, if any, are generated by Internet navigation. Rather, the purpose is to estimate the potentialities that are offered by Internet navigation.

The research was carried out between January and March, 2003. Out of the 50 portals found by the above procedure, 15 could not be examined either because they were not functioning, or because they required a payment or because they were not in English. The remaining 35 yielded tens of thousends of entries, yet the vast majority of them did not have a web site. Of the thousends left, a half were ignored because they were constructed out of a template. Others, because they were simply repetitions of web sites already found in other portals. Finally, a few were excluded because they did not have an English version (more details on search procedures can be found in Appendix A).

In the end, this procedure yielded a dataset of 1121 web sites. Thus, the num-

ber of fabrics producers that actively engage in creating a web site and promoting it in the appropriate portals is, at present, very small. Notably, only five Pratese firms have been found in this sample.

These web sites were examined in order to assess whether they entailed information on products. Criteria were the same as those used to analyze the web sites of Pratese firms. However, since the database was much larger one could distinguish between *aesthetical information*, communicated by pictures of fabrics and *technical information*, conveyed by data on fabrics density or composition. The possibility to convey aesthetical information is the most relevant advantage of web sites with respect to traditional yellow pages. However, availability of technical information is also a novelty because in general it cannot be made available in yellow pages due to lack of space. More details on the criteria that have been used in order to determine whether a web site provided aesthetical or technical information can be found in Appendix B.

Table 5 illustrates the informational content of the web sites of fabrics producers disaggregated according to broad geographical areas. Since some web sites provide both aesthetical and technical information while others only provide one of them, table 5 reports the percentage of web sites that provide aesthetical information (E), the percentage of web sites that provide technical information (T), the percentage of web sites that provide both of them (E and T) and the percentage of web sites that provide at least one of them (E or T). The figures collected in the Prato portals (Table 4) correspond to (E or T).

| *Region* | *No. of Entries* | *Aesthetical and Technical Information* | | | |
|---|---|---|---|---|---|
| | | **E** | **T** | **E and T** | **E or T** |
| **Europe, Middle East** | 113 | 24 % | 15 % | 3 % | 36 % |
| EU | 76 | 24 % | 11 % | 1 % | 33 % |
| others | 37 | 24 % | 24 % | 5 % | 43 % |
| **South Asia** | 215 | 29 % | 13 % | 3 % | 39 % |
| India | 152 | 35 % | 13 % | 3 % | 45 % |
| others | 63 | 16 % | 11 % | 2 % | 25 % |
| **East Asia** | 694 | 45 % | 35 % | 13 % | 66 % |
| China | 492 | 45 % | 36 % | 12 % | 69 % |
| Jp + Kr + Tw | 170 | 46 % | 36 % | 19 % | 62 % |
| others | 32 | 44 % | 3 % | – | 47 % |
| **America, other W.C.** | 99 | 42 % | 18 % | 6 % | 55 % |
| USA | 80 | 44 % | 17 % | 5 % | 56 % |
| others | 19 | 37 % | 21 % | 11 % | 47 % |

**Table 5**. Aesthetical (E) and Technical (T) information entailed in the web sites of fabrics producers in various geographical areas. Data include web sites from the following countries. Europe and Middle East, EU: Belgium (1), Denmark (1), France (9), Germany (10), Great Britain (19), Greece (1), Italy (26), Portugal (3), Spain (5), Sweden (1). Europe and Middle East, others: Czechia (2), Hungary (2), Israel (1), Romania (3), Russia (2), Switzerland (1), Syria (1), Turkey (25). South Asia: Bangladesh (2), India (152), Iran (2), Nepal (1), Pakistan (58). East Asia: China (492), Indonesia (14), Japan (5), Malaysia (4), South Korea (90), Taiwan (75), Thailand (9), Vietnam (5). America and other Western Countries (W.C.): Argentina (2), Australia (4), Canada (7), Chile (1), Mexico (3), South Africa (1), United States of America (80). The acronyms Jp, Kr, Tw stand for "Japan", "South Korea" and "Taiwan", respectively. A few producers in Australia and South Africa have been aggregated to America as "other Western Countries".

It may not be correct to compare the figures of table 5 to the figures of table 4 because table 5 represents the "cream" of all fabrics producers of the world, those who are likely to be in the best positions to exploit the possibilities of e-commerce. Thus, a 33% for the average information content of this particular selection of EU fabrics producers may not conflict with a 16-22% found on *all* web sites of Pratese fabrics producers (Table 4). Furthermore, the sample of Table 4 included several

web sites built out of templates. In general, web sites built out of a template are very simple and lack figures.

However, it is perfectly legitimate to compare the various sections of Table 5 to one another. Comparison between the 36% in the last column of "Europe and Middle East" and the 66% of "East Asia" is impressive, and it is even more so if one compares the 33% of the European Union with the 69% of China. More detailed comparison of figures pertaining to aesthetical or technical information alone yield the same picture.

Apparently, Chinese are best prepared to exploit the possibilities of e-commerce, whereas Europeans are least prepared. However, one may remark that China, Japan, Korea and Taiwan rank highest in broadcasting both aesthetical and technical information, whereas other East Asian countries keep the pace as far as it regards aesthetical information but lag behind as far as it regards technical information. Americans fare quite well, particularly U.S. firms. South Asia presents a dichotomic picture, with Indian firms well equipped to exploit the Internet (better than European firms) while Pakistan and other countries are lagging behind.

In the light of the discussion carried out in the previous sections, the following two explanations might be proposed:

1. Firms in China and other emerging countries produce fabrics for lower segments of the market, that are less variable than the fabrics that are produced for the fashion industry. Rather than to Pratese fabrics they should be compared to Pratese yarn which, as we have seen in section 3, does come into the Internet with lots of information.

2. For various reasons, fabrics producers in other parts of the world may have little reason to fear to be imitated by geographically proximate competitors. On the one hand, producers in north America are simply not embedded in industrial districts. On the other hand, small firms located in India or China must overcome a number barriers in order to penetrate western markets. These barriers range from high travel costs relative to domestic wage, to restrictions to export originating from international agreements to sheer cultural and linguistic difficulties. Consequently, Asian countries are generally characterized by relatively few firms engaged in foreign commerce and, for this reason, these firms may not fear to be imitated by the smaller firms of their industrial districts.

Clearly, these two explanations are not mutually exclusive. On the contrary, both of them are likely to be true.

The first one is surely relevant for East Asia. In fact, Table 5 shows that the fabrics producers of the most advanced East Asian countries — Japan, South Korea and Taiwan — broadcast as much information as those of continental China.

However, it is the second one that is most interesting for the European economy. In fact, it would point to a negative influence of European industrial districts on the ability of their firms to exploit e-commerce. Essentialy, this inability would stem out of fear of being imitated (see section 2).

In order to get a better understanding of the patterns illustrated by Table 5, web sites of firms that specialized in a very particular kind of fabrics were noted apart. The idea was to identify very special classes of fabrics, sufficiently homogeneous at all latitudes. If a sharp divide is found across geographical areas even for these narrowly defined fabrics, then structural factors must be at work.

Table 6 illustrates the informational content of 9 classes of fabrics eventually obtained by aggregating specializations for which too small a sample was available. As a benchmark, the average of informational content of all 1121 web sites in the sample and the informational content of the 611 web sites of the firms that do not specialize. More details on the criteria by which these specializations have been defined can be found in Appendix C.

| *Specialization* | *No. of Entries* | *Aesthetical and Technical Information* | | | |
|---|---|---|---|---|---|
| | | **E** | **T** | **E and T** | **E or T** |
| **Greige + Jute** | 28 | 7 % | 25 % | – | 32 % |
| **High-Tech & Medical** | 65 | 9 % | 35 % | 6 % | 38 % |
| NO SPECIALIZATION | 611 | 37 % | 25 % | 10 % | 52 % |
| AVERAGE | 1121 | 40 % | 27 % | 9 % | 57 % |
| **Nonwoven & Mesh** | 36 | 25 % | 42 % | 11 % | 56 % |
| **Synthetic** | 134 | 34 % | 43 % | 13 % | 65 % |
| **Denim** | 28 | 32 % | 64 % | 29 % | 68 % |
| **Embroidery + Nap** | 49 | 69 % | 2 % | 2 % | 69 % |
| **Silk + Hemp + Cashm.** | 75 | 55 % | 25 % | 12 % | 68 % |
| **H.work + Local + Nat.** | 26 | 65 % | 15 % | – | 81 % |
| **Decor. + Des. + Vint.** | 69 | 75 % | 10 % | 7 % | 78 % |

**Table 6**. Aesthetical (E) and Technical (T) information entailed in the web sites of fabrics producers according to specialization. The following specializations have been lumped together because at least one of them was represented by too few

web sites: Greige (22) + Jute (6), Lace & Embroidery (35) + Nap & Plush (14), Silk (61) + Hemp (12) + Cashmere (2), Handwork (14) + Local Tradition (10) + Natural Methods and Materials (2), Decorative & Upholstery (52) + Designers (14) + Vintage Prints (3). Lumped specializations exhibited similar behavior in isolation.

Table 6 begins with two categories of fabrics that provide roughly as much technical information as the average, but little or no aesthetical information. These are greige and jute fabrics on the one hand, high-tech and medical fabrics on the other hand. Obviously, aesthetics counts little for these categories.

Producers of nonwoven fabrics, as well as woven fabrics mainly entailing synthetic fibres, broadcast a bit less aesthetical information than the average but definetly more technical information than average. Their combinations with the AND/OR operators lies just above the average.

The next group entails two specialties that neither require high technological skills, nor make use of particular materials nor exploit artistic creativity. On the one hand, denim fabrics are mostly characterized by their technical features. On the other hand, laces and embroideries as well as nap and plush fabrics are overwhelmingly described by their aesthetical features. On the whole, they show very similar values of informational content regardless of type (E or T).

Finally, there comes a group of specializations that, for different reasons, identify particularly sophisticated fabrics. Silk, hemp and cashmere fabrics are top-class fabrics by the very materials of which they are made. In particular, Indian silks reach incredibly high levels of exquisiteness. Fabrics made according to a local tradition or taking care of using natural methods and materials all imply handwork to some extent, so they have been lumped together with the category of handwork fabrics. Handwork fabrics generally address a high segment of the market. Decorative and upholstery fabrics distinguish themselves because they rely very much on aesthetics. They have been lumped together with designers fabrics and vintage fabrics that are, essentially, a top-class subset of decorative and upholstery fabrics.

All these categories have been ordered by increasing levels of aesthetical information, which also corresponds to decreasing levels of technical information. On very few instances information is both aesthetical and technical (E and T), while information regardless of type (E or T) reaches the highest levels among all specializations.

Clearly, not all high-quality fabrics are captured by these specializations. In

particular, many producers of high-quality apparel fabrics do not specialize at all. Consequently, they rather fall into the "No Specialization" category. However, this residual category is so broad that it entails fabrics of very different kind and quality. On the contrary, the last set of specializations of Table 6 identifies a class of high-quality fabrics that is relatively homogeneous around the world.

Furthermore, fabrics in these categories are tightly linked to the inventiveness and creativity of their producers. Although not necessarily linked to the world of fashion and its vagaries, preciously decorated silk fabrics or upholstery fabrics base their attractiveness on designs that are specific to each single firm. To an even larger extent fabrics signed by particular designers do, but also fabrics that are produced by handwork or using natural methods generally entail an artistic component.

In general, these are the fabrics that are most liable to be imitated. Thus, we should look at this set of fabrics in order look for support to the hypothesis that differences in broadcasted information depend on the structure of productive agglomerations. Table 7 shows the information content of web sites by country disaggregation for the three categories of top-class fabrics lumped together.

| *Decorative, Upholstery, Silk, Hemp, Handwork and Designers' Fabrics* | | | | | |
|---|---|---|---|---|---|
| | *No. of* | *Aesthetical and Technical Information* | | | |
| *Country* | *Entries* | **E** | **T** | **E and T** | **E or T** |
| **EU** | 10 | 30 % | 20 % | – | 50 % |
| **India** | 46 | 61 % | 9 % | 4 % | 65 % |
| **China** | 58 | 65 % | 26 % | 14 % | 78 % |
| **USA** | 29 | 83 % | 17 % | 7 % | 93 % |

**Table 7**. Producers of silk fabrics, hemp fabrics, cashmere fabrics, fabrics made by handwork, fabrics made according to a local tradition, fabrics made using natural methods and materials, decorative & upholstery fabrics, fabrics explicitely authored by a designer, vintage prints of famous designs. Information content in the web sites of four large countries specialized in these fabrics.

Although the three last categories of Table 6 have been lumped into a single one and although Table 7 only focuses on a few large countries, in the case of Europe the sample is really very small. This is particularly disturbing, because the low propensity of European high-quality fabrics producers to broadcast information is precisely the puzzle that calls for an explanation.

However, the differences in the percentages of aesthetical information are so pronounced that a real phenomenon is likely to be there. In fact, both India and China more than double Europe's levels, and the U.S. are far above any other country. Differences in technical information are less sharp, but this is not the kind of information that is relevant to this class of fabrics.

If we accept that the fabrics of Table 7 are of sufficiently high and homogeneous quality, then we may conclude that Europe's textile districts do not broadcast information because of imitation fear. This effect cannot exist in the U.S. because textiles production is not organized in industrial districts, while it is likely to be dampened in India and China because the access to international markets is monopolized by a few exporters. Data for Taiwan and South Korea were not shown because the sample was even smaller than for the E.U.

# 5 Conclusions

Let us come back to the question with which this article began, namely, whether geographically concentrated firms will exploit B2B electronic commerce and, consequently, whether industrial districts will have a different role in the future. This question has been addressed with reference to the fabrics industry, yet the conclusions might be quite general because fabrics span so many dimensions of variety.

Firstly, we should be clear about what communications and what commercial arrangements we are considering. Table 1 (section 2) highlights that the typical subcontracting relationships that characterize a district involve little bargaining but a lot of checking of on-going activities. ICT are likely to have a large impact on these relationships in a near future [16]. However, the arrangement of production was not the focus of our investigation. On the contrary, we focused on the possibility that international buyers shop on the Internet instead of physically moving to a district where they have acquaintances.

If this happens, then we may assist to the formation of virtual clusters of producers well-equipped for B2B e-commerce. These would be virtual "clusters", not virtual "districts" because the firms involved would not contract one another.

Furthermore, we may ask what sort of goods can be advertised and exchanged in electronic markets. In any case not "too normal", because nobody wants to see his profits squeezed by increased competition. But also not "too special" if production is carried out in industrial districts where imitation is practiced.

Thus, we may conclude that productive systems composed by isolated firms

(e.g. the U.S.) or industrial districts where smaller firms cannot imitate the few exporting firms (e.g. India and China) are better equipped to insert some of their members in these virtual clusters. However, one should consider that many European industrial districts are undergiong a process of industry concentration that may lead to the emergence of a few firms that are still embedded in industrial districts, but that are so much more advanced than the others not to fear imitation. In this case, a structural evolution of European industrial districts would allow them not to lag behind their Asian and American counterparts.

On the whole, ICT are likely to add virtual clusters to physical clusters and districts, not to substitute them. It is worth to remark that this is what happened in the industry of currency exchanges, which is fairly different from textiles but which has been the object of close scrutiny because it experienced widespread use of ICT since the 1980s [28].

# A Search Criteria on the Web

The Internet was explored search for web sites of producers of fabrics for home and apparel. Producers of finished products, such as curtains or bedsheets, were excluded. Producers of industrial fabrics, i.e. geotextiles, were excluded as well. However, producers of home and apparel fabrics that produced *also* curtains, bedsheets and other finished products were included. Likewise, producers of nonwoven fabrics for garments and house upholstery that also found industrial uses, were included as well. Firms were excluded if they produced *only* industrial fabrics or *only* finished products. Finally, labels and electronic fabrics (i.e. fabrics entailing switches that can be applied to apparel and furniture in order to command electrical devices) were excluded because qualitatively too different from home and apparel fabrics.

Companies devoted to trade and purely B2C web sites were excluded. However, since fabrics production is characterized by extensive subcontracting, commercial companies that ordered production of specific fabrics were included, as well as companies that used their web site for both B2B and B2C. In the case of low-wage countries, all exporters defining themselves as “exporters and manufacturers” were included (most of them added a brief description of their production facility though it was understood that most of production was subcontracted).

Standardized web sites, i.e. those provided by a portal on a template basis, were excluded. The obvious reason is that only web sites that have been tailored to a particular firm may represent what information that firm wants to make available

on the Internet.

Only web sites in English have been included in the sample. This requirement excluded some Chinese and several Latin American web sites, while obviously biasing the sample towards overrepresentation of web sites from English-speaking countries.

Entering “fabrics” in the *Google* search engine yielded 1,780,000 entries, of which the first 500 entries were scrutinized. Among these 500 entries there were links to commercial portals that were either devoted to textiles, or had a textiles section or allowed for a search for fabrics. Furthermore, portals were examined that provided standardized web pages, since some of the firms lited therein had their own web site as well.

Starting from *Google*, the following portals were encountered: in-netster.com, portal.gio.gov.tw, texcom.co.kr, www.alibaba.com, www.allaboutfabrics.com, www.aptma.org.pk, www.asiannet.com, www.business-directory.com.hk, www.b2bturkishtextile.com, www.chinaccm.com, www.chinamarket.com.cn, www.chinatexnet.com, www.cntexnet.com, www.cntextile.com, www.ecf.com.cn, www.ec21.com, www.enaseeg.com, www.fabric.com.cn, www.fabrics.com, www.fabrics.net, www.fibre2fashion.com, www.gd-textile.com, www.geocities.com, www.globalsources.com, www.indiafabricsexporters.com (trade-india.com), www.indianexporters.com, www.indiatex.com, www.indobase.com, www.italianmoda.com, www.knitsb2b.com, www.made-in-china.com, www.mfg.asiaep.com, www.nbtex.com.cn, www.newworldindex.com, www.portugaltextil.com, www.romtextiles.com, www.searchindia.com, www.sinotex.net, www.tdctrade.com, www.texindex.com, www.texstudio.com, www.textilee.com, www.textilenet.org.tw, www.textileportal.com, www.textiles.com.tw, www.textilewatch.com, www.texurat.com, www.texwatch.com, www.trade-india.com, www.wovenb2b.com. The following portals were not functioning: www.ecf.com.cn, www.enaseeg.com, www.gd-textile.com, www.nbtex.com.cn, www.newworldindex.com, www.textilewatch.com. The following portals did not provide members URLs without paying a fee: www.business-directory.com.hk, www.cntextile.com, www.fabric.com.cn, www.knitsb2b.com, www.texwatch.com, www.wovenb2b.com. The following portal would provide URLs after requesting a password that it never conceded: www.textilee.com. Finally, the following portals were only in Chinese: www.chinaccm.com, www.sinotex.net.

Thus, out of 50 portals only 35 could be examined. Each of them provided tens to tens of thousands of URLs, but many of them contained standardized web

pages only. The largest portals generally either provided internal search engines that were used to look for “fabrics”, or directories of fabrics producers.

# B Information Content of Web Sites

The web pages of Pratese textile firms were said to entail “information” according to different criteria depending of their productive specialization. In particular, information may regard production processes, aesthetical features of products or technical features of products.

Firms operating in the early production stages, handworkers such as spinners and weavers as well as firms performing embellishment operation were said to provide information if they adequately described the machinery that they owned and the operations that they performed. Descriptions had to be supported by technical data and, in the case of particular embellishment operations, original featurres had to be explicitely stated.

On the contrary, in the case of yarn and fabrics producers web pages were said to entail information if they provided adequate description of their products. Albeit classification criteria did not change, examination of the web pages of Pratese firms did not distinguish between information on aesthetical (E) and information on technical (T) features. Thus, the values of Table 4 correspond to column (E or T) of Tables 5 and 6.

Information on aesthetical features was assumed to be conveyed by pictures of the produced fabrics. Conventionally, a web site was counted as providing aesthetical information if it entailed at least 5 pictures of very few and clearly visible pieces of fabrics. Ideally, one different piece of fabric for each picture, which was the most common case. Overall pictures of a showroom or of the whole production did not count as informative. A few cases of moving pictures were not counted as well. Very few web sites provided just five or just four pictures. In the vast majority of cases, web sites either entailed no picture satisfying the above criteria, or at least ten of them.

Information on technical features was the composition of yarn or fabric in term of fibres, or chemical composition in the case of non-woven fabric, fabric weight per surface, mesh density or other technical aspects. The size in which fabrics were made available was not counted as technical information — namely, it was so common that nearly all producers would be counted as providing information if size was included.

# C Fabrics Specializations

Web sites of producers that specialized in a particularly well-defined category of fabrics were isolated. The following fabrics specializations were singled out:

**Cashmere (2)** Fabrics made out of cashmere wool. The vast majority of firms dealing with cashmere either sell yarn or made-ups. Only two were found selling cashmere fabrics.

**Decorative & Upholstery (52)** Fabrics made for decorative purposes, such as pillows or curtains, and fabrics for house upholstery. Car upholstery was excluded. Decorative and upholstery fabrics made of synthetic fibres were not classified in the "synthetics" category.

**Denim (28)** Fabrics for jeans and related garments.

**Designers (14)** Fabrics explicitly designed by named persons. The number of designers ranged from one to tens to hundreds. Fabrics by isolated designers were included in this category even if, in this case, a component of handwork was surely present.

**Greige (22)** Greige (or grey) fabrics are eventually produced by spinning mills that want to integrate their yarns production.

**Handwork (14)** Fabrics characterized by hand work, such as hand embroidery or Indian crewel fabrics. Handloom fabrics were excluded because they may reflect poor working conditions rather than handworker creativity.

**Hemp (12)** Hemp fabrics. Hemp is currently experiencing a revival as a high-quality material.

**High-Tech & Medical (65)** High-tech fabrics are mainly designed for sporting apparel. Medical fabrics are used for surgeons and nurses garments, but they include diapers fabrics as well. Gauze and surgery tapes have been excluded because they are finished products.

**Jute (6)** Jute fabrics are still produced in China and India, chiefly in the Calcutta area.

**Lace & Embroidery (35)** Mechanized laces and embroidery fabrics, excluding finished products such as lace table-cloths.

**Local Tradition (10)** Fabrics in this category range from the traditional tissues of particular Himalayan valleys to an English producer of a very thick cotton cloth that was used by British pilots during World War II. All of them imply some degree of handwork.

**Nap & Plush (14)** Fabrics for toys, pillows or particular furniture.

**Natural Methods and Materials (2)** Ecological cultivation methods, traditional weaving, natural dyes. Essentially, a subset of the "handwork" category.

**Nonwoven & Mesh (36)** Nonwoven and mesh fabrics not only for industrial use but, for example, production of water-repellent garments or door mats.

**Silk (61)** Natural silk. Artificial silk has been included in the "synthetics" category.

**Synthetics (134)** All fabrics obtained weaving overwhelmingly artificial fibres.

**Vintage Prints (3)** Fabrics reproducing past designs and fashions. A number of web sites of specialized B2C sellers were found. Only the very few web sites have been included, were firms declared to organize production of vintage fabrics. In general, they focused on a very specific age and fashion.

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