The symbiotic division of labour between heterogeneous districts in the Dutch and Italian horticultural industry. (in corso di pubblicazione su Urban Studies)

Abstract

This article focuses upon the historical development of three ornamental horticulture districts located in the Netherlands and in Italy. The aim of our investigation is to underline the existence of a global division of labour among three districts driven by industrial district heterogeneity, uneven learning systems, and a unique specialisation in production and retailing. The historical development of the three districts is very similar, but the application of science and the role of local institutions are the explanatory factor of the evolutionary path of the cluster located in the Netherlands. Despite the lack of natural resources

and unfavourable climate, high labour and energy costs, the Dutch district and the horticulture industry based in the Netherlands hold a leading position. The Italian districts analysed, which belong to a very weak national innovation system, even if they are endowed with better resources, are now strongly dependent on the Dutch system.

1 Introduction

The aim of this article is to describe the significant variety occurring among horticultural districts in the Netherlands and in Italy. Our empirical analysis allows us to apply the widely used concept of industrial district, pinpointing the emergence of global production networks (Coe and Bunnell, 2003) which link the analysed industrial districts together. The globalisation of the economy is creating a hierarchy among these industrial districts, within a global division of labour. A kind of "symbiotic" division of labour has been

discovered among the three districts considered: Boskoop, Pistoia, and Saonara, which dates back to the international fragmentation of the value chain (Arndt and Kierzkowski, 2001). The governance of the value chain represents a key connection between the individual industrial district and the globalisation of production chains, giving rise to hierarchies of places and new linkages which reconfigure the old territorial division of labour. Our work shows that the application of science in horticultural districts has transformed them into knowledge-intensive districts. This process is more visible in the case of the Dutch district than in the case of the Italian districts.

Section 2 provides the theoretical background of our research. Section 3 briefly outlines the strategic orientation of firms specialised in the ornamental horticulture industry. Sections 4.1, 4.2, and 4.3, describe the evolutionary pattern of the three horticultural districts. Section 5 outlines a comparison describing the

existing symbiotic division of labour among the three districts. Some conclusions are set out in Section 6.

2 Theoretical background: districts' heterogeneity, innovation, and global supply chains

The concepts of "industrial district" (Panniccia, 2002; Cooke and Huggins, 2003; Belussi, 2006) and "cluster" (Porter, 1998; Maskell, 2001; Maskell and Lorenzen, 2004; Martin and Sunley, 2003) have entered our economic daily life language[1]. Let us start with Marshall's concept of the industrial district (Marshall, 1920; 1919), based on the importance of external economies to understand the development of an agglomeration of small and medium-sized firms. The industrial district is an organisational model of interconnected firms, a hybrid model between market and hierarchy, and a territorial model (a specific localised system characterised by a high sectoral

specialisation). Since the work of Marshall, economists have stressed that the characteristics of an industrial district are related to the benefits of external economies emerging from the close proximity of firms working together in the same industrial town, or in a decentralised "industrial district". Other important elements of the model are: a) the concentration of many small factories specialising in different phases of the same production processes; b) the gradual accumulation in the area of skilled labour force; and c) the creation of subsidiary industries and specialised suppliers. External economies, depending on "the aggregate volume of production of the kind of neighbourhood" (Marshall, 1920, p. 265), can be juxtaposed to the internal economies related to the coordination of activities under the vertically integrated factory. Marshall advocated that, *at least for certain types of production*, two (equally efficient) manufacturing systems could be employed: the large vertically integrated firm, and the industrial district.

Using the Marshallian approach, this article will trace the historical pattern of evolution of the three districts. However, we shall also apply a "modern view" on industrial districts, looking at the way in which local districts are inserted into global networks and supply chains (Gereffi, 1994, 1999; Dicken, 2003; 2007). Our theorisation focuses on some important points. Firstly, the industrial district is a specific organisational model, *ceteris paribus*, equally efficient - in the condition of technical or economic divisibility of activities - to that of the large firm, but this does not imply that a bunch of similar co-localised small firms, specialised in a particular activity, are *per se* efficient. For instance, they could adopt inferior technologies to those in use by large organisations or to those utilised in other competing industrial districts located elsewhere. Secondly, heterogeneity appears to be a key feature which distinguishes industrial districts specialised in the

same industry. Heterogeneity is related to the fact that local agglomerations of small firms may resort to different entrepreneurial models. Moreover, industrial districts are not islands in a sea of pure competition: their evolution is affected by the external institutional context and by the local innovation system - on which the regional and the national innovation systems do exert some influence as Lundvall (1992) and Braczyk, Cooke, and Heidenreich (1998) authoritatively stated. Thirdly, external efficiency in industrial districts is not just related to the volume of activities (scale efficiency), but to other forms of efficiency depending on increasing returns and innovation dynamics (dynamic efficiency). They are conditioned by the stage of evolution of each industrial district and by the various (moderate or strong) forms of learning developed by local firms (Asheim, 1996; Belussi and Gottardi, 2000; Belussi and Pilotti, 2002). Our article contributes to build a

new approach to the literature of industrial districts focusing in particular on three issues that regard:

A. The way in which external relations are developed by local firms and interact with the globalisation process;
B. The continuous process of differentiation that creates heterogeneity even among districts located in similar industries;
C. The role played by research institutions in transferring useful knowledge to local firms, helping them to become knowledge-intensive organisations.

If we study the "economic interrelatedness" of an industrial district/cluster, we can shift from spatial interconnections, which are defined by geographical proximity, to virtual connections (Gallaut and Torre, 2005), which are related to the many external linkages that each local organisation activates with the external world. In other terms, by doing so, we interpret a "given

system" as an open system, with limiting boundary conditions between what is inside and outside our model, but with open exchanges of knowledge flows and resources with the rest of the world. In modern times external linkages are immensely more important than before, and they often allow the industrial districts to work efficiently (Hu, Lin, and Chang, 2005).

We are referring here to firm networks, which include local suppliers, customers, and global supply chains (Gereffi et al., 2005; Gereffi and Bair 2001). Network access can potentially upgrade firms belonging to the district (Humphrey and Schmitz, 2002). However, sometimes the global connections do not carry on any transferable knowledge or advanced organisational routines, but they work only as powerful governance structures whose leaders are the commercial actors. It is the case of the Netherlands, and in particular of the Boskoop district, and of its intense and distributed business networks spread throughout the world.

Already Richardson (1972), in his seminal article, highlighted the motivations for firms to enter business networks: in order to reach complementary, but dissimilar competencies they lack, they need to fit a specific organisational productive demand, that cannot be bought on the market ready-made. In the industrial districts, this has implied the continuous search for specialised producers, and for critical competences, but it has also called for cheaper producers, either geographically co-located or more and more dispersed in low-wages countries. This is why, in a period of fragmented, but integrated global production processes, the construction of global supply chains (Gereffi et al., 2005), has gained ground, both as buyer-driven chains (ruled by retailers and large commercial buyers) or producer-driven chains (ruled by MNCs)[2].

The heterogeneity that characterises industrial districts has been well emphasised by the international literature and recently also by Sammarra and Belussi

(2006), where for instance a synthetic taxonomy of the Italian industrial districts is proposed. The essential parameters used to discriminate between different typologies were: a) the socio-economic structure (including the relational structure and the type of governance); b) the prevalent strategy of district firms (including the degree of openness); c) the learning mechanism (and the attitude towards innovation); and, finally, f) the institutional environment.

But heterogeneity appears to be significant also within the classification suggested by the OECD (2001c), which does not take into account the variety of knowledge used for new products and processes. The classification, put forward by the OECD (2001c), which groups similar products in high tech, medium-high tech, medium-low tech, and low tech, is not truly representative of the peculiar knowledge intensity of each sector, as has been discussed by Sedita (2005). For instance, investments in a plurality of learning activities also affect industries not properly considered at the edge

of the economic growth, such is the case of the ornamental horticulture industry further down analysed.

These learning activities (internally to the district) are supported by firms' strategies, and by their proactive efforts (R&D, engineering departments, focused working groups, etc.), but they are also the result of firm interactions with science and research institutions.

The different ability to interpret and catch the technological opportunities differently characterises the three districts illustrated in this article. They can be ranked in a sort of hierarchical order. The first place is taken by the Boskoop district, Here we find located the most powerful international global retailers and the most prestigious science-based institutions whose activities are applied to plant propagation in vitro, and to new science-based varieties of seeds. The second place is occupied by the Pistoia district, which plays, in part, the role of international producers of Mediterranean plants sold by Dutch wholesalers on the international market. Here local institutions have

recently developed specific bodies deputised to the technological up-grading of the production of local firms. The last district considered in this ranking is the Saonara district, where local firms cover the Italian market and are specialised in the service of landscaping, being low exporters. Our analysis has individuated many relations among firms in these three districts; they are often regulated not by long term subcontracting but by spot-transactions. Inter-district commercial flows and existing suppliers/subcontracting relations show that these industrial districts are linked by a symbiotic relation, where the entire value chain is characterised by a strong inter-firm division of labour (upfront activities and commercial distribution being carried out in the Boskoop district and in the Netherlands). Linkages between the economic agents are related to a model of loose governance, where their asymmetric nature does not imply a high degree of hierarchical control. This transnational analysis appears to be a new perspective

which overcomes the traditional self-contained approach to traditional Marshallian districts.

3 The strategic orientation of firms in the ornamental horticulture industry

Few studies have been conducted on the international ornamental horticulture industry, which is often neither well known nor examined in its economic, social and territorial aspects. The ornamental horticulture industry is composed of floriculture and nursery sectors. The floriculture sector covers firms specialised in cut flowers and cut foliage, whereas the nursery sector comprises the cultivation of plants and gardening products, as shown in Fig. 1.

All activities are organized within different production networks, which are organizationally complex. The ornamental horticulture industry in Europe is dominated by the Netherlands, which contributes nearly 60 percent of world green exports,

but Italy holds the second position, producing 23% of the entire European market (Aiph/union fleurs, 2001). The ornamental horticulture industry represents more than 7% of the entire Italian agricultural production. According to the 2006 Ismea-Ac Nielsen report on the ornamental horticulture industry, there are almost 33,000 firms, which cultivate an area larger than 38,541 ha, producing more than 25,500 types of flowers and plants, and employing more than 100,000 workers. 48% of the Italian firms operating in the industry are devoted to the floriculture segment, 43% to the nursery segment, and only 9% to both segments.

Even though the ornamental horticulture industry is far from being counted among the high-tech industries[3], it firmly and extensively has adopted ICT (Information and Communication Technologies) and intensive agricultural technologies to improve both the production system and the distribution process.

Concerning the commercialisation stage, floriculture has been at the forefront of development and application of

B2B (Business-To-Business) technologies, mainly devoted to the construction of e-marketplaces, which use the "reverse" (to lowest price) auction mechanism[4]. B2B technology solutions and e-marketplaces, spanning both vertical and horizontal markets, have re-structured over time the competitiveness of the industry, reaching scale economies, into structures that increase market and value chain transparency. The use of automating transactions supported the existence of a global value chain. We refer, for instance, to the Dutch cooperative enterprise Bloemenveiling Aalsmeer (VBA), which is 'discontinuously territorial' (Coe et al., 2004; Dicken, 2003). It is the most prominent floricultural products auction in the world, involving about 7,000 cultivators from all over the world, and operating daily about 55,000 business transactions. The VBA works as a virtual marketplace, where buyers can purchase flowers and plants from the clocks[5] (that run from the highest to the lowest price) using the Remote Purchasing service (KOA), simply by the Internet. This is a window-

shopping mechanism. Wholesalers and consumers, by viewing the un-priced supply of product, can ascertain in advance what they need to buy, mark the batches that interest them, and they will be informed in good time if the product is about to be auctioned, so that they can switch to the correct clock for one-shot buying. There is also freedom to purchase outside the auction room, which has significant advantages for repetitive-shots. For example, it allows an organisation to buy items from the same producer, and it creates more cooperative interactions, and thereby integrates data from the auction with internal firms data systems.

Concerning the production, and the conception of new products, specific technologies are applied to optimize the flower life cycle, and to generate new varieties of flowers and plants. Among the process technologies we can mention (among others) automatic irrigation, fertigation, farm tractors, trailers, power cultivators, ploughs, clod busters, extraction machineries, motor mowers, and elevating trucks. Dutch

firms are at the front line in these technologies, followed by mechanical firms specialised in agriculture machinery, which are mainly based in Italy, in the regions of Emilia Romagna and the Veneto. The generation of new flower and plant species normally takes place in the research labs of large multinationals, universities, and public or private research institutes. New technologies are normally applied to plant propagation and to recombinant DNA engineering. The Dutch research institutions are the world leaders in both science activities and technological applications.

Another important mechanism for the diffusion of novelties is the participation in trade fairs which is considered very important for firms operating in this sector. In fact, it gives entrepreneurs and experts the chance to be kept up to date on the forefront techniques of production and commercialisation, and to be informed on the newest horticulture species realised mainly in the research labs of Dutch companies. The largest international horticulture exhibitions are

Plantarium in Boskoop, IPM in Essen, Glee in UK, Four Oaks in UK, Iberflora in Spain, and Flormart/Miflor in Padua.

The ornamental horticulture industry clearly shows how the globalisation of the markets can affect a product – flower or plant – that is easily transportable so that the production can be moved to lower energy costs countries, or countries with better climates, or finally, countries with lower labour costs.

Firms operating in the ornamental horticulture industry need to avoid the negative effect of increasing local costs in nursery garden districts.

The Netherlands is presently at the forefront of this industry. Despite the high labour costs and the unfavourable climate, Dutch firms were able, over time, to develop a strong expertise in horticulture production, and in related R&D activities. This attitude towards product and process innovation places the Netherlands in a leading position, allowing it to exert its power as a strong supplier of cut flowers and young potted plants to

be sold throughout Europe (Hughes, 2000). Besides, less strategic activities have been outsourced in other countries. Horticultural suppliers are in fact not only active in the Netherlands. They operate increasingly on the world market. Almost a quarter of the production value of this sector is obtained nowadays abroad (den Hertog, 2003), such as in the case of the cultivation of cut flowers, which takes place mainly in the region of Lake Naivasha, in Kenya's Great Rift Valley, approximately 120 km from Nairobi. Kenya is the largest flower supplier to the EU, and, within Europe, the Netherlands is the leading destination (68% of all Kenyan flower exports – Dolan et al., 2002). Furthermore, a significant quantity of Kenyan flowers are re-routed to other countries through the re-export of the Netherlands. However, Kenya seems to be heavily dependent on knowledge and technology from the North.

Similarly, the Italian producers, mainly organised in industrial districts, regardless of their ancient tradition,

their territorial embeddedness, and the excellent climate, became strongly dependent on the Netherlands, which is now the “leader” of a global value chain, thanks to its forefront product and process innovations.

In Italy there is a vast assortment, which goes from cut flowers to potted plants for apartments, plants for gardens, and large parks. Some typical national products are ornamental citruses in terracotta vases, olive trees of all varieties and shapes, and the most specific Mediterranean plants. This makes Italy one of the most heterogeneous and commercially interesting countries.

Some ornamental horticulture production takes place in territorially circumscribed areas, and its organization assumes the appearance of the classical industrial district, such as in the case of Pistoia, in Tuscany, and Saonara (in the province of Padua), which will be further analysed.

However, Italian production is strictly dependent on several Dutch activities, as the Netherlands is the leading country in this industry.

4. Three case studies

In this section we shall focus on three ornamental horticulture districts, two located in Italy, and one in the Netherlands.

Our analysis is based on secondary data on the districts' structure and performance and on primary data collected through 45 face-to-face semi-structure interviews to entrepreneurs operating in the three ornamental horticulture districts in the period September 2004/April 2005 (15 in Boskoop, 15 in Pistoia, 15 in Saonara) [6].

In Tab. 2 some structural features and performance indicators of the three districts are schematically represented, while in Tab. 3 the principal associations and institutions operating in the three districts are briefly presented.

4.1 The Boskoop ornamental horticulture district

The most important nursery centre in the Netherlands is Boskoop, a town and municipality in the western Netherlands, in the province of South Holland. The

municipality covers an area of 16.96 km². The Boskoop area is a horticulture district belonging to a very specialised and dense area of activities within the country of the Netherlands. The horticultural sector is indeed responsible for 41% of the entire agricultural production in the Netherlands, and the ornamental plants sector accounts for two thirds of the latter. The ornamental plants sector also accounts for about 25% of the Dutch trade surplus (Maijers, Vokurka, van Uffelen, and Ravensbergen, 2005). In Boskoop (Tab.3), hundreds of firms produce ornamental plants and conifers (in greenhouse pots and in the open air).

The origin of the district dates back to the Renaissance, when local farmers learned the art of fructiferous grafting from the Rijnsburg Convent[7]. For a long time they applied the new techniques only to fructiferous plants, but during the 17th century they started the production of ornamental plants, with the same methods. In the 19th century the local production was mainly concentrated in few large firms.

Subsequently, the process of spin-off of qualified manual workers, thoroughly studied in the districtliterature, gave rise to a multitude of small-specialised firms. However, the district firms[8], until World War II, were still quite undeveloped, and commercial circuits were mainly local, with few exports. The real business growth started during the 1970s, as a result of the increase in international demand, and the development of economic welfare (horticultural plants are luxury goods sold in affluent societies).

The horticultural production in Boskoop is favoured by some local specificities, such as the excellent peat soil, which combines a high density of water (high humidity) with an always-moist quality of compote, ideal for plant cultivation. The district is specialised in the production of young plants, which are cultivated only up to low-medium height. Boskoop producers cultivate all types of plants (such as red Fagus,

Magnolia, Buxus, Acer, etc.), except tropical ones, and the plants are mostly grown outside.

The majority of firms are small size family companies, which often employ only 2-3 persons. The capabilities needed to conduct the business are transferred from father to son, and developed through on-the-job training procedures. In the past, the district counted a vocational training school, which is now closed, because local firms deal directly with more advanced centres and universities. Generally Boskoop entrepreneurs feel the sense of belonging to a district, but the youngest ones are more formally involved in cooperation agreements with public institutions and rival firms.

Greenhouse producers and open air growers no longer sow by themselves. Sowing and cultivation of young plants has become the work of highly specialised nurseries, which use advanced computer techniques, and robots. The whole production process is a prime example of advanced technology applied to horticulture.

Family firms do not deal with the market directly, and work on behalf of the wholesalers. It is a type of subcontracting arrangement existing among manufacturing sectors, like footwear or clothing. Wholesalers annually stipulate contracts for buying a clearly defined set of products, which they will sell at the international level. These contracts are regulated by external institutions, and are limited by strict obligations, on both sides. Unlike other markets of the Dutch horticultural industries, it is difficult for foreign clients to override the wholesale structure, buying directly from the producers. They can have access only to redundant production, and in any case, they must pay in advance by cash.

The wholesalers are the largest firms in the district, they are typically private, limited companies with 5-20 employees, and with a range of sales varying between 2.5 million and 5 million Euro. The wholesalers presently operating in the market are mainly run by the third or fourth generation of local entrepreneurs. They

sell their products primarily either to Garden Centres (60%), or to other wholesalers (30%), or, finally, to public institutions (10%). Sales target countries are the EU, Canada, US and Japan. Adult plants are often imported from Italy, France and Germany, and they are further distributed worldwide. One of the main features of the Boskoop district is that, using advanced logistic techniques, clients receive their orders in all parts of the globe within 24 hours.Wholesalers' plants are normally small, and this characteristic allows them to be transferred at low packaging and transportation costs.

Plantarium, one of the largest international horticulture exhibitions, is held in the Boskoop district. Not only the participation in the international local fair, but also the connections between district firms and local and national entrepreneurial associations (see Tab. 3) can be seen as one of the strategic factors driving the competitiveness of local firms[9].

Many public/private bodies (see Tab. 3) assist firms (both producers and commercial firms) in their daily

activities, supporting both the marketing of the district at the international level (PPH - Plant Publicity Holland), and the R&D projects (the PT - Product Board for Ornamental Horticulture, for instance, invests about 4.5 million euro each year in research activities).

Many governmental agencies[10] are also involved in supporting related R&D activities, often working jointly with private associations, such as in the case of a project on logistics, where the government has supported the introduction of standard transportation tools and packaging (see for example the chrysanthemum box), together with the association of entrepreneurs, VBN.

Local associations are also active in setting rules and fair business practices, which are now standardised (Ecp.nl, 2005) and codified (see: *Trade Rules for Flower Bulb Trading* and *The Dutch Terms and Conditions of Trade for Nursery Stock).*

Considering the public institutions, the well known University of Wageningen (Wageningen UR) plays an important role.

Additionally, we must acknowledge the software producers that worked with the Beurshal organisation in the first years of the 1980s to build an automated system for the selling and buying of horticultural products (VARB[11]), which is now one of the most advanced systems of electronic commerce.

There is also a special Tribunal for horticulture commerce, which deals immediately with all litigations (*Boskoops Scheidsgerecht voor de Boomkwekerij*), and an archive of delinquent clients, based on the historical file of unreceived payments, to which local firms can have access, and through some special inquires, they receive information on the clients' credit guaranty[12].

The Boskoop district operates under a clear-cut open innovation system[13]. Innovation does not take place within a vertically-integrated company, where all the R&D activities are carried out in-house, but is the result of a dense network of cooperation between firms, research centres, and universities. Besides, recently a Dutch innovation platform has been set up by the

government, with the purpose of stimulating innovations in the Dutch flower and food business. The rationality behind this project is to reinforce the connections between knowledge institutions, innovative suppliers, leading entrepreneurs, and buyers, under the perspective of qualifying horticulture as a knowledge-intensive industry.

The long standing division of labour among Dutch firms, and the use of science applied to the reproduction of plants (and to manufacturing and transportation techniques), has created the preconditions for a leading position in the global supply chain, mainly because of the specific capabilities developed by the Nordic firms in crucial fields of the ornamental horticulture industry, such as: a) propagating material, b) plant breeding of seeds and young plants, c) greenhouse construction and installation[14], d) harvesting and sorting machines, e) design of innovative machines for the improvement of logistics, and f) production of other horticultural goods (equipment, accessories, such as: pots, trays, covers and

sheeting). The presence of many specialised consultants, working in the horticultural sector, completes the spectrum of the heterogeneous and strategic capabilities possessed by the local district[15].

3.1 Pistoia ornamental horticulture district

Pistoia, located in the north part of the Tuscany region, is the "greenest province" in Italy (Bardelli, 1999). More than 50% of its territory is covered by forests of conifers, hardwood forests and typical shrubs of the maquis. The ornamental horticulture industry is the most important agricultural activity; it contributes 75% to the formation of the gross product of Tuscan agriculture, 35% of the national GDP, and it represents 5% of the overall European ornamental horticulture industry (Sarti, 2006).

The birth of the ornamental horticulture district in Pistoia dates back to 1849, when the young gardener at Villa Bozzi, Antonio Bartolini, convinced his father to rent a narrow piece of land on the "Lucchese"

Provincial road. Here he built up the first nursery in Pistoia; soon his brothers started to work with him, constituting a small family firm.

In 1851 the rooms of the former “Convento del Carmine”, a monastery, accommodated the first edition of the Pistoia horticulture exhibition. Between 1870 and 1900 several important fairs dedicated to horticulture took place, since the Bartolini Brothers company was no longer the only one in the Pistoia horticulture industry[16]. In 1895, Ernesto Tonelli built an important nursery in the garden of the “Madonna del Soccorso”, and he was the first to “export” his own productions to the Leghorn market. The propulsive phase of the Pistoia horticulture industry began during the first two decades of the 1900s. The agricultural companies grew in size and number, and the activities that previously were carried out within the walls of the city began to expand externally, along the eastern and southern directions.

Between 1909 and 1923, the industry expanded quickly, both in terms of cultivated hectares and

adopted techniques, being supported by a significant number of institutions devoted to research, experimentation, and diffusion of knowledge activities. Among others it is worth mentioning the AOPI (Italian Professional Horticultural Association), created in 1911, and counting horticulturists, floriculturists, nursery professionals, garden constructors, seed traders, and florists as members. The AOPI was the first association in Italy dedicated to scientific, technical or practical knowledge transfer among professionals.

Moreover, in 1923 the "Royal Practical and Theoretical Observatory of Fruit-growing" was founded in Italy, for research and experimentation in the field of the fruit-bearing plants. The Observatory had two main objectives: a) maintaining the plant varieties and curing the diseases of the various cultivations, and b) organizing fruit growing courses, conferences, and working as a consultant to enhance the development of the industry.

As a result of such initiatives, a formal education system, focused on the arts of agriculture, was initiated in the city, through the institution of regular courses of pruning, grafting and diverse agrarian techniques. These initiatives were at the basis for the foundation of the future Agricultural College “De Franceschi”.

The Pistoia horticulture enterprises faced many crises, due to phylloxera[17], World War I and II, but they were able to maintain their business and to grow in number and target markets (also international), reaching a phase of strong expansion during the 1950s, when the cultivated surface increased from 500 ha in 1956 to more than 3000 at the end of the 1960s. The growth was supported by the creation of new institutions and specialist schools, and by the increasing participation of local entrepreneurs in international fairs (such as the Flormart in Padua and the Miflor in Milan). The innovative capabilities of local firms were spurred both by the collaboration with local research institutions and universities (such as Ce.Spe.Vi in 1981 and a new

University course on Nursery in 1992 – see Tab. 3) and by their proactive behaviour, which favoured the introduction, from the 1970s, of many innovative improvements, related to both the product and the production process, such as the large-scale cultivation of plants in pots in the 1970s, the specialisation in topiary, and particularly in the cultivation of shrubby creepers in pots in the 1980s, and the cultivation of large trees in affixed containers in the 1990s. The latter innovation deeply characterises the strategic position of the Pistoia district on the global market. Olive trees, strawberry-trees, palms, carob trees, oaks and other species, "captured" from various environments, were transported to Pistoia, unloaded, placed in large pots with the appropriate soil, correctly pruned, and placed in fields to be cultivated and grown, and to be reproduced. Now Pistoia's trees adorn many villas and public gardens, giving rise to a new trend in the sector, and a new specialisation, as confirmed by Hodgson (2004): "instant" gardens.

As a result of the advances in horticulture production, and the continuous growing of new species, during the 20th century the cultivated hectares increased to 5000 ha. The district is now composed of roughly 2000 firms with 5000 employees, and the value of its production has reached sales of about 300 million in recent years.

The majority of firms operating in the ornamental horticulture sector in Pistoia are individual firms (90% of total firms), only 10% of the companies are larger legal entities. Three categories of firms can be identified in the Pistoia district[18,] according to their size (Manetti and Pasqual, 2006):

a) Small size firms (1.6 ha). Small producers, specialized in the production of a single variety of plants, belong to this category. They normally work on demand for a single large company, with which they sign annual contracts with small margins of gain;

b) Medium size firms (5.8 ha). Producers that also commercialise their products are included in this group.

They are independent of larger companies, and they adopt expansion strategy at both national and international level, where they often play the role of peripheral nodes of the business network.

c) Large size firms (18.7 ha). Only about 20 firms belong to this category. They are oriented to sale their products mainly to foreign markets (within the EU), and they invest a large portion of the revenues in R&D activities, often carried out internally in advanced laboratories. As a result, they have been able during time to register 5 new types of plants: (one Magnolia grandiflora, two Quercus robur, two Robinia).

The assortment of plants cultivated in the district is very large in species, but the specialisation is in evergreen, deciduous plants, and conifers. Moreover, the district is characterized by the typical productions that draw their origin in the tradition of Tuscan Renaissance small farms, namely the cultivation of citruses and other exotic species in pots. Also the art of

topiary is developed here, in order to obtain plants of various shapes for adorning classic gardens.

The level of specialisation of the area is impressive, and the division of labour between companies has been pushed so much further that it can be easily stated that a plant born in Pistoia passes through 2-3 (or even 4) enterprises before being ready to reach the market. The experience that some of the firms have accumulated over time is so precious that they became a point of reference at national level – such is the case of companies that develop gardens and parks, means of production (pots, fertile soil, greenhouses and plant engineering, etc.), or supply services (and connected materials goods).

In the Pistoia industrial district the enterprises and the public system have been able during time to conjugate entrepreneurial culture and scientific knowledge, creating, as a result, modern ornamental horticulture enterprises,and advanced structures of training and technical-scientific support, like the

bachelor course in Nursery Technique and Landscape Architecture.

3.2 The Saonara ornamental horticulture district

The industrial district of Saonara is located in the province of Padua, and is one of the most ancient horticulture districts in Italy. It covers an area of 2,000 hectares, of which more than 40% are used as cultivated nursery by about 1,000 firms[19]. The district is specialised in rosebushes and fruit-bearing trees.

The production includes also ornamental plants for gardens, trees, plants for landscaping and forestry. Firms are also limited exporters. Recently some firms have begun to specialise in gardening, and private and public green maintenance.

The historical origins of the ornamental horticulture industry in Saonara go back to the city of Venice, which, between the 15th and the 18th century, assumed the role of driving centre for the local development of botanic science. The Venetian aristocracy has

consistently maintained a passion for the cultivation of rare plants, creating beautiful gardens in the lagoon city, and on the “terra firma”. Particular recognition is due to the abbot and nobleman Gabriele Farsetti, who, already in the 18th Century, built, around his historical house in Santa Maria di Sala, a municipality near Padua, a large company dedicated to the cultivation of ancient plants (botanic gardens, meditation gardens, fruit-bearing fields, and so on), and twice published, in 1793 and 1796, rich catalogues of all his varieties of plants.

Following this first attempt to codify ornamental horticulture knowledge, some more popular oriented publications were diffused also for a larger audience than the scientific and academic ones. Since 1763 a public institution for the cultivation of fruit and garden plants was active in Padua, founded by a decree of the “Veneto Dominio” (the Venice Republic).

This phenomenon of popularisation of sector-specific knowledge shows other evidence in the fact that in the first half of the 19th Century the participation in

flower exhibitions was not only a privilege of the aristocracy, and of the wealthy classes, but also a passion for the middle classes.

The association “Società Promotrice del Giardinaggio”, active in Padua between 1846 and 1868, contributed to the local diffusion of horticulture practices, whose expansion was intensified in the first decades of the 20th Century. This association started to sponsor numerous flower exhibitions in Padua, and to promote flower shows in private villas.

Pioneer firms were the following companies: Fassina, Croff, Gribaldo, Rizzi, Sgaravatti, Zorzi, and Van Den Borre. Some of them are now closed down or decreased in size. The Sgaravatti family firm was one of the most important producers of the Saonara district, contributing strongly to the extension of the district markets towards all Europe.

Angelo Sgaravatti, born in 1798, became in 1815 an expert gardener in service of the Count Morosini. In 1820 he bought a small piece of land (one ha.) from the

Count - whose economic fortunes went bankrupt as occurred to many Venetian nobles - on which he started a small ornamental horticulture production. The small firm grew extensively during time, involving also the founder's brothers and starting new activities in other locations. The "Fratelli Sgaravatti Piante" was able in 1936 to buy a firm in Pistoia (Stabilimento d'Orticoltura Bianco Bianchi), to differentiate the production to include also the cultivation of conifers, which require more favourable climate conditions. In 1946 the firm also acquired some land in Rome. The firm closed down during the 1960s and was taken over by its workers, with the name of Cooperativa Co.Vi.Sa, which no longer exists.

The Saonara district is nowadays composed mainly of family companies (30%), which own a very small piece of land (1 ha). The majority of them are individual companies, some employ workers who are not family members (3-8), and only two or three firms have more

than 20 employees. Besides, the employees are often linked to the firm by a seasonal contract.

The revenues of the producers depending on wholesalers' purchases tend to be low. The specialisation in gardening services allows firms to escape the price mechanism driven by marketplace technologies, which put producers in global competition, following a purely neoclassical mechanism, where prices are no longer dependent on "local" costs but are fixed in a global context.

One of the weaknesses of the Saonara district nowadays is that it is not characterised by a strong presence of professional and research institutions. Many horticulture production support activities are organised by the Padua agriculture associations (Unione Provinciale Agricoltori, Coltivatori Diretti, and C.I.A. - Confederazione Nazionale dell'Industria e dell'Agricoltura). Only in 1985 was a specific association for horticulture set up (Associazione Vivaisti Padovani), but it has not been very active in

organising conferences, R&D agreements with the university, firms' cooperation, and training activities. In 2000 another institution was founded (Consorzio Florovivaisti Padovani), specialised in quality certification (ISO 9001), the management of members' participation in exhibitions, and the publication of a technical manual for the production of ornamental horticultural plants.

Research and experimentation centres, which are perceived as indispensable by the entrepreneurs, are in short supply (see Tab. 3). In Legnaro (a municipality in the province of Padua) there is Agripolis, a university pole of the Faculty of Agriculture and Veterinary Science. The campus also incorporates the Veneto Centre for Agricultural Studies. In Padua there is a secondary school specialised in agriculture studies, the Istituto Tecnico Agrario "Duca degli Abruzzi". However, there are not many close and productive connections between firms and these institutions. The Faculty of Agriculture has recently proposed two

specific courses for the sector (the bachelor course in Nursery Techniques and the bachelor course in Landscaping, Parks and Gardens), but local entrepreneurs are reluctant to employ graduated students in their small firms, and to provide internships for university students.

Despite the existence of specific education programmes, a poor network of internal relationships, which involve institutions, universities, and firms, contributes to the creation of a relational vacuum, where knowledge circulation and collaborative projects are not easily pursued. Paradoxically, the presence in Padua of an important international fair, Flormart/Miflor, which hosts, twice yearly, the leading operators in the ornamental horticulture industry[20], does not contribute considerably to the Saonara district firms' performance. This is probably due to the poor absorptive capacity of the firms located in the industry, which are not able either to grasp the new trends of the market or to

upgrade their production processes, or, finally, to engage in international research projects in the field.

5. Some considerations on the symbiotic division of labour As it is well known, The Netherlands plays the role of a monopolist supplier of cut flowers distributed throughout Europe (Elshof, 1998). In particular, Italy has consistently incremented the imports of horticultural products. According to the 2006 Ismea-Ac Nielsen report on the ornamental horticulture industry, the imports of flowers and plants from the Netherlands cover almost three quarters of the overall imports. This process was accelerated by the constitution of the "Mercato Unico Europeo" (Economic European Area - EEA), which occurred on the 1st of January, 1993. In the year 2004, exports towards Italy contributed to a sales turnover of 333 million Euro for the Netherlands, an amount that increased by 5.1% between 2003 and 2004.

The ornamental horticulture industry (also known as the green industry) is clearly affected by international

production and distribution flows, which stimulate global competition and the rising of leading countries (and districts). The analysis of the three districts presented above aims to define clearly their strategic position within a global supply chain, which is the result of a symbiotic division of labour at the international level. Tab. 2 summarizes the main features of the three districts, based on our firms' interviews, and reveals their heterogeneity. The three districts are all very old, and are formed mainly by small firms. In all three cases during the 1930s and the 1940s, large firms were dominant in the districts, but in the post-war period we witnessed the rise of smaller firms, partly as spin-offs from existing companies in the districts.

However, the exploitation of science, together with a high entrepreneurial attitude and trade mentality (de Lauwere, 2005) has greatly contributed to globalise the Dutch district, and to render this district a very particular combination of scientific activity and practical knowledge embedded in manufacturing tasks.

It is clear, from our study, that local and national institutions played a very important role in the determination of the success of Boskoop, mainly rooted in the innovations adopted to improve both the production and the distribution phases.

On the other hand, Italian growers hold the firm belief that the advantages of the Mediterranean climate free them from the need to consider the possibilities of high technology. High technology is regarded as too risky and too expensive (Schneider, 1991).

A global division of labour links the three districts along the value chain: Pistoia and Saonara must buy nearly all the small plants they need in the Netherlands, where propagation activities are more developed, and then grow the small plants in Italy. In some cases, adult plants are re-exported to the Netherlands, and sold on the global markets, through the advanced commercial structures of the Dutch distributive sector.

The breeding of horticultural crops has a long history in the Netherlands. Traditionally, seed

companies were located in the northwest, around Enkhuizen. But subsequently, many plant breeders moved, or were created also in (or near) the Westland. Because of the importance of the Dutch market, many plant breeders come from the United States, Japan, France and other countries. Due to the highly specialised nature of plant breeding, and the high costs involved, firms tend to collaborate also with foreign firms located in the area.

In spite of the internationalisation of the plant breeding sector, much of the scientific research into new varieties has remained in the Netherlands. This gives a high competitive advantage to seed firms, which export a significant proportion of their products (seeds). The Netherlands are now the home of plant breeding, and the innovator for new plant and flower varieties (Maijers, Vokurka, van Uffelen, and Ravensbergen, 2005).

Many firms in the Pistoia district buy young plants from the Netherlands, which are then cultivated in their

nurseries. However, the largest firms are able to sell their cultivated plants back to the Dutch garden centres. The Netherlands lack the right soil and sun for the "maturing" of the plant development, and production costs are much higher than in Italy. So, we can observe an interesting division of labour that takes place between the two districts: scientific activities and propagation tasks (which are also related to the application of biotech techniques to the propagation phase) are more developed in the Netherlands, where local firms benefit from the existing well developed "national innovation system", while the "manufacturing" process of plants development, starting from the small plant to the adult plant, is organised by the Italian district.

Strictly speaking, we see that horticultural districts are no more low-tech activities, but science is applied differently in the two districts, and districts work now in an integrated flow of knowledge exchanged in goods and services. Some districts have specialised in

knowledge-intensive activities, others are less knowledge-intensive.

1. In the former, biotech activities are behind the development of knowledge in plant reproduction and in product innovation (the generation of new varieties), and in ICT applied to logistics, selling and marketing techniques.

2. In the latter - which cannot benefit from a national advanced system in plant reproduction and in biotech science - we see interesting new applications of mechanical labour-saving techniques for irrigation, automation, and so on, which are more related to medium-low value added phases of the value chain, and some timid progresses in new techniques of propagation related to typical endogenous niche products, that the Dutch have not much developed (Mediterranean plants). It is a process very similar to the one that takes place in clothing and footwear districts (Sammarra and Belussi, 2006), with the difference that here more advanced Italian districts specialised in design, production

techniques and marketing activities govern the entire global supply chain (and often own the foreign firms that operate in the distant manufacturing districts).

In this context, it is interesting to observe that Pistoia firms are also involved in commercial activities with Saonara firms, to which they sell plants and some mechanical tools for the nursery sector, because in the Pistoia district there are some specialist firms which have developed a new machinery sector. Some local specialised suppliers have developed important innovations in collaboration with the advanced Italian agricultural machinery sector, mainly based in Reggio Emilia, in Emilia Romagna, and in Padua, in the Veneto region. They are now among the largest Italian suppliers of these products.

All the firms operating in the Saonara district have some relationships with Pistoia, for buying plants, materials, and equipment. For this purpose firms have developed an effective logistic system, which is organised in two ways (with plants and materials bought

in Pistoia) and sold to Pistoia (mainly rose bushes). Some of the firms are connected to the Netherlands, from which they buy rootstocks and young plants. Thus, Pistoia is more specialised in cut foliage and "instant gardens" plants, and Saonara in roses. Saonara is also involved in the service sector of garden and public flowerbed maintenance, for which they are able to compose "bunches" of different plants: some bought and some cultivated by them.

Despite their relationships with Pistoia and Boskoop, the Saonara firms are not at the peak of their sector: they are not adopting advanced techniques in product development, and they are neither innovators nor early followers. This is probably due to a lack of intrinsic motivations and cultural embeddedness, which makes the entrepreneurs very resistant to novelties and self-upgrading, favouring a lock-in mechanism which prevents the district being globally competitive.

The absence of effective meta-organizers, which operate as district boundary spanners (i.e. training

institutions, knowledge reservoirs like a district museum, specialised consultants) constitutes a strong limit to the evolution of the Saonara district, and keeps it qualitatively and technologically distant from both the Boskoop and the Pistoia districts.

As a result, the Saonara district is configured as a weak component of a global value chain, where the Netherlands are the innovators that sell their new products (in the shape of young plants) to a district, Saonara, which does not possess the capabilities to make technological improvements, and to experiment in loco the creation of new flower and plant varieties.

4 Concluding remarks

This article describes an important and understudied industry, which benefits from a high growth rate and an increasing demand, namely the ornamental horticulture industry, also known as the green industry. The production of cut flowers and potted plants, together with garden services, is concentrated in particular

locations, often organised within industrial districts connected worldwide along a supply chain. We have demonstrated that nowadays the ornamental horticulture industry is a knowledge-intensive industry, where strategic capabilities are related to innovation, both at the process and at the product level. The global supply chain is actually dominated by the Netherlands and by its most important district, Boskoop.

The analysed districts operating in the sector are quite heterogeneous since local firms depend strongly on local institutions. The existence of linkages with science institutions seems to be a precondition for the success of the green firms, being also a prerequisite for the diffusion and adoption of novelties. The "atmosphere" which surrounds firms networks forges heterogeneous situations and significantly diverse innovation systems. Diverse has been the capacity of local firms to deal with distant extra-district operators. Diverse is the ability of local firms to absorb knowledge on the basis of external relations.

The different set of capabilities owned by each district specialised in the ornamental horticulture industry shapes the way it positions itself in the green global supply chain.

Depending on the capabilities (both developed internally and acquired externally) owned by the individual industrial districts, they might appear as global leaders or followers. Thus, a hierarchical structure has emerged over time. The Netherlands are presently at the forefront of the horticulture industry (Ferretti, 2004), and contain numerous related activities, and a specialised district (Boskoop). Even though the country suffers from the highest labour costs and the most unfavourable climate, it has been able, over time, to develop a strong expertise in horticulture production, in related R&D activities, and in the management of global trade flows of flowers and plants .

A large number of specific institutions have sustained this trend, developing several collaborations with universities and research centres, with the purpose

of keeping “in house” the most profitable activities related to: 1) science application: plant propagation, new plants engineering, seeds production; and 2) distribution: logistics, auction, marketing, and retailing. Firms have outsourced the lowest added value activities (such as plant growing) to lower cost (or better climate) countries.

This attitude towards product and process innovation places the Netherlands in a leading position, allowing them to exert their power as the strongest global supplier of cut flowers and young potted plants. In the cases analysed here, while Boskoop represents the head of the supply chain, Pistoia plays the role of an intermediary actor, and Saonara positions itself at the bottom of the chain, where only routine activities are organised in firms. Our empirical analysis has shown the existence of a global value chain, composed by the interrelationships between the three studied horticultural districts.

They are remarkably different, in research capabilities, types of products, adoption of technology, market shares, business models, and relations with local institutions. The influence of globalisation has not reduced the diversity but it has contributed to increase specialisation and to enforce the symbiotic division of labour among them.

References

AIPH/UNION FLEURS (2001) *International Statistics. Flowers and Plants*, 49, edited by Florian Heinrichs, Institut für Gartenbauökonomie der Universität Hannover.

ARNDT, S. and KIERZKOWSKI, H. (2001) (Eds.), *Fragmentation. New Production Patterns in the World Economy*, Oxford Univ. Press, Oxford.

ASHEIM, B. (1996) “Industrial Districts as ‘Learning Regions’: a Condition for Prosperity”, *European Planning Studies*, 4, pp. 379-400.

BARDELLI, F. (1999) *Storia del vivaismo a Pistoia*, Pistoia: Etruria Editrice.

BECATTINI, G. (2003) From the industrial district to the districtualisation of production activity: some considerations, in: F. BELUSSI, G. GOTTARDI, and E. RULLANI (Eds.) *The Technological Evolution of Industrial Districts*, Boston: Kluwer.

BELUSSI, F. (2000) *Tacchi a spillo*, Padua: Cleup.

BELUSSI, F. (2006) In search of a theory of industrial districts and clusters, in: B. ASHEIM, P. COOKE, and R. MARTIN (Eds.), *Cluster in Regional Development*, London: Routledge.

BELUSSI, F. and PILOTTI, L. (2002) The development of an explorative analytical model of knowledge creation, learning and innovation within the Italian industrial districts, *Geografiska Annaler*, 84, pp. 19 – 33.

BELUSSI, F. and GOTTARDI, G. (2000) *Evolutionary Patterns of Local Industrial Systems: Towards a Cognitive Approach to the Industrial District'*, Aldershot: Ashgate.

BRACZYK, H.J., COOKE, P., HEIDENREICH, M., (Eds.) 1998. Regional Innovation Systems: The Role of Governance in a Globalized World. UCL Press, London.

CHESBROUGH, H. (2003) *Open Innovation: The New Imperative for Creating and Profiting from Technology*, Harvard Business School Press.

COE N. and BUNNELL T. (2003), Spatializing knowledge communities: towards a conceptualisation of transnational innovation networks, *Global Networks*, 3, 4, pp. 437-56.

COE N., HESS M., YEUNG H., DICKEN P., and HENDERSON J. (2004), Globalising regional development: a global production networks perspective, *Transactions of the Institute of British Geographers*, 29, pp. 468-84.

COOKE, P and HUGGINS, R. (2003) 'High Technology Clustering in Cambridge', in F. SFORZI (ed.), The Institution of Local Development, Aldershot, Ashgate.

DE LAUWERE C.C. (2005), The role of agricultural entrepreneurship in Dutch agriculture of today, *Agricultural Economics*, 33, pp. 229-238.

DEN HERTOG, P. (2003) The role of cluster policies in economic growth and competitiveness, paper presented at the European Seminar on Cluster Policy, June 10th, Copenhagen.

DTI (2001) 'Business Clusters in the UK – A First Assessment', London: DTI.

DICKEN P. (2003), *Global Shift: Mapping the Changing Contours of the World Economy*, London, Sage.

DICKEN P. (2007), G*lobal Shift: Reshaping the Global Economic Map*, London Sage. DOLAN, C., OPONDO M., SMITH S. (2002), Gender, Rights & Participation in the Kenya Cut Flowers Industry,

NRI (Natural Resources Institute), Report No. 2768, SSR Project No. R8077 2002-4.

ECP.NL (2005) EbXML for managers, Amsterdam.

ELSHOF, P. (1998) The Dutch flower sector: structure, trends and employment, SAP 2.68/WP.122, ILO working paper, Geneva: International Labour Office.

EUROPEAN COMMISSION (2001) *Methodology for Regional and Transnational Technology Clusters: Learning with European Best Practices*, Enterprise Directorate General, Brussels.

FERRETTI, R. (2004) L'andamento del florovivaismo in Europa nel 2004, *Linea Verde*, October 2004.

GALAUT, J. and TORRE, A. (2005) Geographical proximity and circulation of knowledge through interfirm relationships, *Scienze Regionali*, 1, pp. 5-25.

GEREFFI, G., HUMPREY, J., and STURGEON, T. (2005) The governance of global value chain, *Review of International Political Economy*, 12 (1), pp. 78-104.

GEREFFI G. (1994), The organisation of buyer-driven global commodity chains: how us retailers shape overseas production networks, in GEREFFI G. and KORZENIEWICZ M. (eds.), *Commodity Chains and Global Capitalism*, Praeger, London.

GEREFFI G. (1999), International trade and industrial upgrading in the apparel commodity chain, *Journal of International Economics*, 48, pp. 37-70.

GEREFFI, G., BAIR, J. (2001) Local clusters in global chains: the causes and consequences of export dynamism in Torreon's blue jeans industry, *World Development*, 29 (11), pp. 1885-1903.

HARVARD BUSINESS SCHOOL (2002) Cluster Mapping Project, *Institute for Strategy and Competitiveness*, Cambridge, MA: Harvard Business School.

HODGSON, I. (2004) Italian plants with designer appeal, *The Garden*, March 2004, Vol. 129, Part 3, pp. 194-199.

HUMPHREY J. and SCHMITZ H. (2002), How does insertion I global value chains affect upgrading in industrial clusters, *Regional Studies,* 36, 9, pp. 1017-27. HU, T., LIN, C., and CHANG, S. (2005) Role of interaction between technological communities and industrial clustering in innovative activity: the case of the Hsinchu district, Taiwan, *Urban Studies*, 42 (7), pp.1139-1160.

HUGHES A. (2000), Retailers, knowledges and changing commodity networks: the case of the cut flower trade, *Geoforum*, 31, pp. 175-190.

Imea-Ac-Nielsen (2006), Ornamental horticultural report, Milan.

LUNDVALL, B-Å. (1992). *National systems of innovation: Towards a theory of innovation and interactive learning*. London, Pinter.

MAIJERS, W., VOKURKA, L., VAN UFFELEN R., and RAVENSBERGEN, P. (2005) Open innovation: symbiotic network. Knowledge circulation and competencies for the benefit of innovation in the

Horticulture delta, Paper presented at the IAMA Chicago conference, April 19th.

MANETTI B. and PASQUAL S. (eds.) (2006), "Prima indagine regionale sulle aziende florovivaistiche della regione Toscana", Regione Toscana - Settore Sistema Statistico Regionale, Firenze.

MARSHALL, A. (1919) *Industry and Trade*, London, Macmillan.

MARSHALL, A. (1920) *Principles of Economics*, 8th edn., Macmillan, London, First edition [1891] (London: Macmillan).

MARTIN, R. and SUNLEY, P. (2003) Deconstructing clusters: chaotic concept or policy panacea?, *Journal of Economic Geography*, vol. 1, pp.5-35.

MASKELL, P. (2001) Towards a knowledge based theory of the geographical cluster, *Industrial and Corporate Change*, vol. 10, n. 4, pp. 921-943.

MASKELL, P. and LORENZEN, M. (2004) The cluster as market organisation, *Urban Studies*, Vol. 41, Nos 5/6, pp. 991-1009.

OECD (1999a) *Boosting Innovation: The Cluster Approach*, Paris, OECD.

OECD (1999b) *Economic and cultural transitions towards a Learning City: The case of Jena*, Paris, OECD.

OECD (2001a) *World Congress on Local Clusters*, Paris, OECD.

OECD (2001b) *Innovative clusters: Drivers of National Innovation Systems*, Paris, OECD.

OECD (2001c) *Science, Technology and Industry Scoreboard 2001 - Towards a knowledge-based economy*, Paris, OECD

PANICCIA, I. (2002) A Critical Review of the Literature on Industrial Districts: In Search of a Theory, in: I. PANICCIA, *Industrial Districts: Evolution and competitiveness in Italian Firms*, Cheltenham: Edward Elgar.

PORTER, M. (1998a) *On Competition*, Boston, Harvard Business School Press.

RICHARDSON, G. (1972) The organization of industry, *Economic Journal*, 82, pp.883-96.

SAMMARRA, A. and BELUSSI F. (2006) Evolution and relocation in fashion- led industrial districts: evidence from two case studies, *Entrepreneurship & Regional Development* Special Issue on Industrial districts' relocation processes: evolutionary and policy issues, 18, pp. 543-562.

SARTI A. (2006), Pistoia: caput mundi del florovivaismo, www.pratoblog.it.

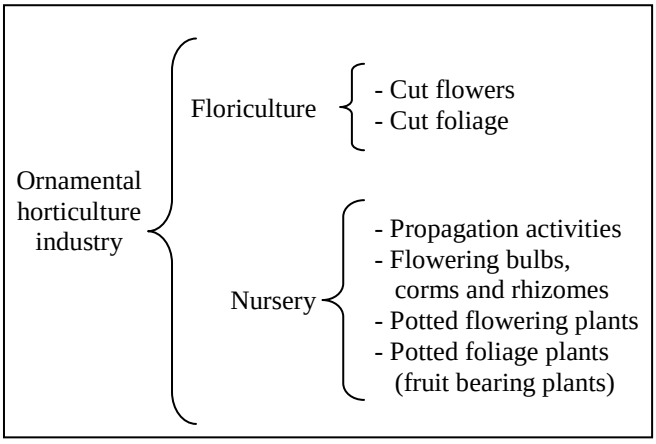
SCHNEIDER, V. (1991) The comparison between Italian and Dutch floriculture technical and economical aspects, Acta hort. (ISHS) 295: 107-112 http://www.actahort.org/books/295/295_13.htm.

SEDITA, S. R. (2005) Knowledge vs. Technology: investigating the relationship between R&D and knowledge intensity in the Danish manufacturing industry, paper presented at the 5th Triple Helix Conference, 18-21 May 2005, Turin (Italy).

VAN KLINK, A. and VISSER, E.J. (2004) Innovation in Dutch horticulture: Fresh ideas in fresh logistics, *Journal of Social and Economic Geography*, 95 (3), pp. 340-346

VBN (2005), Annual report, Leiden.

Fig. 1 An abridged classification of the ornamental horticulture industry



Tab. 1 Structure and performance indicators of the three districts (2003)

District	*Number of firms*	*Area covered (ha)*	*Number of employees*	*Sales (mil. €)*	*Export (%)*
Boskoop*	1000	2200	2500	350	90
Pistoia**	1767	4403	5000	300	45
Saonara*	151	1000	800	15.5	10

*Source: * Our survey ** Regione Toscana – Settore Statistica*

Tab. 2 A cross-comparison between the 3 districts (Saonara, Pistoia and Boskoop).

	Saonara district	*Pistoia district*	*Boskoop district*
Natural resources	Malleable soil	Malleable soil and Mediterranean climate	Soil rich in water, and tender compote
Climatic conditions	Medium	Very good	Unfavourable
History	Founder firm: Sgaravatti in 1820	Founder firm: Bartolini in 1849	Horticultural specialisation emerged during the 16th century Numerous firms emerged during the 19th century Take off after WW II
District specialisation	Fructiferous plants, and rosebushes Maintenance of public gardens and green areas	Cultivation of ornamental plants ready to instant garden	Small plants, seeds, and propagation (R&D- intensive production)

Quality of the product	Very good	Very good	Very good and certified on the basis of numerous criteria Central Dutch Service for quality (Naktuinbouw)
Labour market	Specialised	Specialised	Specialised
Co-operation	Very low	Medium level	Very high (both among firms and institutions)
Infrastructures	Medium	Medium	Advanced through Rotterdam port (diversity and volume of cargos)
Entrepreneurial organisational capabilities	Very low for SMEs medium to large firms	Very low for SMEs medium to large firms	Very high for all firm sizes
Introduction of new products	Low	Medium	Very High

Level of inter-firm cooperation	Medium	Medium	Medium
Role of public institutions	Medium	High	Very high
Diffusion of new technology	Limited	Higher	Very high Logistics and e-commerce retail; presence of VBA, the most prominent floricultural products auction in the world
R&D	None	Few links with Italian Universities	High R&D flows provided by public expenditures and by firms associations
Promotion	None	None	PPH - Plant Publicity Holland

Source: Our elaboration of firms' interviews.

Tab. 3 Main institutions operating in the districts analysed

	Private associations located in the district	Public institutions located in the district or in the region	Main activity
Saonara	Consorzio florivivaisti		Conference organisation and quality certification
	Associazione vivaisti		Promotion and participation in exhibitions
		University of Padua	Sporadic activity of consultancy
Pistoia		C.N.R. (National Research Centre) Institute of Florence	Studies for the propagation of the wood species (mainly conifers), flowers, and hedge shrubs
		National Germplasm Bank (University of Florence)	New centre for in vitro propagation of old plants and for the conservation of ancient species
		Ce.Spe.Vi. s.r.l.	Centre for experimentation and propagation of nursery plants
Boskoop	KVBC (Royal Association for Boskoop)		Development of science referring to plants
		University of Wageningen	Creation of new varieties
	Dutch Nursery Stock Association	Research Station for Nursery Stock	Conservatory of plants and technical problem solving activities
		The Praktijkonderzoek Plant & Omgeving (PPO Applied Plant Research)	Cell culture for propagation recombinant DNA Greenhouse practices - conditioned storage and treatment rooms, experimental fields, laboratories and climate chambers (also commercial issues)

Notes

[1] See the numerous works that have used industrial district and cluster analysis for the identification of these systems in the various contexts (European Commission, 2001; OECD, 1999a and 1999b and 2001a and 2001b; DTI, 2001; and Harvard Business School, 2002).

[2] International trade has been strongly influenced by intra-industry trade and PPT (Passive Perfectioning Traffic), giving rise to enormous flows of outsourcing. Within IDs, the first wave of outsourcing began in traditional sectors during the 1970s, in clothing, textile, footwear, and cheap electronics, and in the 1990s it developed greatly due to the fall of the Berlin wall, and the integration of eastern countries into the European Community, and of large economies of developing countries like China, India, and the Far East in the global market created by WTO.

[3] We refer here to industries that show a high level of R&D investments and technology intensity (OECD, 2001).

[4] A reverse auction is an on-line procurement method used to obtain quotations for commodities and services. In a reverse auction, something is purchased from the lowest quote (which is the "reverse" of a normal auction, typically organised for unique artistic pieces sold to the highest quote to discerning bidders). A reverse auction is typically organised via the Internet, where in the same market there are hundreds of suppliers (not just one) and hundreds of wholesalers, whereby bidders anonymously bid against each other for a specific

quantity of given items. Bidding takes place at a specified date and time, and continues for a specified amount of time or until no more bids are received. Producers list their products first, then wholesalers begin to express their interest. The Netherlands invention has transformed an artistic version of market mechanism into a typical district "market" model for phase firms (subcontracting), where producers are strongly induced to cut their prices, and the market is very transparent, described by the Italian researchers (Becattini, 2003).

[5] This auction method uses a clock: the clock hand starts at a high price and drops until a buyer, by pressing a button, stops the clock to bid and accept (part of) the lot. A Dutch cauliflower grower invented the clock in the 1870s to reduce the time spent by growers at markets.

[6] Our assistants Gian Michela Zoccarato and Valentina Grolia conducted the interviews.

[7] Sources: information provided during interviews to Dutch horticultural firms.

[8] The term "district" is not clearly spread in the Netherlands, where, on the contrary, they frequently use the Porterian term "Dutch Horticulture cluster". Often these studies refer to a national dimension, and the term "cluster" is used to underline the synergic relations among firms and the public actors.

[9] Within national associations "plant groups" are created, which deal with specific species. They organise training activity, business trips, etc.

[10] A good example of partnership between Government and the horticulture industry is the tendency to pursue common policy goals; the Ministry of Agriculture and the associations have agreed jointly to fund research aimed at enabling growers to reduce CO2 emissions by 15% over 10 years, in line with the Dutch Government's commitments under the Kyoto Agreement. The Government has adopted a similar partnership approach to a four-year plant-breeding programme for the ornamental sector (1.5 million of investment each year). The aims are to address problems in the supply chain, shelf life resistance to pests and disease, quality improvements, and product innovation.

[11] VARB works together with the site www.plantscope.nl which provides the users with the following information: scientific data, correct nomenclature with all synonyms, commercial information, product codes, data on patents and copyrights, and regulations on their potential use.

[12] The organisation of information on client reputation is not unique in Boskoop. To our knowledge there is something similar also in another Italian district: the footwear district of the Riviera del Brenta (Belussi, 2000).

[13] The "open innovation system" was introduced by Chesbrough (2003), to identify a peculiar type of innovation process, where networks of organisations, both private and public, are involved, and play an important role.

[14] There are about 40 firms in the greenhouse construction business, including system suppliers and fitters of glasshouse technology. AVAG is the Dutch Association of Contractors and Fitters in Glasshouse Horticulture.

[15] The total production value of this sector amounted in 1996 to EUR 1.7 thousand million (den Hertog, 2003).

[16] Among the 15 firms operating at the end of the 1800, we can mention the Bianco Bianchi, Raffaello Fedi and Massimiliano Capecchi companies, the Martino Bianchi Company, the Chiari Company.

[17] Phylloxera (Phylloxera vastatrix, or Viteus vitifoliae) is an aphid parasite of the vines, belonging to the family of the Phylloxeridae. Originally from North America, it reached Europe during the end of the 19th century.

[18] The district covers five municipalities in the Pistoia province: Pistoia, Serravalle Pistoiese, Agliana, Quarrata and Montale.

[19] The district covers ten municipalities in the province ofPadua: Saonara, Campagna Lupia, Campolongo Maggiore, Vigonovo, Piove di Sacco, Ponte San Nicolò, Polverara, Legnaro, S.Angelo di Piove, and Strà.

[20] The fair covers about 30,000 m^2, hosting yearly more than 1,000 exhibiting firms and 35,000 visitors. Source of data is the Flormart/Miflor web-site, years 2000-2003.