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THE EFFECTS OF THE PANDEMIC OUTBREAK ON THE LIVENZA FURNITURE CLUSTER AND THE S3'S NEW DEVELOPMENT TRAJECTORIES FOR A POSSIBLE ECONOMIC REVIVAL OF FRIULI VENEZIA GIULIA'S WOOD AND FURNITURE INDUSTRY.

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To Agnese,

May your future be the brightest

INTRODUCTION

In the last thirty years the economic world has faced several changes and challenges: new technologies have revolutionized manufacturing activities; globalization has led to new business strategies, such as outsourcing; and the way in which companies interact has revolutionized the flow of information and knowledge along the global value chains.

What has evolved most is, for sure, the concept of territory. Over the years, morphological and industrial transformations have changed irreversibly the idea of territory from a simple geographical region limited by boundaries into complex pools of knowledge.

Strictly connected to this last view of territory there is the concept of "cluster" which, in the last decades, has drawn attention of national and supra-national institutional bodies. The discovery of this model of economy has to be attributed firstly to Marshall (1890) and Becattini (1979), which detected and described the "district" model, which then evolved into "cluster" thanks to the definition provided by Porter in 1998.

He described clusters as "a geographic concentration of interconnected companies, specialized suppliers, service providers, firms in related industries that compete but also cooperate". In particular, this coexistence of competition and cooperation is the key factor that allows cluster's firms to be more productive and enhance their competitiveness in the national and global markets.

Two fundamental characteristics of a cluster determine its success as business economy. The first is the fact that within a cluster there is a strong horizontal integration. Companies are mostly small and medium enterprises, each of them highly specialized over a single or few passages of the supply chain. This allows to the whole system to reach a high aggregate level of knowledge, since that every step of the production process (fully internal to the cluster) is made by experts.

The second success factor is determined by the capability of the system to ease the share of knowledge – especially tacit knowledge –, creating a continuous flow of information and skills from which new wisdom born. What happens is that a constant "buzz" pervades the territory like a white surrounding noise that can be listened by everybody and exploited to produce new ideas and skills (Storper and Venables, 2002) (Bathelt, 2004). This is also eased by geographical proximity, which, on one side, reduces transaction costs and, on the other, increases the possibility to establish human interactions which foster the implementation of a virtuous circle.

However, the "buzz" is not simply "something in the air" (Marshall, 1890), but is a precise characteristic of the territory. In fact, according to Pisano (2008), clusters have the capability to produce the so called "industrial commons". They are a set of knowledge, skills and industrial resources that belong to every economic agent within the cluster and that is embedded to the territory.

Moreover, such an interwoven system owes its success to the capability of its inhabitants to establish strong governance structures able to manage the complex network of relationships that takes place in the territory.

Many examples of successful clusters can be done, one over all the Silicon Valley. However, Italy as well has a long tradition of similar geographically localized business ecosystems. In fact, according to the last ISTAT's census, 156 districts and clusters are present in the Italian territory, mostly localized in the north of the country.

In this thesis a particular attention has been given to Livenza Furniture Cluster, located in Northern East of Italy between Veneto and Friuli Venezia Giulia region[1]. This cluster has to be considered one of the most important hotspots for the global furniture production, since in it is possible to find the major supplier of global multinational enterprises, but also some of the most important brands such as Veneta Cucine S.p.A, San Giacomo S.p.A. and Fantoni S.p.A. Together with Monza-Brianza district, Livenza Furniture Cluster is the most important Italian pole for furniture production.

Over the years, this cluster has faced a consistent growth rate, especially in terms of exportations and presence of key international players that have decided to exploit its capabilities for their purposes. However, 2008/09 and 2012 crisis, and, last but not least, Covid-19 outbreak have hardly hit the territory, reducing its capability to be competitive in the global value chains.

The first purpose of this thesis is to analyze which are the effects caused by the lockdown imposed between March and May in the furniture industry and especially on Livenza Furniture Cluster. Furthermore, the reason will be focused on the new challenges brought out from the actual tough situation, but also on the opportunities that may rise by

[1] *Nota Bene*: since that the Cluster is divided in two regions, I have decided to focus my attention on Friuli Venezia Giulia's side. This decision has been taken for a matter of data availability and because this thesis has been written with the support of Cluster Arredo FVG, the wood and furniture industry's consortium and observatory in Friuli Venezia Giulia. From now, every reference to "Livenza Furniture Cluster" has to be intended for Friuli Venezia Giulia's side, except from when diversely expressed.

exploiting new forms of innovation that can allow to Cluster's companies to invest and get back on their feet again.

In order to do so, Smart Specialization Strategy (S3) will be considered as main tool able, first of all, to distribute to companies the necessary funds to invest in innovation and, most importantly, to show them the future long-term innovational paths. In fact, S3 is considered the *ex ante* condition for accessing to European Regional Development Funds (ERDF).

Nevertheless, the actual S3's programming for 2014-2020 will expire in the next months and, in the days in which this thesis is written, the stakeholders' meeting aimed at discussing the next seven years plan for 2021-2027 have been reunited.

Upon the invitation of Cluster Arredo FVG – the main supporter of this thesis and the institution uncharged to coordinate the meetings – I've had the honor to participate to the first two sessions of the Entrepreneurial Process of Discovery for "Home System" specialization area[2], the phase that in the next months will give birth to the next seven years plan. This has allowed me to undertake a bottom-up perspective, integrating into the analysis not only the available market data, but also the points of view of directly involved stakeholders in order to outline a first draft of the innovational paths known as "development trajectories".

In conclusion, the main aim of this thesis is not to provide the final version of the next seven years S3's programming for Friuli Venezia Giulia's Home System. Vice versa, more widely, it wants to provide food for thought on the innovational paths that have the potential to outline a long-term growth in Livenza Furniture Cluster, considering new technologies as the trigger to revive the territory and enhance again its competitiveness.

Chapters will be organized as follows:

- Chapter one will analyze the concept of Cluster starting from Porter's definition and going deeply through different point of views, from the knowledge creation process, to the role of territorial capital as company's intangible, ending with a focus on the role of governance in such an ecosystem and the forms of financing adopted by companies;

[2] Home System is one of the six Friuli Venezia Giulia's areas of specialization that encloses Livenza Furniture Cluster as main player.

- Chapter two will deeply analyze the Livenza Furniture Cluster, focusing not only on its history, but most essentially on its performances over the last twenty years and on the reasons of its competitiveness on markets;
- Chapter three will analyze the effects of Covid-19 outbreak on the wood and furniture industry, focusing, for obvious reasons, on the Livenza Furniture Cluster. Particular attention has been given to Friuli Venezia Giulia side of the cluster[3].
- Chapter four will firstly analyze the Smart Specialization Strategy (S3) and its development trajectories implemented in the last 2014-2020 period for Home System specialization area. Then, it will reason on the potential challenges and opportunities brought out by Covid-19 in order to define, through the "Entrepreneurial Process of Discovery", which will be the technological and innovational paths that Home System's companies may follow to get again on their feet and re-establish the cluster's competitiveness.

[3] The decision of analyze only this part of the cluster has to be addressed to data availability.

CHAPTER 1: THE CONCEPT OF CLUSTER – A COMPREHENSIVE LITERATURE REVIEW

1.1 The concept of cluster: from Marshall to Porter – an evolutionary path of the definition

The concept of cluster as we know nowadays has been developed over several years of studies in the field of economic geography. First insights have been reported by Alfred Marshall in early '900 on his studies on textile industries of England which let him to define a first definition of "industrial district". In particular, the keynote around which has been developed the concept is the localization of an industry".

Marshal recognized that certain industries were concentrated in specific geographical location, due to various reasons, as he need of manufacturers to be close to suppliers or simply for the ease of access to raw materials; but also, a specific localization of an agglomerate of firms may be due to the presence of a high demand of a specific product or service in that specific geographical area; but also, thinking about the industrial revolution and the evolution that had brought to the socio-economic fabric of several countries, an agglomerate of firms may be localized in a specific region due to the presence of a city. Initially, every industrial district has been built around one or more cites, and, after the expansion of the factories, the districts has invaded the outskirts of the cities, giving birth to a more complex system of interconnected firms (Marshall, 1920). When this "primitive" localization lasts long enough, becoming a more compound localization, it gives birth to an industrial district (Belussi, Caldari, 2008).

Moreover, because of a long-lasting localization, the district acquires what Marshall defines a "special atmosphere" which gives several advantages to the firms located in the specific and restricted geographical area, determining what Becattini in 1991 defines "creative milieu".

The passing of time allows firms of the district to gather several advantages:

1. Due to the social embeddedness of the specific industry and of the population, specific skills develop and embed in the specific geographic area. Moreover, special capabilities are transmitted from one generation to another, becoming the characteristic qualification of that area

2. The presence of a large number of firms lead to the establishment of subsidiary firm which supply with implements and materials and providing services
3. Because of the high division of labor and the specific skills developed by single firms, every firm is highly specialized in a passage of the supply chain.
4. Despite an isolated factory, which may have problems at finding workers, a district offers a "constant market for skill" so that employers have any problem when they look for workers.
5. The development of a creative milieu stimulates creativity and so the evolution of the district itself. This create the so called "Industrial Leadership"
6. The development of a social local network let to new ideas to be adopted promptly and so novelties becomes immediately part of the production process. Moreover, the single idea is taken as starting point for the development of new ideas, by the combination of single knowledge and suggestions.

A critical feature that has to be highlighted concerns the development of a network between the firms of the same district. This led to a very efficient division of labor among them.

Also, as highlighted by Loasby, the growth of a local market in which every player is characterized by specific skills justify firms to devote themselves to a specific small part of the production process. Moreover, a multitude of services, from education to infrastructure design, can be tailored to the district in order to improve efficiency.

Within the district there is no need for vertical integration and it's not necessary to ensure the alignment of closely complementary activities.

However, the lack of vertical integration does not constitute a con for the district, since, according to Marshall, the firms of the district together can compete with large vertical integrated firms. The keynote is the presence of external economies, that are able to support the development of the district as a whole, improving productivity and efficiency.

During the second half of 20th century, after World War II, especially in Italy is possible to notice an expansion and an increment of industrial districts and agglomerations of firms within the same industry.

In particular, what happened is that in the Italian economy a new dualism had born and beside the consolidated economic realities of big firms, small and medium highly specialized enterprises have come into existence in small agglomerates, and, during the years, started to gain more and more market share.

The exploit of new networks of firms, suppliers and retailers within the same industry pushed many scholars to understand and study the phenomena. Among all, in the '70s Giacomo Becattini, one of the major Italian scholars on the development of industrial districts, recalls the concepts defined by Marshall more than 50 years before, applying the studies to the Italian district of Prato. In particular, the Italian scholar wanted to analyze the strong development trend of certain areas of Italy after the scars left by the war.

Becattini noticed that the characteristics of local development of firms within the same industry in a narrowed geographical area, with a high level of horizontal integration were the same of particular areas of the center of Italy. However, a fundamental characteristic has been highlighted by Becattini.

Whether English industrial districts were a simple aggregation of firms and suppliers of the same industry, with a high level of specialization, but without a high sense of embeddedness, Italian districts were shaped more as a community in which history, non-written rules and a series of shared values were able to influence productivity and efficiency of the district itself.

In fact, the economic fabric that emerges after the post-war crisis is characterized by a system of small local networks of small and medium enterprises with a high degree of specialization and skilled employees, focused on a specific industry.

Considering the social and cultural aspects, Becattini defines the industrial district as "a socio-territorial entity which is characterized by the active presence of both a community of people and a population of firms in one naturally and historically bounded area" (Becattini, 1990), stressing also the idea of a merge between the local community and the district itself, intended in a Marshallian point of view.

Moreover, five aspects differentiate the two definitions of the analyzed scholars:

1. The local community: a "relatively homogenous" system of values in which non written rules and customs and traditions are part of the district itself and constitutes the essential condition for its development and reproduction. Without the system of values, the district would not persist through time and inevitably the area would stagnate.
2. The population of firms: not intended as simply multiplicity of firms, but an agglomeration of economic realities in which every component tend to specialize in just one or few phases of the production process. The main characteristic is the division of labor, which determine horizontal integration.

3. The human resources: within the district prevails the ethic for which everyone will cover the position that fits best her/his abilities. The high level of peculiar skills creates a continuous labor market with consequent reallocations. The process is sequential and for every allocation there is a new available position.
4. The market: the development of the district is highly correlated with the development of the relative market. Moreover, within the district the economic agents are themselves the market and the final consumer is the last step of a complex system of deals done within the network. Also, the commodities of the district must have peculiar characteristics which allow to the final user to distinguish the product among the others.
5. Cooperation and competition: within the district cooperation and competition coexist, giving birth to a mechanism that improves both productivity and efficiency. Cooperation can be the keynote for what concerns innovation, competition pushes the single agents to enhance their competitiveness.

In his paper, Becattini underlines also the idea for which the district is an adaptive system, since the agents operating in it are able to adapt to ever-changing shape of the production organization and, doing this, improving also the control over the productive chain.

Finally, a fundamental characteristic highlighted by the Italian scholar which constitutes the bases of the further analysis of districts and clusters is the technological change.

According to Becattini, the district constitutes the fertile ground for technological progress, since the inter-relationships among firms, the high level of specialization, and the human capital ease the adoption of new technologies and strategies which improves the competitiveness of the district as a whole. Moreover, the introduction of a technological progress is a social process, since it is achieved through a process of self-awareness on the actors of the system and the population.

More recently, the topic has been shifted to a managerial and strategical point of view. Beside the studies on districts, scholars started to analyze the phenomena of Clusters.

In particular, in 1990, Michael Porter published his famous “Competitive Advantage of Nations”, giving his first definition of Cluster as “geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries and associated institutions in a particular field that compete but also cooperate”.

Analyzing the definition, Porter sees clusters as the natural evolution of the districts described by Becattini.

Despite looking at the district as a geographical area in which it is possible to find a co-location of firms, suppliers and service providers able to reach economies of scale, the agglomerate created during the years is seen as a more complex ecosystem where the competitive advantage lies in the geographical location in which the firms and industries are located, and not within the singular companies (Porter, 2000).

This means that within the cluster, firms do not only share a geographical space which allows them to reduce transaction costs and accelerate the flow of ideas. Actors of the ecosystem are part of a complex network of interconnected companies where the human relationships play a key role for what concerns the development of the system as a whole (Kano-Kollmann, 2016).

Moreover, firms are linked by commonalities and complementaries, which means that within the cluster cooperation and competition coexist.

Within the system geographical proximity enhances the informational, transactional and incentive efficiencies.

Territory cannot be seen as a mere container in which productive companies locate themselves and take advantage form proximity. Territory is a productive resource as well as plants, equipment or human capital which, beside capital and labor, contributes to value creation (Rullani, 2007).

In particular, territory cannot be considered only as the location in which companies locate themselves, but as a “anthropized resources”, since it embeds the history and the culture of population that have lived it.

So, within a cluster, value is created especially from geographical proximity and the shared background built in the years before in the territory.

Considering the Marshallian district, it’s clear that a cluster is a more sophisticated ecosystem. Location is a variable that shapes a multitude of trade-offs.

Companies within the same industry which share the same territory do not only reduce transaction costs and reach economies of scale, which could never reach standing alone. sharing the same location, firms are able to produce an efficient circuit of cognitive labor division (Rullani, 2007).and enforce trust and communication establishing relationships with the surrounding economic and social realities (Porter, 2000).

Doing so, also smaller enterprises are able to participate to a more sophisticated system and reach, together with the cluster's participants, bigger (and often international) markets.

Moreover, we attend to a process of collective learning (Rullani, 2007), concept recalled also by Gary Pisano describing the idea of "industrial common".

The so built ecosystem and its participants can also be considered as a pipeline for the flow of information and practical skills, which favorites especially the transmission of tacit knowledge from one component to another (Cano-Kollmann, 2016).

Moreover, the network evolves during the time. Companies establish new linkages, new actors become part of the cluster and boundaries may expand or restrict, depending whether the industry grows or shrinks.

The emergence of new players produces a more competitive ground in which companies are incentivized to transform themselves and adapt producing innovation, which can be considered both in technological and strategical terms, allowing to the cluster to enhance productivity and productivity growth.

The presence of new players which bring in new competences and higher degrees of specialization, new services and new knowledge in general determine an evolution of the cluster especially for what concerns of human capital.

However, under certain circumstances, the cluster may retard innovation. Since that within the established network companies share a uniform approach to competing, a sort of groupthink could reinforce behaviors that may reduce the flow of ideas and create rigidities (Porter, 2000).

In his definition, Porter underlines the coexistence of cooperation and competition within the cluster.

In particular, competition is seen as a form of incentive for firms, which are forced to innovate themselves, explore new demands and producing new supplies, in order to gain new customers or retain the old ones. A cluster encloses a multitude of rivals in the same geographical area, who often produce similar products taking advantage form the same suppliers. For this reason, competition is accentuated.

But geographical proximity can be seen as a key point for what concerns cooperation too. As said before, territory is not seen as a mere box in which companies are located, but it is a field full of history and traditions, and it embeds a "collective learning", intended as knowledge and skills which belongs to the territory itself. Also, human relationships,

trust, common language and beliefs, which are components of the territory, allow faster transfer of information and easy knowledge sharing (Carbonara, 2002)

Recalling the description provided by Becattini for the industrial district, in a cluster it is possible to find a high level of vertical integration, which allows to firms in the network to reach the same markets of highly vertically integrated companies.

Geographical proximity and the consequent flow of information let to the companies within the territory to exchange ideas and pursue projects together with other companies of the territory, leading also a process of innovation.

Within the cluster, cooperation and competition coexist because they are very different dimensions and sometimes cooperation is part of winning the competition at other levels (Porter, 2000).

A further step in Porter's model is the recognition of the presence of governmental and other institutions. The presence of Universities, standard-setting agencies, and other associations, provide a series of services as education for the formation of employees, facilitate the informational flow, research and technical support.

Universities and similar institutions are considered as a source of skilled labor, able to shape workforce's abilities through education, but also a source of technology and innovation, letting to the cluster to evolve.

But also, a key element is represented by infrastructures, which represent the tangible element that works as a pipeline for the flow of information and knowledge, and by other institutions as standards setting agencies.

The presence of institutions allows to the cluster to reduce or, in some cases, eliminate the costs related to internal training. Moreover, thanks to the presence in the territory of universities and public institutions, firms have access to experts' advices at a low cost.

Within the cluster information can be considered as a public or quasi-public good, because of the continuous flow that is established within the network.

To sum up, a cluster is a concentration of highly specialized skills and knowledge, where firms, service providers and institutions coexist concentrated in a specific region characterized by commonalities and complementaries. All these elements create a complex ecosystem in which proximity play a key role, allowing the formation of special access, special relationships, faster flow of information, incentives and fostering productivity, productivity growth and innovation that could be difficult to tap from longer distances (Porter, 2000).

Real sources of innovation are residing in the network of social relationships and not in the single entrepreneurs or in large firms (Cooke, 2002).

1.2 Knowledge creation process and innovation

1.2.1 Knowledge creation process within the cluster

The analysis provided by Porter describe a cluster as a complex environment of interconnected companies and institutions in constant communication facilitated by geographical proximity. Moreover, companies and institutions constantly share information each other, creating a continuous flow of idea which constitutes a fertile ground for the development of skills, knowledge and innovation.

Anyway, a cluster should not be considered as a mere gathering of firms which share the same territory and that are able to exploit proximity to reduce transaction costs. Moreover, it is a much more complex system of interconnected agents in which knowledge and skills are embedded to the territory where a process of collective learning takes place (Lawson and Lorenz, 1999).

Also, learning is not only the acquisition of information, but it's the process by which information becomes usable knowledge (mostly tacit) eased by the presence of a common language and culture (Camagni, 1991) (Lawson and Lorenz, 1999).

However, before proceeding with the analysis of the knowledge creation process, is necessary to understand which are the main differences between tacit and explicit knowledge.

Explicit knowledge can be summed as "knowing-that". It's the knowledge that can be codified or digitalized in books and documents that can facilitate actions. It can be easily identified, shared and employed. This kind of knowledge might come from the institutions, like universities and specialized schools, which are part of the cluster's ecosystem. One key feature of explicit knowledge is that it's objective, rational, technical, and, in particular, codified.

A first distinction, due to a proper definition of tacit knowledge, has been developed in 1967 by Polanyi in his "The tacit dimension", in which states that "we can know more that we can tell", establishing a reasonable doubt on the capability of humans to gather and accumulate skills that cannot be codified in verbal terms.

However, a more complete definition has been developed by Nonaka and Takeuchi in the book *The Knowledge-Creating Company* in 1995, proposing the SECI model for knowledge creation. From their analysis it comes out that tacit knowledge can be summed as "knowing-how". It's the knowledge that comes directly from human experience and jobs,

also known as know-how. Tacit knowledge is part of the wisdom and experience of every single human being, making it difficult to extract and codify in books or documents and to share. Intuition and insights are examples of tacit knowledge.

Considering, now, the context of a cluster, as highlighted before, what is possible to find is an intricate network of firms with a fragmentated division of labor, in which every company covers one or more passages of the supply chain. Moreover, for every specialized firm, it is possible to find a set of skilled workers which have accumulated and embedded themselves over time a bundle of know-how that allow to the company to reach the highest value added in the specific production process that is covered.

This means that every single enterprise embed itself a specific set of tacit knowledge reached over years of experiences, self-developed or reached from outside (e.g. the labor market), that allows it to reach a form of competitive advantage too.

Moreover, in order to analyze and understand the process of knowledge creation within a cluster, is necessary to divide the horizontal and vertical dimension of a cluster, which often coexist, in order to understand the lines of relationships between the several agents involved.

In the horizontal dimension is considered the relationship between firm and direct or indirect competitors.

Especially in the early stage of a cluster, both specialization and formation play a key role in terms of capability of a firm to gain any form of competitive advantage. In particular, companies have the possibility to benefit from co-location with direct competitors, carrying on a monitoring and comparing process. In particular, analyzing other players' products in terms of quality and processes in terms of efficiency, firms have the opportunity to capture important information necessary for them in order to draw a concrete picture of the surrounding network and understand the strength and weaknesses of firms located in the same geographical area (Bathelt, 2004). Moreover, this allows to managers to design a proper strategy in order to enhance the competitiveness of the company.

Vice versa, in the vertical dimension, we consider a form of cooperation between companies and suppliers or service providers.

In this case, the flow of information is direct and swipes from one player to another. Moreover, recalling Marshall's description of knowledge stimulation and creation, when an idea grows within the boundaries of a certain company, it is taken up by the other

players of the cluster and, from that, new one could bear, becoming a source for new knowledge and innovation. Also, considering that in the early stage of a cluster companies try to specialize themselves in order to enhance their competitiveness, the environment that is created in the geographical region let to other specialized service providers and suppliers to grow too. This creates a new flow of knowledge that is transmitted from one firm to another and, again, proximity and symbiosis play a crucial role, leading a form of knowledge-connectivity (Cano-Kollman *et al*., 2016).

Potentially, every form network in which are involved linkages among different agents can produce a new graft for the knowledge creation process.

The flow of information, created from the several interconnections, and the shared knowledge constitute the basis for processes of combination and re-combination of resources, allowing to the ecosystem to produce new knowledge and innovation. Also, this led to the formation of a virtuous circle: companies involved in the process start a specialization path, creating a pool of skills accessible to ever cluster firm (Maskell and Malmberg, 1999) (Bathelt, 2004).

Moreover, also the labor market represents a source for the knowledge creation process. As highlighted before, a cluster is characterized by the presence of skilled workers which enclose themselves a bundle of tacit and explicit knowledge accrued over time. In fact, considering the high specialization level of every firm of the cluster, every workman can be considered as an expert.

The high competitiveness between workers creates a vibrant labor market, with a potential flow of people which is translated in a flow of information, skills and knowledge. Moreover, the exported bundle of knowledge is subjected to combinations and re-combinations, allowing, again, to the ecosystem to produce new knowledge and innovation.

The result of these processes can be seen as an enhance of the competitiveness of the single firms in which there is an inflow of skills, but also as an enhance of the competitiveness of the cluster as a whole, since every firm may benefit from the net of interconnections.

Doing so, companies are able to exploit connections and take part at a collective learning process that allow to single firms to enhance their single competitive power and to the cluster to grow, especially in terms of innovation.

Sharing of a common background, made of a common language and formal and informal rules, also, facilitate the capability of firms to capture a pool of knowledge that is concretely embedded to territory.

Moreover, recalling the definitions of Marshall and Becattini of "industrial atmosphere" and "innovative milieu", used to describe the environment that surrounds the agglomerate of firms and institutions, it's clear that the knowledge creation process within a cluster is more than a simple flow of information.

Authors have always given importance to the sense of being that characterize companies of the milieu and to their capability to develop forms of tacit knowledge necessary for the improvement of the production process.

In particular, a cluster can be pictured as a hive in characterized by a continuous "buzz" (Storper and Venables, 2002), which refers to the information and communication ecology created by face-to-face contacts, co-presence and co-location of people and firms within the same industry and place or region. In particular, the "buzz" consists of specific knowledge and continuous update of it, coming from direct and unanticipated learning process and fostered by geographical propinquity of industries and by the presence of a common surrounding environment and language, which also stimulate the establishment of conventions and other institutional arrangements (Bathelt, 2004).

A particular focus should be on "face-to-face" contacts. The capability of firms to establish strong human relationships with the surrounding companies does not constitutes only an advantage in terms of transaction costs and ease of supply management.

The presence of strong linkages among players of the same environment work as an internal pipeline, able to convey the flow of information from one gate to another, helping also companies to update their knowledge on strategies and technologies adopted by the cluster. Also, the learning process is facilitated by the capability of firms and people to make side visits and establish frequent face-to-face contacts (Porter, 1998), necessary also to compare different viewpoints.

These reasonings highlight that knowledge and skills within a cluster are something more that simple tools that can be exploited by companies and institutions. Tacit knowledge takes roots in territory and develop an actual "common".

In XVI Century, in England the term "common" referred to lands collectively owned by a group of people in which every single person had the same right to collect wood, to graze or, in general, to benefit from every disposable natural resource. What characterizes

commons is the fact that the ownership was not of a single, but the Crown directly assigned the land to the community.

But a similar situation can be highlighted within the boundaries of a cluster environment. So, an "Industrial Common" is defined as a set of knowledge, skills and intellectual resources which belongs to a community of firms, institutions and other economic agents located in the same geographical region and that can be exploited by everybody. Such resources are literally embedded to territory, which is constituted by tradition, formal and informal laws and a common shared language, and, together with human capital, creates the highest source of value for the inhabitants of the cluster. Moreover, the geographic character of industrial commons helps to explain the reasons why companies tend to cluster in the same region: sharing a common background characterized by geographical proximity and having the possibility to share a pool of resources, commons constitutes a source of competitive advantage (Pisano, 2008).

Nowadays, the idea for which a specific pool of knowledge gets embedded within a specific region it's quite uncommon. Because of the rise of the Internet which ease the gather of every type of information and the fall of every metaphorical boundary that could divide us from every type of skills, we may think that "the World is flat" (Friedmann, 2005).

However, by analyzing accurately the global economic context, it is possible to underline that world is less flat than what we may imagine, especially in terms of flow of information and knowledge.

Considering a cluster system, it's clear that two elements above all characterize the environment: geographical proximity and human relationships. In fact, what is clear is that geographical distance plays a key role not only for a reduction of transaction costs, but also for the establishment of strong relationships.

For these reasons, experts are more likely to share information with other experts of the same region (Pisano, 2008). The affinity established between people who join the same background will stronger than any other connection established only through telematic tools. In particular, many studies affirm that the co-presence of different experts boosts creativity and the propinquity of knowledge sharing.

Moreover, the presence of "buzz" makes possible for knowledge to be captured, directly or indirectly, since the whole surrounding and vibrant environment makes possible for firms of the cluster to get access to rumors. This means that agents do not only search for

information, scanning the environment, but it's the milieu that thanks to rumors, recommendations and strategic advices creates a continuous flow (Bathelt, 2004).

Also, once that every participant makes its efforts for the creation of the milieu, a virtuous circle takes place. The flow of information stimulates new ideas and, so, new knowledge can be created. This not only enhances the strength of industrial commons, but also attracts new subjects, as experts and skilled employees, and new investments, which enhance the competitiveness of the cluster as a whole.

Doing so, a cluster act as a catalyst, able to attract new sources of knowledge and boosting them up and creating new opportunities for local and foreign investments, attracted also by the presence of a strong network of suppliers and service providers and geographical proximity ready to exploit.

In particular, the presence of local suppliers and partners represent a strength for the implementation of the innovation process, since, involving directly their efforts, it is possible to ensure a better match with customers' requirements (Porter, 1998). Also, geographical propinquity allows firstly to reduce the timing of procedures and transaction costs, but also it ensures a higher level of control over the supply chain, avoiding, so, the implementation of sophisticated and costly control systems.

A concrete example of innovation process driven by the presence of a well-developed milieu and geographical propinquity can be seen in the Silicon Valley.

Within the American technological cluster par-excellence is possible to evidence the presence of thousands of interconnected companies and institutions where the competition and cooperation dimension exist. In particular, beside firms as Tesla, Apple and Google, in the same region are located the universities of Stanford and Berkley, thought to be the central brain of the region, and division of governmental agencies.

The closeness to institutions allows to companies to develop a continuous innovation process, self-driven by the flow of information produced both at a company and institutional level, which allowed to the geographical region to develop a modelled form of industrial common.

Moreover, the closeness to research centers allow to companies to exploit forms of innovation developed by public institutions and take them as a starting point for the creation of new products, even if the research carried on by governmental agencies or universities had not the same goal.

For instance, the first generation iPod, launched in 2001 by Apple, is the result of seven different technologies, as the microprocessor and the "click-wheel" have been developed by governmental agencies as DARPA (Defense Advanced Research Project Agency) and CERN, which have been developed for other purposes, but that have been adapted for the needs of the single companies.

Especially for technological clusters, the State represent one of the major sources for innovation, because it is the only one that can afford the capability to focus a huge amount of resources in innovation and at the same time undertake the risk of market failure. However, State's investments go beyond "blue-sky" basic research, being more entrepreneurial than the private sector sometimes, which shies away from radically new products that necessitate of blue-sky research to be discovered, leaving to governmental agencies and universities the risk of undertaking the risk of market failures (Mazzucato, 2015).

This example explains how the enterprises of a cluster are able to exploit the knowledge produced by institutions and governmental agencies, but innovation does not only come from the transversal dimension of the cluster, intended as the firm-institution relationship.

In fact, as just mentioned before, within a cluster the cooperation and competition dimensions coexist.

Firms exploit interconnections in order to create a flow of knowledge, sharing ideas and creating the "buzz". However, the creation of such environment does not provide only a competitive advantage in terms of production, but also constitute a trigger for the development of a strategical and technological innovation.

Firms dipped in a competitive environment are forced to continuously update their strategies and make new investments in order to do not lose their competitive power. For this reason, within a cluster context is possible to evidence a shift from imitation to innovation (Porter, 1998), since companies are constantly required to invest not only in their assets, but mostly on intangibles. In fact, as stated before, human capital represents the most important source for competitive advantage that a company could exploit.

Moreover, geographical proximity allows to companies to understand the strategical moves undertaken by direct competitors and, consequently, design a proper strategy necessary to maintain stable the market share or, eventually, to enlarge it, taking advantage from other's wrong moves.

This form of rivalry could lead to a virtuous circle of non-stop investments and updates, that may attract new investments and human capital, reinforcing the existing industrial common.

Similarities of basic circumstances like labor cost or utility cost combined with the presence of multiple rivals, forces firms to seek creative ways to distinguish themselves and proximity and the continuous monitoring and comparing activities of direct competitors can be exploited to design new strategies able to reinforce the presence of the company in the market.

However, as stated before, is necessary to underline that under certain circumstances cluster's environment may retard innovation (Porter, 2000). Firms of a cluster tend to adopt similar approaches on competing and a sort of groupthink could reinforce old behaviors, suppressing new ideas and threatening the innovation process. Moreover, innovation is not only product/service related, but it's also about the whole infrastructure. Whether wrong or old behaviors takes root in the ecosystem, they may conduct to a wrong implementation of correct infrastructure system that can help the cluster to grow and reinforce its competitiveness, threating also the existing pool of talents that have been developed over the years.

Vice versa, considering the horizontal dimension of a cluster, is easier and more logical to understand the process that may lead firms to produce innovation.

In fact, establishing cooperative relationships, companies and institutions are able to leverage each other strengths and have the possibility to experiment at a lower cost.

Moreover, as highlighted before, proximity ease the flow of ideas, but also reduce transaction costs and enhance the level of control over the different passages of the supply chain.

A a firm within a cluster can source more rapidly new components, services, machineries and other elements needed to implement innovation. local suppliers and partners can get closely involved in the innovation process, so that the inputs better match the firm's requirements (Porter, 2000). The influence of suppliers, which dispose of specialized personnel and focused over a single passage of the production process, allow to the cooperative relationship to produce a more effective innovation path and matching customer requirements, also achieving complementarities.

Of course, the double connection established between suppliers and firms makes possible also the development of new strategies, from which both companies are able to take

advantages. For instance, the stipulation of a contract for exclusiveness of a product could advantage the supplier, which develop a form of technological innovation, and the firm itself which maintain stable or enlarges its market share.

Understanding the dynamics through which the network of a cluster takes roots in the region is necessary for firms in order to understand which are the resources that can be exploited in order to undertake a form of competitive advantage.

Moreover, this explains also why a cluster may be considered as a more fertile ground for the development of innovation despite single standing alone firms highly vertically integrated.

The presence of different actors, each of them with its own viewpoint, confers to the cluster the capability to reach more stimuli that can trigger the knowledge and innovation creation processes.

Considering a standing alone firm, all the processes implemented in a cluster for the development of the innovation process cannot be replicated and, so, the vertically integrated company can't benefit from the network of expertise, nor from the local buzz, which can be translated in higher costs.

However, the knowledge creation process does not stop within the boundaries of the territory but passes from the so-called Knowledge Integrators (Pisano, 2018), lead firms of the cluster able to connect the regional reality with the global market.

1.2.2 Knowledge creation across clusters

In the late 20th and early 21st centuries, world started to face the phenomenon of globalization, with the consequent intensification of the commercial trades and international investments, leading a rapid transformation of the economic world as has been intended before by the creation of Global Value Chains (GVCs).

The arrival of the Internet and computer technology, the fall of trade barriers, the rise of commercial deals between countries and the ease of access to knowledge and information have implanted on us the idea that "the world is flat", as stated by Thomas Friedmann in 2005, creating the idea for which geographic boundaries are not an impediment anymore. However, the statement is not an ultimate truth. Considering the cluster as an ecosystem, there are two points that should be highlighted.

The first one is that, especially for what concerns technical knowledge, boundaries still matter.

As highlighted previously, experts of a specific territory are more likely to share information with other experts of the same region, because of the presence of a common background and same language that facilitate the flow of knowledge. This implies that it's impossible to state that world is totally flat.

However, what can be affirmed is that globalization have led to a process of levelling, easing the access to different markets and making trade barriers to fall. The same cannot be stated for the process of knowledge creation and sharing, especially for what concerns tacit knowledge, which can hardly be codified and transferred from a region to another.

The second point to highlight is related to the evolution of industrial commons. As stated before, industrial commons are the set of manufacturing and technical capabilities embedded to the workforce, competitors, suppliers, customers and institutions of a cluster (Pisano and Shih, 2009) and so to the territory as a whole.

However, the rise of globalization has led to a potential erosion of the commons. In particular, the openness to a more connected world has led to the development of outsourcing strategies in order to reduce production costs. Exporting low value-added activities and maintaining within the boundaries of the parent company more specific passages of the production process, as design and planning, firms are able to cut costs and become more price competitive.

In fact, when a key player of an industry moves away part of the production process, gaining a short-term cost advantage, the competitive pressure force also the other players to follow the same strategy. As consequence, the commons lose a critical mass of work. The adoption of such strategies has effects over employment opportunities, on the labor market and on the capability of the region to produce new knowledge, since that a massive part of the skills is brought away (Pisano, 2009)

The result is a potential erosion of the commons, which can difficultly be restored, with consequent detrimental effects for the cluster as a whole.

Concrete examples can be found in the electronic industry. Over the past years, big players as Amazon and Apple have opt for a substantial outsourcing of specific low value-added passage of the supply chain, exploiting low cost labor force in China, India and South Korea. Only industrial design processes have been kept within the boundaries of the US parent companies. Moreover, right now a similar trend is taking hold for software industry. As result, US has diminished its capability to produce high-tech products.

Moreover, physical distance between the different passages of the production processes may threaten timing of production. For this reason, after that production processes have been outsourced engineering expertise can't be maintained, because of the need of daily interactions between the two steps, and this can potentially erode more commons.

However, it is possible to find concrete examples of preservation of the commons. In particular, Toyota over the years have developed an inclusion strategy for its partners and suppliers for the development of new innovation. Considering them as essential and maintaining alive the network of relationships, the company has been able to constantly feed the commons and develop a sort of cluster environment, in which a continuous flow of information allow to the parent company to understand how to apply innovation to meet consumer needs and, at the same time, to suppliers to maintain a stable level of innovation. This creates a virtuous circle that leads to produce new knowledge and innovation, so enhancing the competitiveness of the company.

Notwithstanding the Toyota's example, the erosion of the commons problem and the vicious circle that may be produced are concrete. However, the solution can be found directly on the global market framework, considering the role of clusters in the global value chain and the methods adopted by firms to produce new inter-cluster knowledge.

In order to remain competitive in a globalized world, regions and firms need to upgrade their capabilities, improving the connection of the single ecosystem with the rest of the

world and trying to avoid the cognitive myopia that could destroy the innovation capability of the cluster (Pisano, 2018).

More specifically, the presence of a shared background which constitutes the ecosystem of a cluster called by Marshall "industrial atmosphere", allows to industrial commons to take root in the region. However, in order to allow to the region to amplify its competitive power, commons must be fed over the time, not only by intra-firm knowledge creation processes, but also by clusters collaborations and technology sharing processes (Barzotto, Corò, Volpe, 2017).

As for the single region, also with the rest of the world is necessary to establish a sustainable level of "knowledge connectivity", meaning the capability to pick up new sources of knowledge, not only local, but mostly global, in order to absorb and generate new competences (Cano-Kollmann, 2016).

The erosion of the commons and the cognitive myopia are the most critical factors that may threaten the competitiveness of a cluster. However, creating global conduits between distant communities, easing, so, the flow of information necessary for an environment to grow (Maskell and Malmberg, 2007), the cluster ecosystem can follow a path of global openness necessary for the development of new knowledge and lead the innovation process.

Of course, the creation of network able to connect different hotspots of innovation around the world requires more efforts than linking different companies within the same environment. Moreover, not every company or institution have the capability to establish a strong relationship, since that the role requires a strong presence in the global market and a strong monetary capacity.

In particular, the main role is played by leading firms present worldwide and able to sustain the costs necessary for the implementation of channels capable to connect different territories and at the same time maintain their territorial position. Firms able to play a similar pivotal role are named "knowledge integrators".

Knowledge integrators are defined as cluster's leading firms whose, by the participation to manufacturing clusters and global value chain, permit the codification and transfer of knowledge from elsewhere to the production territory (Pisano, 2018) through the creation of stable channels of connections called "pipelines".

Pipelines act as a highway for the flow of information, allowing to knowledge integrators to codify knowledge and innovation ready elsewhere, bring them within the boundaries

of the home cluster and let to the whole ecosystem to grow and gain a more global shape. Moreover, thanks to the leading firms' pivotal role, the players of the cluster become more involved in the world market and at the same time exploit all the strengths that the territory could provide them, as geographical proximity and the presence of a well-developed local network.

Knowledge integrators, doing so, allow to the cluster to overcome the trade-off of being too local or too global, preserving internal capabilities and integrating with global market stimuli (Buciuni and Pisano, 2018).

In fact, the ability of leading firms to connect local external economies with their domestic ecosystem creates firstly a constant flow of knowledge that can be exploited for the innovation process, but also becomes a stimulus for the development of internal knowledge, that can be exploited as well and transferred elsewhere following different pipelines.

What is fundamental to understand is that, in order to enhance the level of competitiveness, a cluster cannot act as an isolated ecosystem, where everything can be produced within the boundaries of the geographical region. Local systems need strong connections with other economic realities in order to foster knowledge creation and capabilities (Becattini, Rullani 1996), establishing new synergies.

Of course, the openness encouraged by knowledge integrators allows local clusters not only to participate to a global production process, but also opens the doors of a regional reality to the global market, allowing to all the firms to reach markets that could never reach standing alone.

For instance, the creation of a pipeline by a supply contract developed by a company could be an occasion to exploit the channel for reaching new markets not considered before.

Through their pivotal role, knowledge integrators supply to the problem of cognitive myopia, which could lead the cluster to a sense of groupthink, not allowing the development of new knowledge, but also reduce the probability of erosions of the industrial commons. In fact, the creation of pipelines is not aimed at finding new worldwide suppliers, but mostly to reinforce the local capabilities, feeding them with global knowledge. Of course, global agreements still persist, but from the point of view of a joint growth of the local ecosystem.

Of course, it's not necessary only to establish a pipeline for swiping a bundle of knowledge from one region to another. As highlighted for the processes of knowledge creation among

companies of the same cluster, one of the key factors able to foster the process is the possibility for firms to share the same environment and the same language. For this reason, knowledge integrators have also the task of making knowledge available to the cluster, translating it with the proper codification (Cano-Kollmann *et al*., 2016)

The creation of pipelines and the creation of stable connection with other regional clusters requires conscious efforts. The establishment of stable connections has not to be mistaken for redundant linkages, but it consists in network relations created *ad hoc* for the flow of information and knowledge transmission (Bathelt, 2004).

This means that not every leading firm can be considered a knowledge integrator, but they have to supply specific requirements. First of all, they must have a global footprint and the capability of managing the incoming and outcoming flow of information. Moreover, the process requires investments and resources, meaning that the company must sustain important economic efforts. This also implies that the number of pipelines that a company is able to create is directly proportional to its size (Bathelt, 2004). Also, is fundamental to underline that connections based mainly on human interrelationships (Song, 2014) (Baldwin, 2019) and this means that knowledge integrators must be able to establish a relationship of mutual trust with the companies involved in the process.

Moreover, the process involves several risks and potential cost failures. For this reason, before the implementation of a pipeline, knowledge integrators proceed with selection routines, selecting the targets on the basis of their direct interests (Bathelt, 2004) and exploiting their absorptive capacity in order to recognize external information, assimilate it and exploit for commercial purposes (Cohen and Levithal, 1990). In other words, knowledge integrators must have the ability to find knowledge and innovation, wherever is ready to be used, internalize it for internal purposes and transfer it to the whole ecosystem in which they are based.

However, pipelines cannot be established among every industry. In fact, the main requirements for the establishment of an exploitable flow of knowledge is that the two involved ecosystems must take part to the same industry, or at least to be complementary in order to fill each other gaps (Barzotto, Corò, Volpe 2017). In fact, innovation in one industry can be the trigger for knowledge creation in another one, but at the same time be detrimental for another too (Pisano, Shih, 2009).

Recalling the case of Toyota, it can be considered as a perfect knowledge integrator, able to establish connections among its partners, managing the flow of information. Over the

years the Japanese company has been able to understand that its network of suppliers is not simply a resource to exploit, moreover it can be source for the development of innovation and for the growth of the cosmos that has been able to create around itself.

More in general, firms able to cover the role of knowledge integrators are mainly multinational enterprises (MNEs), because of their global footprint, their presence in Global Value Chains and their ability to manage different suppliers located all over the world.

For these reasons, MNEs are the perfect gatekeepers of knowledge, able to create pipelines, connecting different regional realities, and pursuing the process of knowledge and innovation transfer.

Covering the role of knowledge integrators, MNEs are able to create the conduits necessary to convey the flow of knowledge, making possible for new tools necessary for the innovation process to be available for the regional ecosystem. Moreover, acting as a pivot, MNEs lead a complex procedure of knowledge codification that is beneficial for both the parties involved and leading to a co-evolution process of mobile firms and immobile locations (Cano-Kollmann *et al.*, 2016).

In particular, MNEs are able to exploit their worldwide presence acquired through the foundation of subsidiaries in order to implement an interwoven network of connections between two or more regions and, thanks to the implementation of pipelines, they are able codify and ease the flow of information from one hotspot to another.

MNEs emerge as pivotal actors, able to connect territories, convey information and knowledge amongst domestic and foreign actors by creating and exploiting pipelines (Barzotto, Corò, Volpe, 2017).

Also, another driving aspect for the co-evolution of firms and location is related to the disaggregation of Global Value Chain, which have led to a fragmentation and dislocation of activities in more efficient locations. The role of MNEs is merging their ability to manage complex knowledge networks with the resources available in specific locations.

The aim of this process is not only the possibility to reach new resources, but a for of co-evolution of territory and companies. Undertaking global researches, MNEs are able to discover peaks of knowledge and absorb resources applicable for commercial ends. At the same time, pipelines convey knowledge from a region to another, leading regional systems to be more global. This configures a framework of global growth: on one side, MNEs have the possibility to discover new hotspots of knowledge, and on the other

localized regions take part to the global value chain. Moreover, regional realities become more rugged and attractive as "peaks of knowledge" for the implementation of new pipelines by other knowledge integrators (Cano-Kollmann *et al.*, 2016).

An exhaustive and complete model of co-evolution has been represented by Cano-Kollmann *et al.* (2016).

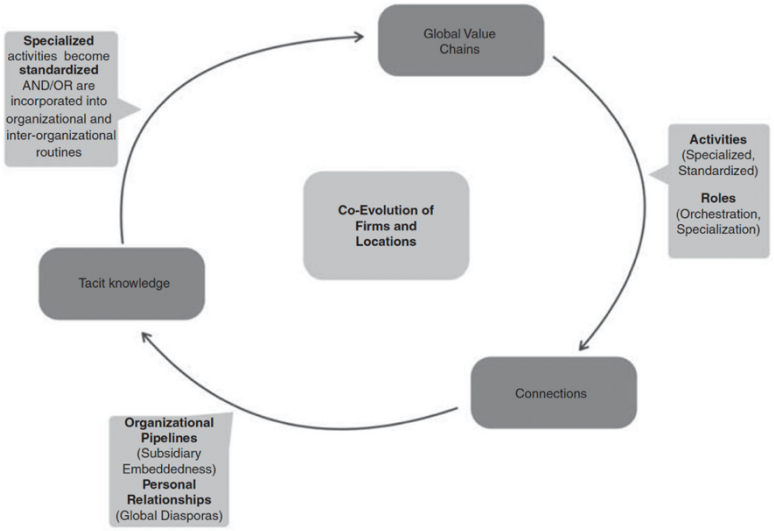


Fig 1, cap. 2, par. 2: A model of co-evolution. Source: Cano-Kollmann et al. (2016)

The starting point are Global Value Chains, that can be studied form the perspective of firms or activities.

Firms can be divided in specialized firms high-knowledge firms and orchestrating firms. The latter ones, in particular, are those able to occupy high network position and capture bulk of knowledge and all value created, and, for these reasons, can be defined as knowledge integrators.

Vice versa, activities can be categorized into high-knowledge (specialized and non-repetitive) and low-knowledge (so standardized and repetitive) both spread over different territories with some degree of trial and error.

MNEs, covering the role of orchestrating flagships are uncharged to establish pipelines in order to connect different locations and personal relationships, necessary for the flow of both codified and tacit knowledge. However, as stated before, their task is also to codify and systematize tacit knowledge, turning today's specialized and non-repetitive activities into tomorrow's standardized ones. Doing so, tacit knowledge and industrial commons of one location can be replicated in another one, and, so, be exploited for an evolution in the innovation process.

In this way connectivity becomes more horizontal, and, searching again for new peaks of knowledge in the global value chains, MNEs allow to the process to start again, making it cyclical.

Doing so, we assist to a co-evolution of firms and locations. Tacit knowledge, transferred from one hotspot to another, lead to an evolution of the industrial commons too, which benefit from the bulk of knowledge imported and, so, this implies that new starting points for the innovation process may grow.

On the counterpart, MNEs benefit from the set of connections established between locations and form the further innovation process.

To conclude, the phenomena of globalization and outsourcing strategies undertaken by companies who tried to be more price competitive have threatened the capability of clusters to produce and increment the set of tacit knowledge necessary to improve their competitiveness over the time, known as "industrial common". In fact, exporting low value-added activities, the cluster loses the capability to benefit from geographical proximity in the innovation process and loses the capacity to embed within the territory the set of tacit knowledge necessary to enhance the competitive advantage of the firms.

However, a potential solution can be the increment of knowledge connectivity between different territories. Leading firms known as "knowledge integrators", searching for peaks of knowledge, have the capability to establish strong relationships among territories, and, as consequence, transfer the set of tacit knowledge from one hotspot to another, thanks to the creation of pipelines.

Doing so, we assist to the phenomenon of co-evolution, where leading firms can benefit from the set of knowledge and innovation found and territories benefit from the import of new knowledge that may lead to the creation of new innovation and enhance the existing industrial common.

The new synergies created between distant realities are necessary for a cluster to escape form the problem of cognitive myopia, that could reduce the capability of the firms to innovate.

The combination of tacit (local) and codified (global) knowledge combined lead the ecosystem to a continuous (co-) evolution and, so, bolster of the competitive advantage of the ecosystem (Bathelt, 2004).

1.3 Territorial capital as company's intangible

The previous paragraph has described the processes that led clusters to create new sources of knowledge and, as consequence, to develop the innovation process necessary to allow to firms to grow and enhance the competitiveness of the cluster as a whole.
In particular, the idea of establishing strong interconnections among the actors of the same cluster have been stressed in order to describe the concept of Gary Pisano of "industrial common".
The goal of this paragraph is to expand the concept of commons, in order to reach a more complete definition of "territorial capital", understanding the dynamics for which it can be considered as a company's intangible and why is getting more and more importance nowadays, considering also the evolution of the economic system after globalization and the rise of new technologies as artificial intelligence (AI) and remote intelligence (RI).
Recalling the definition, "industrial commons" are the set of manufacturing and technical capabilities embedded to the workforce, competitors, suppliers, customers and institutions of a cluster (Pisano and Shih, 2009). It's clear that the focus is putted directly on the inhabitants of the ecosystem and on their capability to embed themselves the bundles knowledge produced within and without the cluster under the form of practical and theoretical skills.
Moreover, recalling also Marshall's theories, he wrote about "something in the air", an intangible factor, result of all the interconnections that the members of the cluster have been able to establish over time and fostered by the common shared background made of traditions, informal rules and institutions, also defined as creative milieu.
This is the starting point to define "territorial capital", which can be considered as the combination of institutions, rules, practices, producers, researchers and policy makers that make a certain creativity and innovation possible (OECD, 2001). For this reason, a certain territory can potentially be more suitable to produce higher returns for determined typologies of investments exploiting the tangible and intangible assets offered by the geographical area in order to gain a form of competitive advantage.
For instance, many factor underlined before as the presence of specific resources, the network of interconnections established by actors in the supply chain and geographical proximity between firms and suppliers or service providers are only few examples of

sources of competitive advantage that can be exploited by companies of the territory and produce better returns for investments.

As highlighted before, "territory" does not represent only the spatial area in which firms and other institution co-locate themselves, but it's a more complex system, characterized by several elements (Camagni, 2009):

- A system of localized externalities, both pecuniary and technological;
- A system of localized production activities, traditions, skills and know-hows;
- A system of localized proximity relationships, which constitutes a "capital";
- A system of cultural elements and values which attribute a sense of meaning and belonging to the territory;
- A system of rules and practices defining local governance models.

The presence of variegate and heterogenic components of the territory, which contribute to the capability of co-located companies and institutions to reach a higher competitive advantage, led us to define "territorial capital" as the set of localized tangible and intangible assets that constitute the competitive potential for a given geographical region (Camagni, 2009).

Generally, when we consider the capability of a firm to gain a competitive advantage, we focus on endogenous resources instead of exogenous ones. Considering the resource-based view (RBV) framework, it argues that firms are able to develop a form of competitive advantage when are able to own, exploit and develop forms of resources that are valuable and rare, non-imitable and not-substitutable (Barney *et al*., 1991), describing a context of internal growth, instead of the system as a whole.

However, the list of factors that contribute to the capability of a firm to enhance productivity allows us to understand that sources of competitive advantage are not only internal to the firm, but external too. The presence of different typology of actors and resources within the same territory and the set of interactions among them led the whole system to create other forms of competitive power that can be exploited for a global form of growth instead of a single one.

Of course, every territory has its strengths that can be exploited and form which is possible to undertake a form of advantage. In fact, as underlined by OECD (2001) in its "Territorial Outlook" every region has its own territorial capital distinct from other areas. For this reason, a specific investment will not have the same return in every territory. The presence of specific assets, tangible and intangible, can make them more effective and

produce higher returns, despite a standing-alone firm which have to follow an internal growth path, which can potentially be more time and money dispendious.

For instance, in the last forty years, changes in production systems driven by the technological progress and the development of industry-specific networks, have led territorial capital to be considered as an active source of competitiveness also from an exogenous point of view (OECD, 2001). Moreover, the rise of highly specialized and co-localized SMEs as support of a specific industry have led firms and scholars to direct their attention to the phenomena of clustering, giving importance to the synergies created by the interconnections within a specific territory.

Also, as highlighted in the previous paragraph, the cooperation and the flow of information among clusters and cluster's companies have led to a technological progress that is not the result of single firms' research activity, but more as a factor of production that can be imported from abroad and internalized. In particular, technological progress may take place in many ways: through learning, exploiting the human capital and the skills absorbed from other environments; through externalities, when the productivity of a specific company can be exploited by other ones to enhance their productivity too; by accumulation of knowledge, exploiting the pre-stored knowledge which can be self-produced or captured from other actors (OECD, 2001).

This makes technological progress not simply an endogenous variable that allows to single firms to reach a form of competitive advantage, but more an exogenous variable that can be internalized by a territory and that can be exploited by all the actors of the system in order to produce higher returns on investments and, as result, a complete form of competitive advantage.

Also, considering the complex environment of a cluster in which firms share a common geographic area, we cannot simply talk about "spatial proximity". In fact, the presence of a strong network established among all the players led us to consider the more complete definition of "relational proximity". In fact, spatial proximity per se may not provide any form of advantage in the knowledge-codification-transfer process, necessary for the reach of competitive power. Vice versa, relational proximity considers also the social interactions that takes place in the geographical region which allow to the several players to take advantage form face-to-face contacts (Capello *et al*., 2010).

Moreover, within a cluster can be found other forms of assets characterized by a high degree of heterogeneity as geographic location, size, factor of production endowment,

climate, traditions, natural resources, custom and informal rules which are all part of the great category of "social capital" (OECD, 2001).

More specifically, other forms of "capital" have to be considered as integral part of territorial endowment, first of all the largely mentioned "human capital" and "creative capital".

Human capital, defined as the economic value of workers' experience and skills, is a fundamental asset which constitutes the base for every firm involved within an ecosystem characterized by territorial capital. The presence of skilled employees and of a market labor able to provide trained workers does not represent only a form of cost reduction, but also a form of competitive advantage for companies. Also, "creative capital, which is the capability of the system to share information and produce new ideas exploiting the interconnections established among the economic actors within the local context, represent the flow of tacit and explicit knowledge present within the territory.

Creative and human capital are also fostered by the presence of a common background made of similar culture elements, which facilitate the share of information that can be summarized under the name of "cultural capital". The possibility to share a common background made of ideas, traditions practices and beliefs ease the flow of information among the economic actors (Moretta *et al*., 2020) and provide to the actors a form of competitive advantage that cannot be reached by standing-alone firms.

These considerations over different forms of capital that characterize territory led us to state that territorial capital emerges as a new wider concept, embracing different territorial assets, both tangible and intangible, with different origins (self-produced, imported, produced by social interactions, …) and marked by a high degree of heterogeneity (Barzotto, Corò, Volpe, 2016). Moreover, recalling the RBV perspective, territorial capital is not only valuable, since it enables economic activities (Camagni, 2008), but it's also unique and non-replicable, since it cannot be easily reproduced or imitated (Moretta *et al*. 2020).

However, in order to fully understand the concept of territorial capital, is necessary to analyze the taxonomy developed by Camagni (2008) which classifies all the potential sources of competitive advantage that could be exploited by a company.

In particular, the analysis is based upon two dimensions:

- Rivalry: public goods, private goods, and intermediate class of club good and impure public goods

- Materiality: tangible goods, intangible goods an intermediate class of mixed (hard and soft) goods.

Doing so, is possible to create a three-by-three matrix in which the nine classes of goods are represented.

Moreover, a second subdivision can be done in the taxonomy.

Considering the four extreme classes at the corners of the square, we obtain the "traditional square", which represent the four assets that are generally considered for the definition of regional policy schemes. In particular, goods are classified only in terms of public/private and tangible/intangible. So, the traditional square excludes from the taxonomy every kind of mixed good in terms of materiality and club and impure public goods in terms of rivalry.

On the counterpart, the so called "innovative cross" considers all the intermediate forms of goods that constitute territorial capital. On the materiality axes, it encompasses mixed goods, which are characterized by hard and soft elements and have the capability to translate virtual and intangible elements into concrete actions, converting potential relationality into effective linkages among agents.

On the rivalry axes, it considers the intermediate classes of goods that can be defined with three sub-classes: impure public goods, club goods and tool goods.

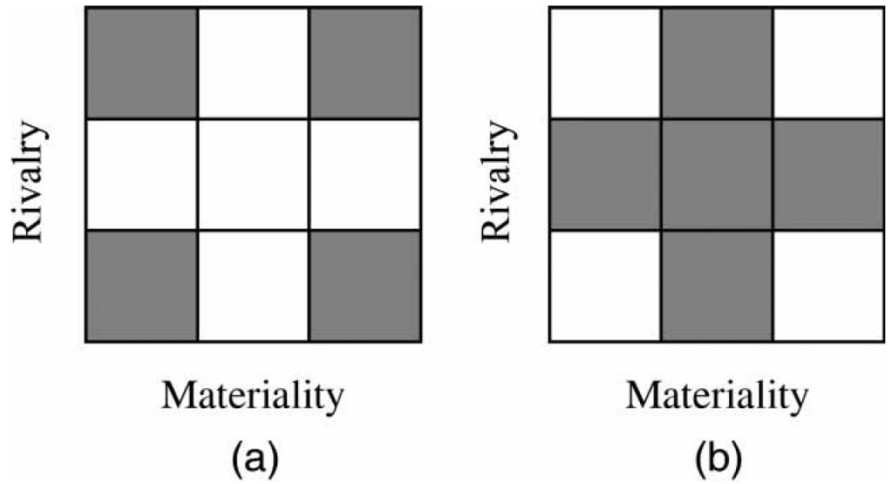


Fig 2, cap. 2, par. 3: traditional and innovative factors of territorial capital: (a) the "traditional square; and (b) the "innovative cross". Source: Camagni (2008)

Starting from the traditional square, four classes of goods can be underlined in order to define the basic components of territorial capital.

The first one, down and to the left corner, are represented by tangible public goods, which are characterized by low rivalry. In particular, we consider natural and environmental resources, which are the fundamental components of territory that without them would not exist. Beside them, we can include also social overhead capital and in particular infrastructures. This kind of goods are the ones that enhance the profitability of local activities and are exploited by the economic actors.

Moving upwards on the rivalry axes, in the top left corner are represented tangible private goods. Private fixed capital stock in the short term can be considered part of the territorial endowment, since it has to be necessarily exploited in order to take expansion in the world trade demand. In the same class can be considered also pecuniary externalities and toll goods, as private highways which have the same importance as other form of infrastructures.

Moving on the column of intangible goods, on the bottom right corner there is a particular class of intangible public goods: social capital. Already mentioned before, it can be defined as set of rules and values which govern interaction between people, institutions the relational network and the whole society (Camagni, 2009). Social capital is the key components that "glues" society together and it refers to the connections among individuals and social networks which determine norms of reciprocity and trustworthiness (Putnam, 2000). The main problem related to this form of territorial capital is that it can difficultly be interpreted as an asset. When we talk about social capital, we refer to a set of values, trust and forms of association that rise form the relationships established over time by the agents in the dynamic system that continuously evolves. Social capital cannot be measured or stocked; however, it has a consistent impact on the performances of a society, and it consists one of the main sources of competitive advantage. The presence of a strong network based on mutual trust is a key feature of localized network as clusters, in which economic actors cooperate in order to reach the same goal of global growth.

On the same column, in the tangible private goods row there is the highly discussed human capital, a fundamental intangible strictly connected to the territory which constitutes the major source of competitive advantage that can be exploited by economic agents. As highlighted by Quinn (1992) human capital exists under the form of tacit knowledge, which is embedded to the single components of the society and, since they are embedded directly to the geographical area, to territory too. This concept has led to the

definition of “industrial commons” and to the logic according to which the competitive power of an enterprise is strictly connected to single workers’ competitive power (Pisano and Shih, 2012). Whether a worker loses its single competitiveness, the competitive capability of the whole company is threatened (Barzotto, Corò, Volpe, 2016). Moreover, human capital can be seen also from the perspective of labor market. as highlighted before, within a territorial ecosystem is possible to state that there is a vibrant labor market in which a continuous flow of skilled workers is able to round over different economic realities, bringing with them their bundle of skills that constitutes the seed for the creation of new knowledge and innovation. But also, entrepreneurship and creativity are components of human capital, which can appear in different forms.

This concludes the explanation of the classical square, which represents the base of the concept of territorial capital.

However, according to Camagni (2009) it is not sufficient for a complete explanation of all the components of territorial capital. In fact, the innovative cross represents sources of competitive advantage that deserve a particular attention. As stated before, it encompasses all the intermediate forms of goods.

Starting from the rivalry axes and moving to the right, we find the class of club and impure public goods. In particular, considering their materiality they can be found in different forms.

In particular, in the column of tangible goods is possible to point out the presence of proprietary networks in transportation, energy or communication. This class of goods is subjected to the supervision of an authority which guarantees the fair access and maintenance and determines fair prices. Moreover, in the same class are located also collective goods, which, as impure public goods, are characterized by two problems: congestion and free riding behaviors. In this case, what guarantees the correct exploitation is the sense of belonging encompassed in social capital and the formal and informal rules self-produced by the community. However, as well as tangible public goods, they constitute the base for the attractiveness of territory, because of the necessity of firms and institutions for an efficient network.

On the counterpart, looking at intangibles, there is relational capital. It is defined as the set of relationships established between firms, institutions and other economic agents within a territory and people which derives from a strong sense of belonging and cooperation. The creation of strong internal, and sometimes, external pipelines constitute

a strong form of competitive advantage for the players of the territory, since it facilitates communication and the flowing of information, reducing transfer costs and fastening up the processes. This corroborate the thesis for which proximity is relational and not spatial. In this terms, relational capital can be assimilated as the local milieu, since proximity is not only spatial, but also socio-cultural (Camagni, 2009).

Finally, considering the materiality axes, the column of mixed goods encompasses three both hard and soft goods which have the capability to translate virtual and intangible elements in concrete actions.

Starting from the bottom, on the public goods row, is it possible to find forms of agglomeration economies, as districts, connectivity and receptivity tools, which constitute the necessary tool for the facilitation of interaction among the different inhabitants of the territory. They are characterized by hard and soft elements, able to transform concrete assets into relationships fostered by the presence of a common background and language. By exploiting these networks, as for relational capital, economic agents can establish strong relationships and gain a form of competitive advantage and global growth.

At the center of the innovative cross there is the category of cooperation networks. They can be described as alliances supported partially by public agencies aimed to support the process of knowledge creation and diffusion, but also to manage the physical space and land-use.

Finally, the last class of goods that constitute territorial capital is the relational private service, which are intermediaries which provide services of networking, researching for the best suppliers and partners or in the case of technological transfer.

In the following tab it will be represented a summary of all the components of territorial capital:

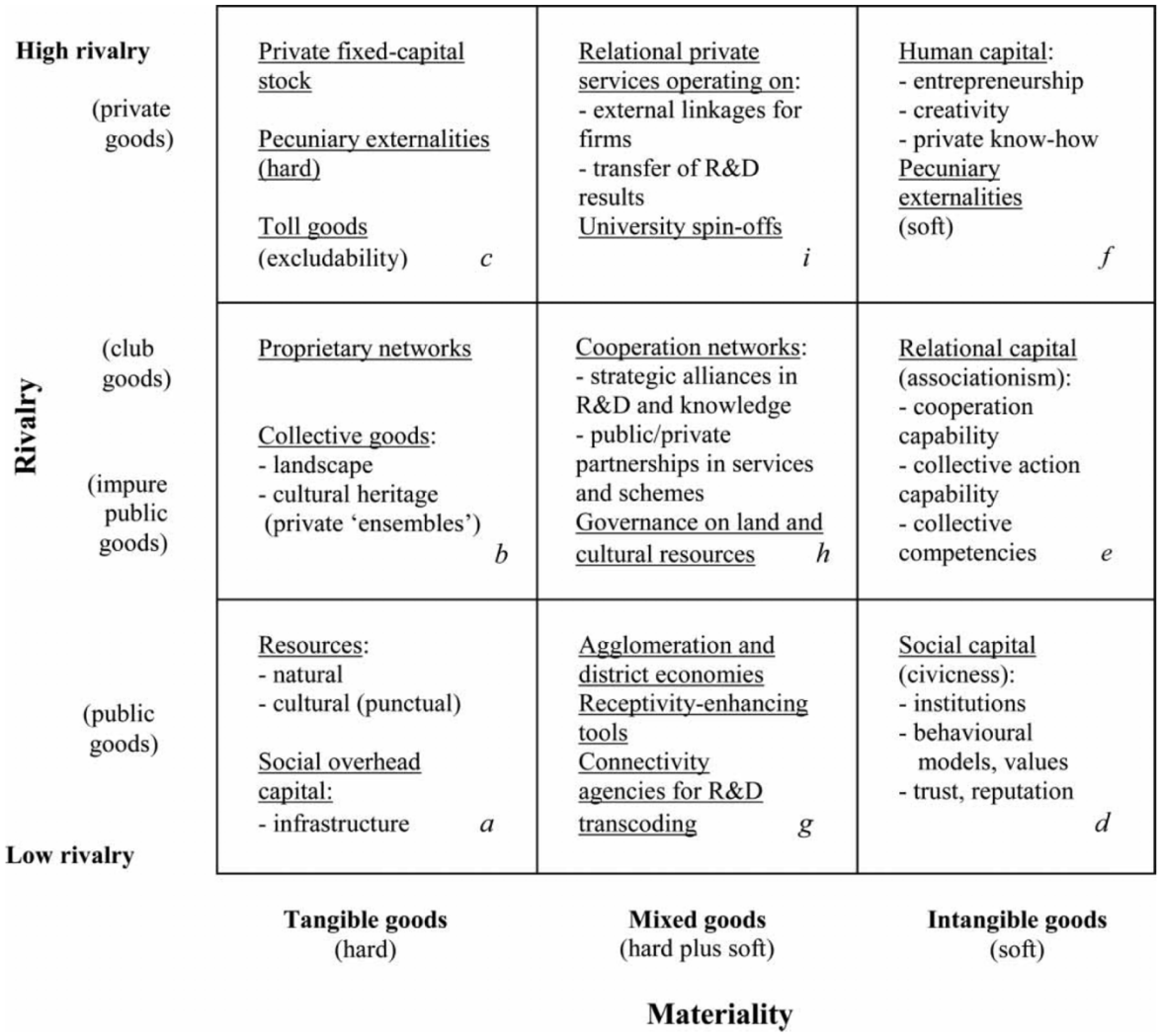


Fig 3, cap. 2, par. 3: A theoretical taxonomy of the components of territorial capital. Source: Camagni (2008).

This taxonomy provided us by Camagni allows to understand which are the tangible and intangible components of territorial capital and how companies are able to take advantage from them in order to produce outcomes and enhance the competitiveness of the system as a whole.

Moreover, it's reasonable to assess that the presence of these kind of assets within a territory constitutes a valid reason for assessing that the outcome of an investments depends directly from where it is located, because of the possibility to exploit territorial capital and so enhance productivity. For these reasons, managerial decisions are taken considering territory as a fundamental variable that could modify the outcomes of a specific investment.

Many theories and studies support these assessments. In "Territorial Capital as a Company Intangible" (Barzotto, Corò, Volpe, 2016) authors analyze the awareness of territory by a set of ten companies located in north-east of Italy. Through an empirical multiple-case study analysis, it is stated that the environment surrounding companies under analysis have a positive impact over performances and that territorial capital has led a form of growth. Also, companies are aware from the decisive role played by territorial endowment, even if interviewed associate the value produced to workforce skills, educational system and supplier network.

However, one of the focuses of the paragraph is to understand whether or not territorial capital can be considered as a company intangible or not.

IFRS 38 sets out the criteria for the recognition and measurement of intangible assets. In particular, the accounting principle states that an intangible is "an identifiable non-monetary asset without physical substance […] the cost of generating an intangible asset internally is difficult to distinguish form the cost of maintaining the entity's operations. For this reason, internally generated brands, mastheads, publishing titles, customer lists and similar items are not recognized as intangible assets".

Moreover, an asset is defined as a resource controlled by an entity result of past events for which future economic effects are expected and must be recognized in financial statements (IASB Framework).

These definitions allow to underline which are the three main attributes that characterize an intangible asset: identifiability, control, future economic benefits (Barzotto, Corò, Volpe, 2016).

For these reasons, territorial capital satisfies the three requirements: the taxonomy identifies the single components (tangible and intangible), companies have control over it and the exploitation of territorial endowment produce economic benefit if used together with private assets.

However, the main problem is that it's impossible to state its monetary value, because it's the result of singles and community efforts during time and it evolves day by day, and for these reasons cannot be recorded on financial statements.

Territorial capital is that "something in the air" named by Marshall which can be exploited by all the inhabitants of the geographic area under several forms and it does not have a single owner, it is property of all.

Moreover, as every asset is subjected to a process of accumulation-impairment. The continuous consume and exploitation of resources by economic agents produce a reduction of the value, as for any other asset and this implies a cost for the maintenance and reconstitution of the intangible.

Nonetheless, this process, and consequently territorial capital itself, is threaten by the mutation of global value chain due to globalization and "globotics" (Baldwin, 2019).

In the recent years, thanks to the rise of the Internet and the consequent knock down of every kind of telematic barrier, world have witnessed a partial transformation of the already rooted concept of globalization.

In particular, thanks to the rise of the Internet and the consequent knock down of every kind of telematic barrier, the already rooted concept of globalization has been amended considerably.

The new born of technologies as Artificial Intelligence (AI) and new algorithms able to replicate and fasten up almost every standardized process, combined with the increasingly popular supply of "telemigrants" and Remote Intelligence, able to provide high quality workforce to the service sector at a low price, a new phase of robotics have disruptively changed the managerial strategies of companies, triggering a new evolutive phase.

"Globotics" is the result of the combination of the old globalization phase, specialized in outsourcing or delivering part of the production process in low-wages countries, and this new phase of robotics, made of futuristic technologies able to threaten almost every kind of process that can be standardized (Baldwin, 2019).

Moreover, this new phase has led to a concrete transformation of labor supply strategies. Whether in a firstly phase of globalization only "white-collars" were thought to be sheltered form job displacement, with "globotics" also the service sector started to be threatened by new technologies as Artificial Intelligence (AI) and Remote Intelligence (RI).

This evolutionary phase has given the possibility to replace also high value-added jobs, finding low-wage (telemigrants and RI) or even zero-wage (AI) supply for every standardized process that were still placed in the parent company.

However, a broader consideration on labor market has to be done. Whether in the first phase of globalization the rise of outsourcing strategies has forced workers to specialize themselves in high value-added activities and the fragmentation of the supply chain have

given the possibility for job replacement, for the new globotics it's not possible to state the same.

In fact, due to the partial impossibility to replace displaced standardized jobs and to the inability of localized communities to maintain the same pace of technological progress, the ecosystem is facing a deep disruption with a consequent radical change of the socio-politico-economic system (Baldwin, 2019)

Moreover, the effects of offshoring and outsourcing were "limited" to a reduction of low-skilled workforce, a loss of domestic market share and to a loss of opportunities for growing and learning form the proximity with parent company or similar/complementary economic actors of the ecosystem that can be translated in a dissipation of industrial commons (Barzotto, Corò, Volpe, 2016). This led to a radical transformation of work skills, which became more and more specialized and industry focused, and this process has been fostered also by the pivotal role of MNEs, which have been able to connect through pipelines different similar or complementary ecosystem allowing them to share bundles of knowledge.

But for "globotics" is not the same. Everything that can be standardized can also be replaced.

However, a concrete solution can be highlighted directly form an analysis of the problem. Even if it seems that every white-collar is threaten by the technological progress, it is not true.

Analyzing the strengths of AI and RI it is possible to understand that what they do is simply replicate standardized jobs, fasten up processes without involving any form of human contact. But as stressed before, a huge component of value creation is driven by face-to-face interactions. For this reason, jobs that have the potential to survive to globotics upheaval are those who require human direct connection.

For instance, for evolutionary reasons in-person meetings cannot be replicated through technologies as e-mails, telephone or video-calling applications (Bohns, 2017). Basically, it is a matter of social and emotional intelligence, which cannot be replicated by any kind robot or algorithm. AIs are able to replicate thousands of co putting processes in a fraction of second but are not able to establish an emotional connection with counterparts or participate to a creative process.

So, sheltered sectors will be those who require tasks as creativity, negotiation and persuasion (Baldwin, 2019), which necessarily involve human interactions.

The concrete implication of this evolutionary path is that communities will be more local, and the attention will be focused on industry specific ecosystems, made of interconnected clusters of firms who share the same territory in which human, social and relational capitals constitute the foundation.

For these reasons, globotics can potentially give more and more importance to territorial capital and to its every single tangible and intangible component, which now and in the future could assume more and more relevance in every kind of economic and managerial decision.

However, in order to enhance the competitiveness of the companies who share a specific geographical area, is necessary to invest on soft non-replicable skills able to reinforce what psychologists define "social cognition".

Social Cognition is the capability of humans to establish stable social relationships and the ability to understand and decrypt the complex network of linkages. In fact, the presence of a specific person in the network could change the mind of all the other players because of the influence that every one of us has in the society. Being able to understand how the mind of a person could change due to the presence of any other individual provide a huge competitive advantage. Also, a reinforcement of social cognition is translated in a reinforcement of social, relational and human capital.

Considering a cluster ecosystem, the tendency to be more local instead of global is already rooted, driven mainly by the self-awareness of the potential sources of value that can be exploited.

Also, a potential virtuous circle could start. Making the correct investments in the territory in order to enhance every single tangible and intangible element of territorial capital it is possible not only to find a solution for the accumulation-impairment process, but also attract new economic agents which can potentially bring in new knowledge necessary for the innovation process development.

Moreover, from a labor market perspective, human capital represents one of the variables that affect companies' performances most (Barzotto, Corò, Volpe, 2016). The presence of high skilled workers, able to cover non-standardized positions, which require a specific bundle of tacit knowledge, allow companies to produce a higher value added for their products/services.

The final result is a general boost of territory and all its elements, that may lead to a transformation of the economic fabric as intended until now, with more localized

economies made of highly connected communities able to leverage each other and the surrounding tangible and intangible resources.

In the era of digital economy and its technologies, the regional reality of a cluster still has its importance, because of all the factors that can be exploited by companies both in the production and, most importantly, innovation process. In fact, the possibility to install synergistic relationship between companies of the same region and the capability to exploit territory in all its components become key factors that must be considered in the managerial decision-making process, especially with a growth perspective.

Within the cluster ecosystem, the synergistic effect is achieved as result of cluster activity as a single mechanism and not as result of separate elements (Poylakov, Stepanova, 2019).

For these reasons, after the disruptive effects of globalization and globotics, clusters become a new source of value and competitive advantage because of their distinguishing feature of being a catalyst for creativity processes, production processes and for the development of innovation.

Also, the possibility to create a virtuous circle, attracting new experts and, so, new knowledge, gives to the system the capability to feed the growth trend and all the components of the territory.

In a world that tries to reduce at the minimum the human interactions, abstracting the concept of territory, clusters follow a different path, giving it more and more importance placing it at the center of the competitive advantage creation process.

Moreover, as highlighted before, a completely flat world hides several inefficiencies and inflexibilities, as verbal incomprehension, lack of control and implementation of standardized procedures which implies a loss of creativity, all issues that are not part of a cluster.

The presence of similar and complementary socio-economic agents gathered in the same area which share the same resources becomes fundamental in order to create a new form of competitive advantage differentiated from the low-price and low-wage competitiveness.

For these reasons, clusters offer a breakthrough approach that can be adopted by several actors of the global economic system, offering benefits in terms of achieving production rates and level of innovation, creating new firms in the industry, attracted form the

resources offered by territory, and enhancing the competitiveness of the cluster as a whole (Poylakov, Stepanova, 2019).

1.4 The role of clusters in Global Value Chains (GVCs)

In the last thirty years the global economy has faced profound changes, from the opening of new channels of communications, establishing connections across distant regions, to three economic crises, with a consequent radical transformation of the supply chain in a more interconnected and faster world.

Obviously, trades have always existed and are not a recent event. However, changes in the speed of transaction, scale and number of parties involved in the interwoven network have radically changed (and continue changing) the architecture of value chains, which continues to evolve.

By definition, a value chain is the set of activities performed by firms and workers to bring a product from its conception to its use and beyond (Gereffi & Fernandez-Stark, 2011). Activities encompasses design, production, distribution, use and post use, and may be performed by a single form or more. Moreover, a value chain can be divided in "internal" or "external". The internal value chain is the set of activities performed by a single firm, generally vertically integrated. On the counterpart, the external value chain is the set of activities performed by different actors, and so direct and indirect suppliers, distributors and retailers, and customers.

As highlighted by Baldwin (2011) the evolution of global supply chain has faced two "unbundlings":

- The first one, with the steam revolution, has made possible to create economies of scale and open trades in goods and labor migration. However, this had not made the world flat, but have clustered production in local factories and districts, since it was possible to exploit proximity for reducing transportation costs and coordination costs.
- The second one, with the ICT revolution, has made possible to coordinate complexity at distance, thanks to the born of telecommunications and web services. This led to the possibility to create a more interconnected economic world, though the implementation of outsourcing strategies and global supply contracts.

Nowadays, probably, is possible to evidence the presence of a third unbundling, with the rise of new technologies as Artificial Intelligence, Remote Intelligence and robotics, which

have automatized several low skilled jobs and that have forced labor market to develop new skills based on human relationships.

The evolutionary path of the economic world, combined with the born of open innovation strategies (Cesbrough, 2003) led to an opening of markets, making possible for trade barriers to fall, with the consequent creation of several networks on a global scale, defined as Global Value Chains (GVCs).

GVCs are the sequence of tangible and intangible value-adding activities carried on a global scale (Gereffi & Fernandez-Stark, 2011). In fact, by trying to optimize their processes, companies locate the stages of product development in different countries, extrapolating the maximum value by every activity and at the same time dispersing activities around the world (OECD, 2013).

There are four dimension that can be considered in the analysis of GVCs (Gereffi & Fernandez-Stark, 2011):

- Input-output structure: it considers the processes for which a raw material is transformed in a finished product. So, the value chain is described as the sequence of processes necessary for the ideation, creation, sales, use and recycling of a product/service. Moreover, every step can be divided in sub-steps and each of them creates a bundle of value. Considering this perspective is not possible to underestimate the evolutionary path of the industry in which the chain is inserted.
- Geographical consideration: GVCs have dispersed around the world the activities of the value chain. However, even if on this perspective there is a form of division, ate the same time GVCs establish relationships between two or more different locations. By considering the geographical scale of a global value chain is possible to understand the complexity of interconnections and at the same time identify the main players per each segment of the chain. Also, it should be reminded that GVCs continuously evolve, both in terms of actors and in terms of activities.
- Governance structure: whether the geographical point of view allows to understand the geographical map of a GVCs, by the analysis of the governance is possible to analyze the role covered by every actor and its influence on the others.
- Institutional context in which the value chain is embedded: the institutional framework identifies how local, national and international conditions and policies shape globalization in each stage of the global value chain (Gereffi, 1995). In particular, as highlighted in the previous paragraph, the insertion in a GVC

depends directly on the local conditions and on the environmental law code shared by the economic agents of the ecosystem.

Transposing the concept of value chain at a cluster level, what is possible to underline is the presence of a full range of economic actors, co-located in a spatial region, able to cover almost every passage of the supply chain, from designing to post-sales services.

Moreover, from a territorial perspective, firms and institutions share a common set of rules which define the standards of the relationships among all the actors. This also defines a governance, since leading players will have a higher decisional power and may be able to influence decisions over the others.

For these reasons, a cluster is for all intents a value chain. But its role does not stop within its boundaries.

In the previous paragraph it has been analyzed the role of knowledge integrators as leading firms able to create pipelines between two or more hotspots in order to allow to knowledge and innovation to flow (Buciuni, Pisano, 2018) (Cano-Kollmann, 2016) (Barzotto, Corò, Volpe, 2018).

But the rest of the actors of a cluster does not play a passive role.

The possibility to establish a contact with distant realities and being involved in a global value chain represent the most important goal for companies of the cluster. In fact, the main issue related to innovation is that it takes time to take roots and it has to be considered as a long-term goal.

In the short term, companies try to establish stable commercial connections with global players, becoming part of the global value chain within the specific industry.

Moreover, another perspective should be considered. Global multiplayers search for the best solution for maximizing the value created, getting in touch with realities that best fit their strategy.

In designing a customized supply chain, companies try to find four typologies of advantages: cost minimization, customization, product differentiation and natural resources exploitation. Also, due to globalization, supply chains have become more dynamic, requiring continual disintegration and reintegration of organizations which can be translated in continuously reshuffling of the actors involved and of structural, technological, financial and human assets, depending on the desired final result (Birdseye Wiel, 2013).

Under this perspective, clusters offer the possibility to have in a relatively narrow region a set of specialized firms and institutions characterized by a common background and by the presence of a territory to exploit in all its tangible and intangible elements. Moreover, since cluster itself continuously evolve, it can provide a strong landmark for the design of a supply chain.

However, not every industrial district and cluster have reacted at the same way at globalization and born of GVCs. As highlighted by De Marchi, Di Maria and Gereffi (2018), three possible trajectories can be highlighted:

- Decline: consistent reduction in the number of firms and capability of the territory to produce value
- Hierarchization: depletion of the population of district enterprises in favor of few large vertically integrated corporations with a consequent employment loss and only a partial compensation. Also, this reduces the possibility to exploit territory, due to the fact that large corporations might not be geographically located within a local context.
- Resilience: moderate contraction of the firm's population, but still a good capacity to generate value. This trajectory describes also the capability to adapt to relevant changes and still be capable to compete in global markets.

Clusters and districts able to pursue a resilience path have been able to upgrade, following the changes in value chains, and take a position in the global market, putting in place strategies aimed to respond to global changes.

In particular, GVCs can be analyzed from two different perspectives: governance, with a top-down approach, which takes into consideration the role played by leading firms of the network and their role within the industry, and upgrading, with a bottom-up view, which focuses on the strategies adopted by countries, regions and other stakeholders in order to ameliorate their position in the global economy (Gereffi & Fernandez-Stark, 2011).

Within a GVC the concept of upgrading is referred mainly to economic upgrading. In fact, within the chain, firms and other economic agents try to move their position from low value activities to high value ones, increasing their benefits from participating in global production. Studying and implementing the correct strategy, companies are able to make a leap forward in the supply chain and upgrade themselves in different ways.

Four typologies of upgrading can be underlined (Humphrey & Schmitz, 2000):

- Process upgrading, consisting in the implementation of new technologies in order to transform inputs into outputs more efficiently;
- Product upgrading, consisting in the implementation of more sophisticated product lines;
- Functional upgrading, consisting in adding or removing functions in order to increase the level of skills necessary to produce value added
- Chain upgrading, consisting in moving across industries in order to cover more passages or to supply to different clients.

With an upgrading there is not only an evolution of the single firm, but an upheaval of the region as a whole. Within a cluster economy, where the presence of a network establishes stable interconnections among economic agents, the upgrading of a single firm becomes the upgrading for all the territory and its inhabitants.

For this reason, the presence of a Global Leading Firm (GLF) within a contest of Local Dynamic Actors (LDA) is necessary for the ecosystem as a whole to evolve and increase the value produced.

GLF are those who have the greatest chances to upgrade, since their contemporary presence in GVCs and local context. Within a cluster economy, upgrading refers mostly to innovation and so process, product and functional upgrading. Moreover, as underlined before, firms have the capability to easily share information and knowledge and overcome lack of skills, characteristics that increase the competitiveness of the system.

The possibility of GLFs to upgrade themselves through their connections on GVCs gives to LDAs the capability to reach a second-order upgrade, with, as result an increase of competitiveness of the whole system.

Moreover, it has to be considered that the existence of a world market enhances the importance of local dynamic systems in which is possible to find bundles of skills ready to exploit. This makes clusters and regional realities attractive for new investments by multinational enterprises and global players (Maskell & Mallberg, 1999) (Baldwin, 2019). Nevertheless, there would seem to be a need for a further specification.

The two perspectives – governance, or to-down, and upgrading, or bottom-up – are not separate at all. In fact, governance is not completely unrelated to upgrading, but plays a fundamental role. The management of a network and the key players are variables that have to be considered when upgrading strategies have to be designed.

At any point of the chain a certain degree of coordination is required, in order to understand what should be or should not be produced, how should it be produced, how much and at what price (Giuliani, Pietrobelli & Rabellotti, 2005).

For this reason, it is possible three grades of governance: network, quasi-hierarchical and hierarchy. The higher is the level of complexity within a value chain and the higher are transaction costs that occur. This implies that a stronger control system is needed. Clusters offer a form of governance shared among the players of the system which ensures, due to geographical and relational proximity, a good level of control and lower transaction costs. This enforces the concept for which clusters can act as key players of GVCs.

The capability of being connected with a GVCs gives to local realities a consistent advantage in terms of understanding how to improve their production process and the related quality of outputs.

This can be seen as an "organizational succession" (Gereffi, 1999), the process for which manufacturing companies involved in GVCs have the possibility to shift form low-segment buyers to high-segment ones upgrading their processes and products. Moreover, in this case upgrading also comes from a "learning by exporting" process, for which companies understand which are the most valuable segments and how can they reach them.

Generally, GVCs' literature refers to upgrading only considering manufacturers in a low level of the chain.

But clusters' literature provides several points of reflections on the capability of clusters of upgrading by participating to GVCs, as described before, and many examples can be done to describe the phenomena.

Among all, the furniture district of Treviso-Pordenone can be considered a cluster that has followed a resilience trajectory and that have been able to upgrade constantly during the years in terms of products, processes and functional, thanks to the proximity of global players that have played a pivotal role as knowledge integrators and as forerunners for global markets.

However, is necessary to underline that trajectories are neither prescriptive, nor immutable. Clusters evolve constantly and it is not excluded that also trajectories may change as well (De Marchi, Di Maria and Gereffi, 2018). For this reason, governance and key players have the key role of managing, form the internal point of view, the network of firms and, from the external one, maintain a strong position on the global value chains.

1.5 Clusters and governance

The previous analysis has pointed out the methodologies adopted by cluster firms to produce innovation and forms of competitive advantage. The core relies on the capability of jointly co-located actors of the ecosystem to establish stable relationships with the other economic agents, but also on the capability of leading firms to establish connections with distant realities and, implementing pipelines, produce a flow of knowledge between two hotspots of innovation and at the same time give to the localized reality the possibility to take a part into Global Value Chains.

However, a particular relevance on the ways in which cluster interactions are managed has to be pointed out in order to understand which are the governance frameworks that subdivide powers and rights within the territory.

"Governance" refers to the set of policies and mechanisms established by the governing body of an association and the continuous monitoring of them aimed to subdivide rights and power across the organization.

Slightly different is the concept of "Corporate Governance", which is defined as the system by which corporation are directed and controlled (OECD, 2011).

For what concerns cluster, is not possible to evidence one single definition, because of the multitude of perspectives that can be undertaken in order to analyze the theoretical framework, due to the complexity of interactions and transactions that take place within and without a cluster and their result in terms value production and innovation. Moreover, the single firm dimension has a relevance too.

The starting point of the analysis is again the definition provided by Porter in 1998, which describe clusters as geographic concentrations of interconnected businesses, suppliers and associated institutions in a particular field.

This firstly explains the double dimension of clusters, which allows to analyze the concept of governance from two different perspectives: the network perspective of interconnected companies and the territorial perspective (Bethinier-Pochet, 2014).

Starting from the network perspective, the set of interactions and transactions that take place in the system will be analyzed.

As widely highlighted before, a cluster is characterized by a double dimension, vertical and horizontal, which implies that cooperation and competition coexist within the boundaries. This suggests that relationships are not managed in a single way, but they

depend directly form the typology of connections that are established and by the typology of actors involved and their related intrinsic decisional power. Also, this implies that two different clusters may adopt two different models of governance, depending on the typology of firms and institutions that are located in the territory and on their decisional power over the system.

Moreover, a consequence of this point of view is that any decision taken at the firm level have an effect not only within the boundaries of the company itself. Because of leading companies' intrinsic power over the system, smaller companies may be influenced by the managerial and strategical decisions taken by firms they rely on or, depending on the circumstances, they may be affected by the inter-dependence and so be subjected to a direct and partial form of control.

For instance, clusters of Northern Italy are mainly constituted by SMEs, which are suppliers or service providers of bigger companies located in the territory. This implies that per every decision taken at the top of the supply chain by leading firms, smaller companies will be therefore affected by the direct relationship.

Of course, every company is considered as an independent actor, but the inter-dependence creates inevitably a cascade effect along the network of relationships.

This vertical dimension describes a form of hierarchical governance. Leading companies directly or indirectly exercise a pattern of authority over the underlying firms and this is strictly related to the set of transactions established among the actors.

However, the vertical dimension is only one side of the coin.

In fact, beside the hierarchical relationships, is necessary to consider also the horizontal dimension in order to fully understand the governance structure that characterize a cluster.

The high degree of fragmentation of the supply chain has produced a multitude of highly specialized companies. Those are characterized by a specific bulk of tacit knowledge that allows them to be experts over the covered mansion.

This position does not depend directly by firm's size, but it is related to the capability of companies to produce and exploit knowledge. Moreover, as underlined in paragraph 2, within the cluster there is a continuous flow of information, necessary to feed the constant production of new ideas and to produce innovation.

It's clear that, from this perspective, the hierarchical structure loses its importance, because what is relevant is the firms' capability to share information and so establish a form of relationship aimed to create new value for the system as a whole.

The vertical and horizontal dimension of a cluster have in common a specific characteristic: both involve transactions.

According to Bell *et al*. (2009), transactions are likely to differ with respect to their attribute, which gave rise to interorganizational governance problems, and their governance solutions.

In particular, two attributes have to be underlined: transaction specific investments and informational tacitness.

The first is related to the vertical dimension of the cluster. Transaction specific investments are direct investments done by the parties in plant, equipment, technology, human capital or other intangibles aimed to increase the value creation potential and that, by nature, are difficult to redeploy. This kind of investments produce a "safeguarding" problem. In fact, what could rise is an agency problem, with the consequent wrong or partial exploitation of the potential value that the investment could produce.

For this reason, the solution relies on a hierarchical structure of interorganizational governance, aimed to directly control the power over the underlying parties and reduce the discretion of the partner.

Hierarchical governance relies on specific patterns of authority for which a single or few entities manage in a mechanical way all the interactions, assuming the role of leader. By establishing the necessary rules to articulate the set of relationships they allocate decisional power and held accountable the parties for their actions (Colombelli *et al*., 2017).

On the counterpart, the informational tacitness is strictly connected to the horizontal dimension. In fact, one of the characteristics that constitute the key success factor of the cluster and its competitive advantage is the flow of information and tacit knowledge across the territory. The main problem, in this case, is that since tacit knowledge is a codified information, it can hardly be transferred with a verbal communication code. The transfer of tacit knowledge requires organic interorganizational devices that support the transmission process (Carson et al., 2003). In particular, the process relies on two steps: the recognition of know-how and its transfer within the boundaries of the cluster.

This implies that a relational model of governance is needed, in order to place order between the parties and favor the flow of knowledge and its transmission.

Differently from hierarchical governance, relational governance is rooted in the implicit understandings, shared norms and routines mutually defined by the parties involved (Colombelli *et al*., 2017).

Within a cluster firms share a common background and a common language that allow them to ease the flow of information and the codification of tacit knowledge. Also, this helps to foster the synergies produced by the relational proximity that characterize the territory.

However, is impossible to see just one of the two patterns applied. The two perspective coexist in the territory. Of course, depending on the case, the hierarchical framework could prevail over the relational one and vice versa, but this depends mostly on the shared system of informal rules and beliefs established in the territory by firms and other economic agents, also known as "macroculture" (Bell, Tracey, Heide, 2009).

As for transaction's attributes, also macroculture can be divided in relational and hierarchical, depending on the typology of relationships that have been established across the organization.

A cluster that shares mostly patterns of cooperation, bilateralism and critical comparison will strive to a more relational macroculture, which will foster the share of tacit knowledge across the organization, weakening at the same time hierarchical models of governance.

Vice versa, a cluster that shares patterns of authority, with the presence of few strong firms who exercise a form of control over the lower levels of the supply chain will be characterized by a hierarchical macroculture and this will favor the control of few elements over the investments of the others, and so weakening models of relational governance.

Obviously, as for the two governance frameworks, also two different macrocultures could coexist within the same territory, but the prevalence of one with respect to the other will shape the governance pattern applied.

Moreover, looking at the cluster as an entrepreneurial ecosystem, is possible to highlight the figure of "anchor tenants".

An entrepreneurial ecosystem is defined as the range of stakeholders, public and private, individual and collective, and the set of policies adopted to enhance their actions and co-

development aimed to promote entrepreneurship, value creation and economic development (Pereira *et al*., 2019).

In such a system, the anchor tenant has the role of central player that actively spurs the economic growth, technological change and innovation in the territory (Colombelli *et al*., 2017). This role could be covered by leading players, as firms that occupy a central position in the network, or by institutions, as universities and research centers.

This implies that the anchor tenant occupies both a hierarchical and a relational position, since it has the task of acting as supervisor for the growth of the ecosystem and at the same time favor the flow of knowledge in order to foster innovation.

However, beside the network perspective, also a territorial perspective can be considered in order to have a better comprehension of the governance mechanisms that takes place within a cluster.

The network perspective considers mostly the relationships that are established between firms and institutions.

Differently, territorial governance is defined as a complex institutional process combining cognitive and political dimensions, in which institutional proximity appears as a precondition of collective action and so organizational proximity at the micro-level of coordination (Carrincazeaux et al., 2008).

Once again, this definition encompasses two dimensions (Bethinier-Pochet, 2014):

- Institutional dimension, for which is underlined the effective collaboration and relationship between the actors of the system and fostered by proximity. So, governance assumes a coordination role;
- Organizational dimension, which emphasize the coordination as well as control of co-located actors. So, governance assumes a regulation and control role.

The topics of relationship and control are recalled again, but from the different point of view of the territory.

Alberti (2001), underlines also a third strategic role of governance, for which cognitive resources and knowledge are developed for cluster's members.

This allows also to understand whether or not the different components of territorial capital have an influence over the governance frameworks adopted by the cluster.

Recalling the definition provided by Camagni (2009), territorial capital is the set of localized tangible and intangible assets that constitute the competitive potential for a given geographical region.

In his taxonomy, the author catalogues the nine components of territorial capital by ease of access and materiality. The list comprehends both material assets, result of investments, but also resources resulting form intra-organizational relationship established among the actors that can be exploited by firms and institutions for enhancing their competitive power and the competitive power of the system as a whole.

Considering the horizontal axes of materiality, what can be highlighted is a strict form of dependency between the applied governance model and the elements of territorial capital.

In particular, a relational model of governance will favor the creation and enhancement of intangible elements as human, relational and social capital, fostered by the management of the relationships established among the actors.

On the counterpart, a more hierarchical structure will favor the safeguard investments sponsored by leading firms in order to foster the creation of value through the supply chain.

Moreover, enumerating the components of territory, Camagni inserts in the list also the "system of rules and practices defining the governance model".

This implies that territorial capital and governance of the territory are two interdependence elements of a cluster and that influence each other in the process of creation of value.

Another aspect that governance influences is the production of innovation.

In the era of globalization, in which the competitiveness has been mostly focused on strategies aimed to cut production costs, the only way in which a regional system can still be competitive is by enhancing its capability to produce innovation in diverse fields, as technological, strategical and organizational.

However, the process is not immediate and requires a strong structure aimed to coordinate sources and processes.

As underlined in the previous paragraphs, the strength of a regional reality as a cluster is the possibility to dispose of a wide array of specialized firms (mostly medium and small enterprises) which share a common background and recognize the importance of establishing vertical and horizontal relationships to foster a collective learning process.

Considering also the presence of bigger leading firms in the environment, the result is the implementation and the support through policies of a multi-level governance structure in which the power is spread horizontally and vertically between the various levels of the

structure (Cooke, 2002). Moreover, a similar environment allows to every company of the cluster to participate to the global market, gaining the access through bigger firms that act as forerunners and establish pipelines in order to connect distant hotspots.

However, due to the born and growth of the global market, with the consequent transformation of the competitive scenario in terms of new competitors, new technologies and new market arenas, new challenges have been grown for regional realities as districts and clusters (Di Maria, Micelli, 2006).

Even if proximity still constitutes one of the key elements that allows to regional networks to be competitive in the market, the transformation that the economic world is facing requires also an incremental capability of efficiency in communication processes.

This implies that clusters have the possibility to play a key role in Global Value Chains, but in order to do that is necessary reset the adopted governance models, adapting them to the new challenges proposed by the evolution of the economic world.

Analyzing the processes that lead a cluster to produce innovation, it has been underlined the importance of "knowledge integrators" (Pisano, 2017), leading firms of a regional network with the capability of being the conjunction point between the regional reality of the cluster and the global market.

Looking at this figure from the governance point of view, those firms cover a strategical role in a multi-level governance framework being able to maintain a position both in the regional and in the global realities.

In fact, in order to acquiring new knowledge, new customers and reinforce the relationships with clients, leading firms cover simultaneously a hierarchical position, exercising a form of control over the supply chain, but at the same time have the force to promote innovation within the ecosystem, implementing relational patterns able to ease and foster the flow of knowledge.

According to Di Maria and Micelli (2006), those firms are defined as "open networks".

Open networks are firms with a strong presence on the international market which directly invest in a sales network and in the international supply chain.

This kind of leading firms are not simply local strong companies which have opened their boundaries in the global market. Open networks still maintain their position in the territory, affecting the mechanisms of governance at the cluster/district level.

In order to maintain the competitiveness, those globalized firms require for more qualified services by a system that may have difficulties to supply certain requests. For

this reasons, leading firms promote specific organization structures, in order to support their strategies and actively invest in the territory.

Recalling the network perspective, explained at the beginning of the paragraph, what can be stated is that open networks implement both a relational and a hierarchical structure, favoring the implementation of new technologies and controlling and monitoring the work of the regional firms.

Because of the role of open networks in managing the relationships among the cluster's firms, the regional system becomes a regional innovation system.

However, beside the role covered by firms, it is also necessary to underline the importance of institutions and infrastructures within the cluster.

Recalling also the role of the State in innovation systems (Mazzucato, 2013), it is possible to divide clusters organizations in two sub-systems (Autio, 1998):

- Knowledge application and exploitation sub-system, which mainly, but not only, concerns on firms;
- Knowledge generation and diffusion sub-system, which concerns with public and private institutions, as universities, research centers and local governance bodies responsible for innovation support.

Moreover, beside the two sub-systems, is necessary to point out the existence of external influences of national or supra-national actors which exercise their influence on the regional systems.

Nonetheless, is also necessary to underline that there may be overlaps in the two sub-systems, especially because for what concerns the latter one both firms and public institutions may take part in the knowledge creation process.

The same overlaps tend to not appear in the first sub-system, where it is possible to find mainly firms, which establish horizontal and vertical network linkages, as stated before in the description of governance frameworks under the network dimension.

The following scheme, by Cooke (2002), helps to understand how a regional innovation system is composed and which influences are exercised by the actors:

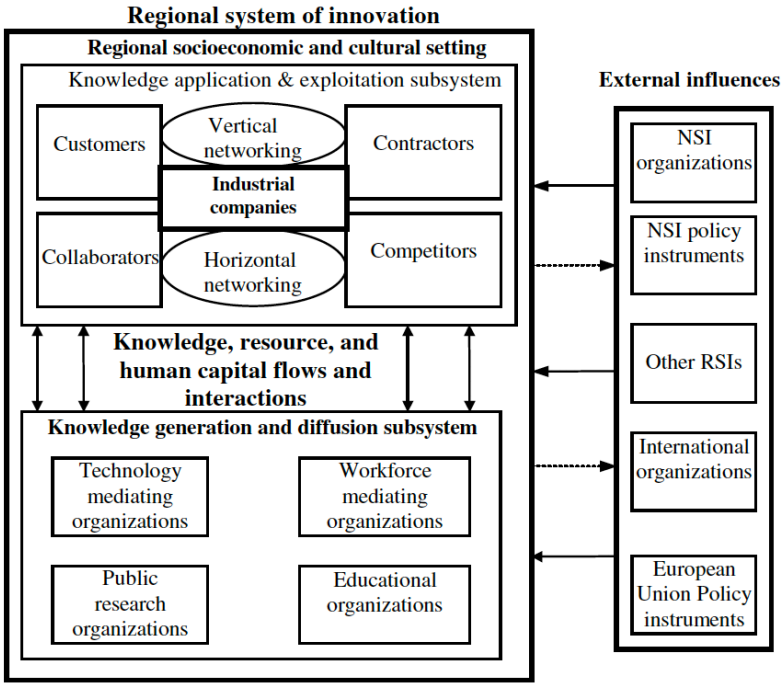


Fig. 4, cap. 2, par. 5. Source: Cooke 2002

As it is possible to see, the two subsystems are strictly related by a flow of human capital and interactions.

Each subsystem has its form of governance, but it is at the same time influenced by the constant relationships established with the actors of the regional system and the external ones.

The result is a multi-level form of governance which subdivide the power over the different actors of the system.

The influence of governance on the innovation process concludes the third perspective under which clusters governance may be analyzed.

Nonetheless the aspect of corporate governance of the single firms participating to the cluster has to be considered as well. OECD principles (2004) define corporate governance as as the system by which companies are directed and controlled. This perspective is necessary in order to understand how decisions are taken at the corporate level and whether the governance structure may influence firms' performances.

The Italian model of clusters will be considered now.

The Italian economic fabric is full of examples of clusters, especially in Northern Italy, and all have in common the characteristic of being composed mainly by small and medium enterprises which depend directly by one or few leading players.
For this reason, a cluster may be seen as a Productive Chain Network (PCN), which can be defined as an economic reality made of SMEs and a network leader which behave as a unique meta-firm, but has the same flexibility of SMEs as boosted by the higher capability to substitute any of its component without shutting down the PCN itself. (Guidone, Mantovani, 2014).
Firms in PCNs can also be clustered in three categories: firms outside the PCN, leaders in PCNs and firms participating to PCNs. The division is useful to understand the differences in corporate governance schemes applied.
In particular, it is reasonable to state that human capital assumes a substantial relevance in PCN, because of the set of constant interactions between the actors of the network. This implies that the higher is the human capital contribution and the more the governance frame applied diverts from the standard managerial models (Guidone, Mantovani, 2014).
Moreover, Italian clusters' firms have also in common the characteristic of being mostly family firms, especially if smaller companies are considered, but there are also evidences on big leading firms coordinated by a single family.
However, is necessary to specify this.
SMEs are usually characterized by a union of ownership and control. The figure of "owner-manager" encompasses at the same time the role of blockholder and manager, which incorporates authority and make investments according to the business vision.
This governance model has pros and cons.
Starting from the pros, stewardship theory fits perfectly on this framework. It states that managers, left on their own, will act as responsible stewards, controlling assets and maximizing shareholders' wealth through firm performances.
In the case of a small family firm, is clear that managers, also part of the family, will act for the sake of the company itself, encouraged by a sense of belonging and identity (Napoli, 2018).
Moreover, also the long run orientation of the company may be fostered by this governance structure. In fact, the presence of an external CEO may be short time oriented, in relation with bonuses and benefits deriving from the achievements of firms' targets. The same cannot be stated for a family management, which, will tend to favor a long run

perspective, investing on R&D and innovation for the sake of the company, overcoming the problem of retard in innovation (Napoli, 2018). This could create a form of competitive advantage, but also start a virtuous circle for the cluster which may benefit from the innovation produced at SMEs level.

Nonetheless, is necessary also to evidence the presence of cons.

Whether the owner-managers on one side may foster the production of investments, on the other there may be problems of "groupthink" and the company may suffer from the single perspective around which the strategy is pursued.

Also, there is a problem of risk perception. Because of the sense of belonging and inclusion, managers will tend to risk less, missing good opportunities of investment. A highly concentrated ownership structure might give rise to risk avoidance when making strategic decisions (Chandler, 1990).

One solution to this perspective is for sure the openness to the global market and the participation to GVCs, thanks to pipelines implemented by knowledge integrators.

On the counterpart, leading firms of a PCN follow a more classical governance model, since very often it is possible to evidence a separation between ownership and control.

Nevertheless, as stated before, the higher is the human capital involved and the different are the governance model applied in order to enhance forms of control over the supply chain.

For instance, in 1980s Sun Microsystems asked to the chip manufacturer Weitek for the development of a floating-point chip for its workstations. In this occasion, Sun "lent" two of its engineers in order to facilitate the development process. this is a clear example of control directly exercised on the suppliers through the flow of human capital (Bell *et al*. 2009).

Moreover, within the PCNs is necessary to highlight the presence of external characters.

For instance, the presence of venture capitalists and other financing subjects have an influence over companies' governance frameworks. In fact, this enhances the level of control exercised and this has an effect over firms' performances.

As highlighted by Guidone and Mantovani (2014), literature evidences a positive correlation between good governance framework applied and firms' performances. Also, a solid management and well-designed governance structures reduces the risk perception, decreasing the cost of capital (Akdogan, Boyacioglu, 2014).

To conclude, the governance framework of a cluster differentiates form case to case, depending mainly by its composition and industry.

Multiple perspectives can be undertaken to analyze the framework adopted by the system: the network perspective, that encompasses the vertical and horizontal dimension of a cluster; the territorial dimension; the incidence of governance in the innovation process; and the corporate governance of single firms.

Again, the common feature is the network of relationships established between companies which is the key factor that determines the governance structure adopted by the ecosystem.

1.6 Clusters and financing tools

In the previous paragraphs the importance for a cluster and its economic agents to establish a strong network to foster innovation and produce value for the system as a whole has been pointed out.

However, in order to sustain a growth path, firms need the support of a well-developed financial system, necessary to finance investments, whether they are tangible or intangible.

But the asset composition of the firms of a cluster is not as clear as it can be for a standing alone firm. For instance, a great source of value derives from the territory itself, which has not to be considered only as natural resource, but as a complex mix of private and public, tangible and intangible assets that allow firms to undertake a form of competitive advantage in the market.

The peculiarity of a cluster of being an environment close within a territory, but opened to the global market, reveals a twofold issue concerning the financial system as support to the investments. First of all, it's necessary to understand which are the assets that has to be financed and then analyze the issues of informational asymmetries and adverse selection that can rise by a misalignment of data between lenders and borrowers and which can be the solutions to reduce this problem.

Starting from the problem of asset recognition, the analysis of the composition of a cluster could help to understand the framework. As widely explained in the previous paragraphs, the majority of firms are small and medium enterprises enclosed in a territory and closely entwined to few bigger companies, usually by supply contracts, focused on a single industry. Also, a set of institutions, as universities, research centers and service providers, take a part as support to the ecosystem as well as local banks, which benefit from the geographical advantages too.

The strength of an environment developed as a cluster relies directly on proximity and on the capability of local actors to develop a network of relationships.

In such a framework, geographical and relational proximity play a fundamental role in the value creation process, on one side, because there is the possibility for firms to break down transaction costs and, on the other, because the interconnections facilitate the flow of tacit and explicit knowledge and ideas necessary for the development of innovation.

Also, sharing the same background, companies and institutions develop a sense of being and a common set of formal and informal rules that determine the solid ground for the development of cluster's governance, fostering the exchange of information and strengthening the industrial commons.

It is therefore true that implementing such an architecture requires substantial investments. As result, companies and institution resort to external finance, especially from banks, which are the main source of financing for cluster's firms.

But a cluster is not a closed ecosystem. Strong connections with other similar or complementary regions located abroad may be established with the implementation of pipelines by multinational enterprises located in the territory of by knowledge integrators too. However, connecting different hotspots through pipelines requires consistent investments as well and they have to be carried on over the time in order to constantly feed the flow of information necessary for the development of new innovation.

This framework reveals that the main source of value within an ecosystem as a cluster derives mainly form the intangible elements which are the result of the interconnections taking place in the network and extra network between the agents.

Those by-products of the network can be seen in the form of human and relational capital, business ideas, information and other tangible and intangible elements, as the infrastructure, necessary for the development of such an interwoven matrix. However, the implementation of a similar structure requires consistent and continuous investments. This implies that an external line of credit has to be exploited by companies. For instance, the implementation of a pipeline, necessary to ease the flow of information with other regions, need time and money to be established. Also, for the local network is essential to create a channel of communication, through the infrastructures or face-to-face contacts and this necessitate of investments too.

Probably, the most iconic example can be seen in the training programs that a company activates for the training of employees, investing so in human capital.

The presence of mostly intangible assets as source of value reveals an informational gap between firms and financial institutions, which have to produce a quantitative method in order to evaluate the outcome of the different investments and, so, assess the creditworthiness of the company. This is not always possible, especially in the case in which the intangible assets do not have a market and so they are not redeployable. This makes impossible to assess a fair value.

Considering also that firms of a cluster focus their investments mostly on innovation, both technological and strategical, the asset portfolio becomes more interwoven. Those assets become necessary for the enhancement of the value creation process, but they usually cannot be used as collateral. Also, because of the intrinsic risk that characterize R&D projects, it is possible that the profits coming from such investments will be insufficient to repay the debt instrument to finance them (Ughetto, 2009). This implies that banks may find some sort of difficulties in evaluating the assets that have to be financed and the economic outcome of the investments that should repay the borrowings.

The result is that the probability adverse selection increase and so the situations of credit rationing increases as well, because of the misalignment of information. In addition, when a credit for financing intangibles and innovation is requested, lenders will require for higher loan spread as compensation of the higher recovery risk and the costly due diligence (Luminotti, 2011).

However, despite the value intangibles that circulate on a cluster is difficultly assessable, banks and financial institutions have to take into consideration that without them the mechanisms of joint value creation processes may not take place.

With the evolution of the economic world and the advent of globalization and robotics intangibles has gained more and more relevance in the markets. This is also enhanced by the fact that the standardization of jobs has given more importance to high qualified human resources.

As consequence, in some occasions, intangibles have become more liquid and consequently, since higher quality information can be produced, and a specific value can be assigned to them. For these reasons, the level of information asymmetries decreased and more sophisticated method for measuring and monitoring the value of intangibles have been developed (Kaplan and Norton, 2004) (Luminotti, 2011). This implies that in several occasions intangible assets have been considered as collaterals. For instance, in 2001 Bank of America underwrote a $350 million loan for Levi Strauss using as collateral the company's trademarks.

Nevertheless, a similar operation cannot be carried out in any situation. It's, in fact, necessary that the company taking out the loan

Nevertheless, it's easy to understand that a similar operation can be undertaken by big companies with market tradable intangibles, as patents and trademarks. In fact, whether it is possible to state the market price of the intangible, the level of informational

asymmetry gets reduced and the risk undertaken by the bank in incurring in adverse selection gets lowered as well. Moreover, it's also a matter of moral hazard, because it's in the interest of the company to save the collateral and so no excessive risks will be taken.
For what concerns the cluster environment, a similar situation would very rarely occur, since that most of the firms are small and medium sized and their intangibles have only in few occasions a market value.
The majority of intangibles of a cluster cannot not even be recorded in the balance sheet, but financial institutions consider them as a variable when assessing the capability of the company to produce an outcome.
SMEs of a cluster are usually suppliers or service providers for other bigger companies and they also specialize themselves in a very specific passage of the supply chain. So, without their specific human and relational capital and their geographical position, their value would decrease as well as their capability to produce cashflows.
So, even if they cannot be considered as a potential collaterals, banks and financial institutions, must consider the intangibles coming from the territory as a condition to assess the capability of the company to produce enough cashflows to repay the loan.
However, this highlight the second issue related to the financial system of a cluster.
The presence of mostly small and medium enterprises hides a complexity on the typology of information that can be gathered. In particular, SMEs and entrepreneurial firms often have difficulties in obtaining credit funds, because of the limited quantity of publicly trade information available to assess their creditworthiness (Moro *et al*., 2017).
Those firms are not listed in the stock market, and this implies that the analysis of the creditworthiness cannot rely only on hard data, as indicators calculated form the financial statement or the potential outcome of the investment, but necessarily on soft data too.
Within a system as a cluster, the analysis of soft data, which rely directly on territory intangibles and the capability of the firm to participate to the network, becomes fundamental for financial institutions that have to analyze the capability of a firm to repay the loan.
Nevertheless, soft data cannot be easily collected, especially when there is a form of physical distance between the borrower and the lender.
As result, a lack of geographical proximity lead, again, to the formation of informational asymmetry and adverse selection.

In 1970, Akerlof studied the role of informational asymmetry in a market, dividing goods in high quality, or “peaches”, and bad quality “lemons. The more informed party, which is the seller, knows exactly which are the good quality and the bad quality products, but do not disclose the necessary information to the other party to recognize them.

Doing so, the buyer will not consider the information disclosed by the seller, considering all the goods at the average value. As result, all the products with a higher value than the average will be excluded from the market. This lack of information creates a form of adverse selection.

For what concerns the financial system of a cluster, the most informed party is the firm, which knows exactly what information should be disclosed in order to get the loan and, of course, the less informed one is the financial institution, which cannot rely only on hard data.

The imbalance of information creates an informational asymmetry, since that the lender cannot gather enough information and so select good and bad creditors, which, consequently, enhances the probabilities of adverse selection.

Moreover, physical distance influences also the relationship that has to be established between the two parties too. According to Carling and Lundberg (2005), the higher is the distance between the borrower and the borrowee and the higher are the risks undertaken by the bank, because of the impossibility to gather the necessary information for the assessment of the creditworthiness. This phenomenon is enhanced whether the financial institution is not part of the cluster, so it’s also more difficult to collect and interpret soft data. As result, bank is forced to apply higher interest rates, because of the higher risk level.

In his analysis of industrial district, Becattini (1991) considered the local bank as part of the institutions of the regional ecosystem.

The geographical location of the lender, in particular, influences the probability of occurring in situations of informational asymmetries and adverse selection. This is given by the fact that, as for all the other institutions, the bank is part of the milieu. Sharing the same territory and the same language of all the other economic agents, financial institutions have more capabilities to capture the soft data necessary for assessing the creditworthiness of the borrower.

The bank is so capable to understand that “something in the air” described by Marshall, becoming also part of the cluster’s network.

The benefits from being part of the cluster are double. Ex-ante, the financial institution has the capability to gather the necessary soft information to assess the level of creditworthiness, without relying only on the financial statements and on the performances of the firm; ex-post, the advantage is concretized in a constant and better monitoring of the borrower.

Moreover, as well for firms, also for lending relationships there is a reduction of transaction costs and agency costs whether a good set of information is shared, especially if a trust regime is established between the two parties. This is translated in a lower cost of credit for firms and lower financial constraints too (Finaldi Russo and Rossi, 2001), and lower costs of monitoring for the bank.

Especially for small firms, the concepts of trust and geographical position become fundamental in order to get access to credit.

Geographical position of the lender with respect to the borrower influence the capability of the financial institution to gather the necessary information. Whether a form of informational proximity is established, it's easier for the lender to get access to the data necessary to assess the creditworthiness of the borrower, especially if it is considered the cluster environment. So, co-location between the two parties facilitates the exchange of information and establish a mutual trust that becomes necessary especially considering if the relationship involves small and medium enterprises which have fewer financial guarantees (Ughetto, 2009).

SMEs cannot provide the same set of information or big firms and groups, especially in terms of hard data and this cause informational asymmetries, with the consequent difficulty faced by the banks to assess the creditworthiness of the customers.

To ensure the repayment of the loan, the banks are forced to find different ways to gather the necessary data, which enables them to make a sound lending decision (Moro, Fink and Maresch, 2015) or to apply covenants or request for collaterals. However, this last solution hides two more issues. The first one is that coercive means to carry on new transaction costs, which will be sustained by the firm, increasing the total cost of debt; secondly, as underlined before, the most valuable assets that are exploited by a cluster firm are mainly intangibles that rarely can be used as collaterals.

This implies that, in the case of SMEs, bank's loan decision has to be based mostly on soft data, which can be gathered form the establishment of a mutual trust between the two parties. Also, this depends not only from the firm size, but on the size of the bank too. As

highlighted by Moro *et al.* (2017), small banks exploit trust as a positive criterion when assessing the creditworthiness of the borrower, differently from larger banks which rely mostly on hard data.

However, this implies that a stable and continuative relationship over the years between the borrower and the borrowee has to be established. According to Ongena and Smith (1998), bank relationships are defined by time and scope, which define, respectively, the strengthen of the relationship and the array of services provided by the bank. In fact, the more services are provided by the bank to the single firm and the stronger will be the relationship, due to the quantity of information that are shared.

The key figure that has to be considered in this connection based on trust is the loan manager, which has the duty to administrate the loan operations and gather the necessary soft and hard data to assess the creditworthiness of the borrower. So, it is the junction point between the bank and the firm necessary for the establishment of the relationship between the two parties.

As evidenced by literature (Mayer, Davies, Schrooman, 1995) (Luhmann, 2000) (Moro *et al.* 2017), when the loan manager perceives the entrepreneur as trustworthy, informational asymmetry is dismissed as major problem, since perceived benevolence and perceived integrity are considered as soft data, and so variables necessary to assess the creditworthiness.

However, the issue is still the gathering of data. To supply this lack, two categories of instruments can be adopted by banks (Berger and Udell, 2006):

- Transaction lending, which is the most common instrument to assess the risk related to the firm and considers the public information that can be gathered on the borrower. It can be divided in financial statement lending, asset-based lending and credit score lending.
- Relationship lending which is the instrument used by a bank whenever hard data cannot provide a full framework of the creditworthiness of the borrower or when there is not public information on its financial solidity. They can be gathered directly form the entrepreneur, asked to disclose information, or can be collected from the network. This latter situation is configured especially when the local bank is part of the cluster.

Combining primary sources of information, screening and underwriting procedures and monitoring mechanisms, the bank is able to allocate loans reducing the risk of adverse selection.

Although relationship lending reduces the level of informational asymmetries, it does not erase the probability of incurring in them at all.

In fact, the goodness of the gathered information is strictly subjective and depend directly form the capability of the loan manager to gather and interpret them.

This implies that a certain level of informational asymmetries still persists and relies especially on the level of data disclosed by the single company. They cannot be considered hard data, because are not public, nor soft data, because they cannot be assessed through observation.

Also, given their specific nature, this kind of information require a certain level of trust, because the loan manager have to assess the goodness of those information and the entrepreneur has to be sure that those data will not be used against its interests (Moro, Fink, Kautonen, 2014).

The reason for which an entrepreneur decides to disclose voluntary information is strictly connected to the topic of trust. In fact, especially when the deal is between the bank and a small enterprise and no hard financial data can be gathered, the firm's voluntary disclosure reduces the perceived opportunism in the eyes of the loan manager and this allow to the bank to discriminate between good and bad customers (Moro, Fink, Kautonen, 2014).

It's clear that a similar process is eased by the presence of a network as a cluster, where the continuous flow of information allows to the lender to gather continuously soft data on firms, observing and monitoring their behavior in the territory and for these reason a firm located in a cluster is less likely to be affected by credit constraints.

To sum up, three elements contribute to the assessment of trustworthiness and are the context, intended as social environment in which the parties are embedded and geographical proximity among them; the relationship that they are capable to establish; and the specific person involved, which are the entrepreneur and the loan manager.

So, with relationship lending, cluster firms have the possibility access to credit lines, even if hard data on financial performance cannot be provided to the lender. Doing so, informational asymmetry can be reduced, thanks to an identification-based trust that allows banks to assess the creditworthiness of the borrower. This is not exempted from

risk, of course, since it is a "leap of faith" (Kautonen *et al*. 2010), because opportunistic behavior cannot be eliminated at all, but only reduced by continuous monitoring and control activities.

1.5.1 Different forms of finance at support of cluster's firms

Bank loans are the most used form of financial instruments that clusters' firms adopt in order to finance themselves and their projects. This because they are mostly small and medium sized and so it would be difficult for them to get access to different and newer forms of structured finance.

However, deep differences on the adoption of this newer form of financing instrument characterize distant regions of the world, mainly because of the type of industry that they serve.

For instance, Venture Capital funds have been largely used in the Silicon Valley, which is focused on the hi-tech industry, but only few minor examples can be discovered in Italy, where manufacturing firms are more present.

The main issue connected to investing in new projects and innovation, especially in the technological fields, is the high level of intrinsic risk. This, by force of circumstances, raises the level of guarantees requested by a bank and also the interest rate applied to the loans. But, especially considering SMEs, cluster firms cannot provide the necessary collaterals.

Moreover, considering the risk of moral hazard and informational asymmetry, bank lending does not represent the perfect instrument for financing innovation.

This implies that new different forms of financing have to be considered by companies in order to fulfill the funding gap.

One solution can be found in private equity (PE) and venture capital (VC) funds, which provide equity capital to non-publicly traded firms in order to finance their high potential projects. Their role does not only consist in distribute funds to companies, but also in providing professional consulting support, especially in the case in which technological startups are considered.

PE funds invest mainly in consolidated companies which are searching for new partners to expand the boundaries of the firm, especially internationally. VC, vice versa, focus their attention on seed financing, early stage financing and start-up financing, providing funds to recently founded firms who need the support of professionals.

From the ‘90s these form of financing have become a key component of the “new economic innovation systems”, made of interwoven relationships between the actors of the environment and financers, especially venture capitalists, which can be considered as drivers of the system because of their propensity to invest in newborn technological firms with high potential (Pierrakis, Saridakis, 2017) (Cooke, 2001).

Moreover, studies based in Europe and US have underlined how the performances of firms have raised after the participation of risk capital investors, but also the whole entrepreneurial system have benefitted by this, with the implementation of new jobs and creating a more international context, abetting exports (Bracchi, 2011).

A particular consideration has to be done on the US market, where institutional investors are more active despite the rest of the world, especially in technological industries.

The following graph compare the level of investments and the rising of funds from 2005 to 2019.

In particular, the greater part of those funds is provided to the Silicon Valley hi-tech firms, which in 2015 have raised 27.42 billion dollars of investments from venture capitalists, for a total of 1335 investments (Statista, 2016).

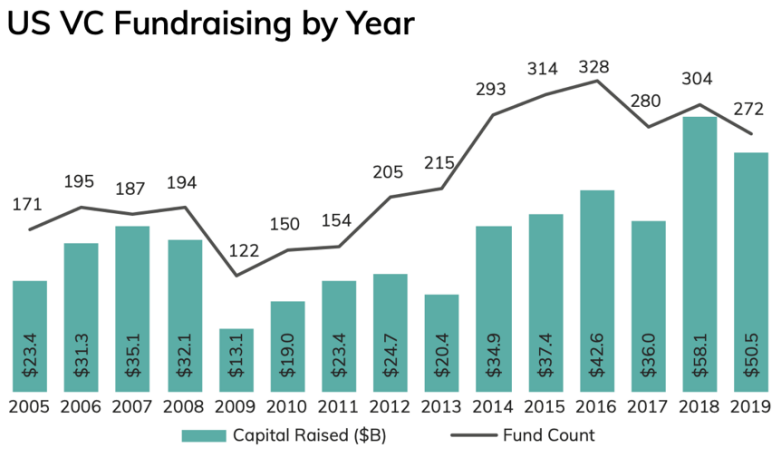


Fig. 5, cap. 2, par. 6. Source: NVCA 2020 Yearbook

Similar examples can be done for Israel’s Silicon Wadi, which have raised many investments by technological giants as IBM, Motorola, Intel and Microsoft, for UK and Canada.

However, for what concerns Italy, it is not possible to state the same. Venture capitalists seems to do not have the same propension to invest in early stage firms and support their

risky projects and this is due to a series of reasons. In particular, Italy is between the last position of the rankings of early stage financing and this is due to several reason (Parente, Petrone, 2006):

- the high technological risk faced by hi-tech firms, especially in the early stages;
- the informational asymmetries between the neo-entrepreneur and the venture capitalist;
- the transaction costs necessary for the assessment of the worthiness of the investment and of the due diligence;
- the difficulties for mobilizing the participation and so exit from the investment.

In particular, in 2016 only 3,92 billion euros have been invested by venture capitalists in Italy (Statista, 2019), that, if compared with the data of the Silicon Valley is approximately the 14%.

Nevertheless, considering the cluster environment, Private Equity funds may be a key resource that can be exploited by firms, not only for raising funds, but especially for the managerial know-how contribution necessary for the full exploitation of investments.

In fact, the private equity operator has a wealth of knowledge that comes from a multitude of industries and this is a form of competitive advantage that the firm may exploit in order to get access in new markets or to establish stronger relationships and enter in new networks.

There is therefore another financial instrument that has to be considered as support of the cluster development: the district bond.

As can be understood from the previous analysis, a consistent limit that have to be faced by small and medium enterprises is their capability to provide enough information on their financial structure in order to get access to credit and, at the same time, be capable to attract investments by risk capital operators.

District bonds born in 2004 to supply to this financial gap, allowing also to SMEs to get access to instruments of structured finance despite their dimension, necessary for supporting innovation and technological progress within the cluster.

They are part of the family of the Collateralized Loan Obligations (CLOs), which are Collateralized Debt Obligations (CDOs) where the underlying assets are only loans.

District bonds are the result of a securitization of one or more loans provided by banks to SMEs of a cluster, which are sold in the market through the creation of a Special Purpose Vehicle (SPV).

The passages that are undertaken in the creation of a district bond are the following:

- the bank provides a series of medium- and long- term loans to cluster's firms, determining also a threshold minimum level;
- when the threshold has been reached, loans are given to a SPV which starts the procedure of securitization.
- Bonds are sold in the international market.

Securitization is a procedure for which an issuer, in this case the SPV, designs a marketable financial instrument by merging or pooling various financial assets in a single group. The value of the resulting bond depends directly form the value of the assets that have been merged.

Doing so, the loans used as underlying assets are rated according to their creditworthiness and this will determine the rating of the single bond that will be sold in the markets.

Doing so, a double advantage can be highlighted for the involved parties.

On one side firms have the possibility to get access to structured finance instruments that otherwise they would never reach, because of their dimension, avoiding any form of entrance barrier. Moreover, companies have the capability to diversify their financial structure, adapting it to medium- and long-term investment projects.

On the other side, banks have the capability to immediately create liquidity that can be used to provide more loans and the risk of credit is transferred to the institutional investors.

However, this kind of operation has cons as well, since the bank has to sustain several costs, especially considering that SMEs do not have a rating and the gathering of necessary information in order to classify the loans requires time. This latter aspect rises also problems of informational asymmetries, for which becomes difficult to evaluate the creditworthiness of the loans.

In the Italian history, two district bonds have been issued in 2004 for a total of approximately 540 million euros. The first one of 232.827.000 euros have been issued for the Veneto region and the second of 307.305.500 euros have been issued for Lombardia, Piemonte and Valle d'Aosta regions, both with a Moody's score of Ba2.

However, no more cases of district bonds have been recorded, probably because of the high intrinsic risk of the loans and the impossibility to provide a concrete rating to them.

Beside the instruments of structured finance, also internal finance can be considered as resource that can be exploited by SMEs clusters' firms.

In fact, as highlighted before, the main issue is related to the impossibility of SMEs to provide enough information in order to get access to credit, also because of their weak capital structure.

But in a cluster ecosystem, the presence of a well-developed governance system may help the flow of money form one firm to another.

In fact, the presence of a leading firm in the network becomes essential not only for the coordination of the various agents, but also for the subdivision of the financial resources over the productive chain.

Generally, since that leading firms are bigger in size, they have also more collaterals which ensures an easier access to credit, differently from small and medium sized companies.

Within the cluster, leaders already manage the flow of information and the productive chain, but they are capable also to manage the external financial needs of the cluster along with the internal allocation of financial resources form a financial point of view (Mestroni, Basilico, Mantovani, 2014).

The provision of funds by leading firms in the network makes possible for the ecosystem to grow as a whole, since money is reinvested in the same region and contributes to the creation of new industrial commons and intangible s that can be exploited to enhance the competitiveness of the territory and the value produced by firms.

The same cannot be stated for standing alone firms, which similarly provide funds through the productive chain network, but the virtuous circle cannot be activated as well.

Doing so, leading firms act as intermediate financial resources, allocating them into the productive chain network using the working capital and exploiting the network of commercial connections the cluster has the possibility to grow as a whole.

In conclusion, bank system is not the only solution that can be adopted by clusters' firms to finance themselves, and it can be seen with the born of new instruments of structured finance, as district bonds, but also with the resort to private equity and venture capital funds, especially concerning the hi-tech industry.

Nevertheless, the bank system is still the preferred one, both because very often there is a process of relationship lending, which favorites the access to credit and also because it is the only solution that can be adopted to finance investments, especially whether SMEs are considered.

CHAPTER 2: THE LIVENZA FURNITURE CLUSTER

The first chapter has provided a theoretical framework of what a cluster is, describing through different topics the main advantages of a cluster economy. It also analyzes the pros and cons of the ecosystems created by firms and institutions gathered in the same geographical region.

The further analysis will shift the focus from the theoretical to the empirical point of view, firstly describing the evolution of districts and clusters in the Italian economy in order, then, to move on to a more in-depth analysis of the Livenza Furniture Cluster, located between Veneto and Friuli Venezia Giulia regions.

2.1 Clusters in Italy: analysis of the evolution of the Italian districts and clusters from WWII until today

The Italian economy has a long tradition for what concerns district economies.

After WWII, especially between 1950s and 1960s, the Italian economic fabric starts to evolve itself due to the born of new geographical concentrations of firms different from the simply co-location of economic activities around a center of interest.

In particular, two elements can be considered the trigger for the creation of the first districts: the first one is the "economic miracle", the reconstitution phase in the postwar period characterized by a strong growth of the Italian economy and by the development of new technologies; on the other side, the second trigger is the spontaneous initiative of several entrepreneurs which developed specific competences and skills in a particular industry and also understood the importance of informal relationships between the different economic realities in the territory.

Contextually to this framework, it's necessary also to evidence the presence on the territory of single big leading firms already developed who have taken roots in the previous years.

The economic context as described has provided to smaller entrepreneurs a double advantage.

The first is the opportunity of making profits providing to bigger firms an array of services strictly related to the production process, but also complementary ones, that have been previously developed within the industry. This is also the result of the capability of skilled

workers to undertake the entrepreneurial path, understanding the potential in the industry in which they have been trained. Doing so, they extracted part of the production process from the production line making it a service as support to the leaders of the industry.

The second one is the possibility of capture the tacit knowledge coming from the flow of information embedded in every connection with bigger firms. Exploiting the network of relationships created in the territory, entrepreneurs have had the possibility to constantly fed their skills, and this led to the creation of what have been called "industrial commons". The effect of this flow of information can be seen also in the attraction of several institutions and universities, which have benefitted from the proximity to the network.

This gave birth to a virtuous circle in which ex-skilled employees exploited their knowledge, but at the same time, thanks to proximity, had the capability to improve their services.

As highlighted in the first paragraph of the first chapter, Becattini studies the phenomena of districts in the Italian economy and can be considered one of the topic's major exponents.

According to his point of view, the birth of districts has to be related to the growth of a fragmented demand of durables strictly connected to the raising of the average wealth ant to the economic boom. As consequence, in order to supply to the increasing demand, firms have developed the district model, organizing themselves in meta-firms in which few leading players directly appeared in the market, but, at the same time, a whole environment of smaller firms supplied to the production process.

So, rather than following the old model of a single highly vertically integrated firm unable to supply to the increasingly demand and at the same time upgrade itself, firms organized themselves into districts, establishing a strong relationships with the already existing companies and forming with them a network able to keep pace with the evolution of the Italian economy.

The model has also been a key success factor in order to overcome the 1070s crisis, because the capability to innovate has given the possibility to districts to supply again to and constantly evolving demand, avoiding the downward spiral.

During the years, the capability to attract new institutions and key players and the development of new technologies have given the possibility to districts to evolve into clusters in which the cooperation and competition dimension coexist.

However, the concept of cluster has not already taken the roots in the Italian economy and for this reason very often the two concepts are used as synonyms.

In the last years, at European level, clusters have become field of study and the European Commission, recognizing them, have developed its own definitions of cluster economies, cluster initiatives and cluster organization:

- Cluster economy are defined as groups of specialized enterprises, often SMEs, and other relating supporting actors in a location that cooperate closely;
- Cluster initiative are defined as organized efforts to support the competitiveness of a cluster and thus consist of practical actions related to the capacity of these clusters to self-organize and increasingly to pro-actively shape the future of the cluster;
- Cluster organization are defined as the legal entities that support the strengthening of collaboration, networking and learning in innovation clusters […] and facilitate the strategic partnering across clusters.

Such a subdivision becomes necessary in order to identify the cluster in the territory and to produce a meticulous census of cluster economies in the EU territory.

In particular, the European Observatory for Clusters and Industrial Change evidences in Europe the presence of 2950 clusters operating in 51 different industries, which account for 61.8 million jobs, equal to 1 out of 4 jobs in Europe. Moreover, according to the 12th report compiled by Intesa San Paolo on clusters, in Italy is possible to evidence the presence of 156 clusters, mostly located in North Italy, which embed the presence of 20.000 firms of which 16.500 of them operate in manufacturing sectors.

Looking at the historical data it is possible to evidence a particular evolution in the number of clusters form 2001, the first year in which ISTAT has provided a census, to today, due mainly to the economic crises that the Italian economy had faced and to the phenomena of globalization that have conducted to the adoption of outsourcing strategies.

In particular, according to ISTAT's census, in 2001 the number of clusters and districts was 181, while in 2011 was 141, with a contraction of 22,1%. Today, the number amounts to 156.

However, the downward trend has not to be associated only to the evolution of the Italian economy, but also to a geographical metamorphosis. The number of municipalities has decreased in the period between 2001 and 2011 and at the same time clusters have

extended their boundaries, encompassing smaller ones (Istat, 2011). In fact, whether in 2001 a single cluster was spread between 13 municipalities on average, in 2011 the number increased to 15, average that is stable nowadays.

Italian clusters have also a consistent relevance for what concerns exportation. Since that the main industries are related to the Made in Italy, Italian clusters and districts have always had a particular weight for what concerns sales outside the boundaries. In particular, in 2011 Italian cluster and district firms exported for 52,6 billion euros, equal to 13,5% of the total Italian export (Unioncamere, 2013), percentage that rises to 91,4 in 2018 and 93,2 in 2019, equal to 19,4% of the total export (Sole24Ore, 2019).

This success has to be attributed to the leather goods cluster of Florence, the fashion district of Empoli and the gold district of Valenza, which in the last years have invested in new technologies and on the reinforcement of the logistic network in order to easily reach the most important European multinational enterprises in the fashion industries, the main clients of Made in Italy fashion suppliers.

However, the leading position for what concerns the exports has to be attributed to the "Triveneto" regions (Veneto, Friuli Venezia Giulia and Trentino alto Adige), which in 2018 have contributed for 33,9 billion euros, equal to 37,1% of the total clusters' export, incremented to 34,2 billion euros in 2019 (Intesa San Paolo, 2018) (Intesa San Paolo, 2019).

The growth trend has to be attributed again to the iconic industries which represent the Made in Italy. In particular the eyewear cluster of Belluno and the Livenza furniture cluster, located between Treviso and Pordenone.

In conclusion, industrial districts and clusters represent a key source of value for the Italian economy and the ability of firms to create a strong network is reflected on the capability of developing new knowledge necessary to reach the global markets and follow a growth trend, also reflected on data on exportations.

2.2 The Livenza Furniture Cluster

2.2.1 Introduction

North East of Italy has a long tradition for what concerns districts and clusters. Especially Veneto and Friuli Venezia Giulia regions' firms have developed over the time a consciousness of the potential of geographical proximity and, consequently, established strong connections firstly with other companies and then with institutions and knowledge centers, as universities.

Due to this consciousness, many clusters and districts have grown over the years, whom relate to very different industries. For instance, in Triveneto it is possible to find the eyewear district of Belluno, which covers the 80% of the national production, the Trentino Alto Adige's mechatronics cluster, which has been classified at the seventh place for the fastest growth between all districts and clusters in Italy, and, last but not least, the Livenza furniture cluster, located between Veneto and Friuli Venezia Giulia regions, encompassing the furniture district of Treviso and the furniture district of Pordenone, which represent one of the most important poles for the furniture industry in whole Europe.

The two districts over the time have extended their boundaries until the conjunction that have gave birth to a single unique industrial reality which do not only encompass the presence of firms, but has been affected by the proximity several independent institutions, among all the universities Ca' Foscari of Venice with its dislocation in Treviso, the University of Trieste and the University of Udine, also alongside the active presence of the governmental bodies of the two regions.

However, a consideration on the use of the nomenclature has to be done. The definition of Porter of "cluster", as well as the definition provided by the European Union, encompasses a double dimension, both vertical and horizontal, in which interconnected companies, suppliers, service providers and other institutions play a role in the same industry enhancing the competitiveness of the local area or region as a whole. Diversely, Becattini in his definition of district looked only at the interconnections between companies specialized in one or more passages of the production process operating in the same territory and in the same industry.

Due to the evolution that the North East of Italy has faced, it is not possible to consider the Livenza region only as a district. First of all, the birth of new companies has reinforced

both the dimensions of cooperation and competition. At the same time new intuitions have been established in the territory as support of the enterprises. For instance, the governmental bodies of the region play an active role in the definition of the politics for the growth, as well as the Livenza furniture consortium, now began "Cluster Arredo FVG", a cluster organization which aims to support territorial companies in the development of networks and provides environmental certifications.

For this reason, especially for what concerns the Friuli Venezia Giulia Region, which will be the main focus of the empirical analysis, it would be reductive to define the ecosystem only as a district, because of the complexity of its actors and because of the interwoven relationships that are established in the territory.

More concretely, the territory of the industrial cluster has an extension over 11 municipalities in Friuli Venezia Giulia[4] and 20 municipalities in Veneto[5].

2.2.2 History of the cluster and evolution from simple district to a more sophisticated ecosystem

As most of the Italian districts and clusters, the birth of the industrial reality, initially considerable as a district, has to be located in the post second world war period, between 1950s and 1960s. At that time, principally in Friuli Venezia Giulia, it is possible to evidence a revolution of the economic fabric, which was composed mainly by small artisanal units. In those years, also, the increasingly demand in consumer goods, home products and furniture, favored by the post-war "economic boom", has pushed the small economic reality of North East of Italy to face a concrete transformation. In order to respond to the increasing and evolving demand, in few years artisanal carpentries and small furniture producers have been converted in industrial realities, also flanked by *ex-novo* firms, who understood the potential profits of the industry.

This evolution of the economic fabric can be seen in three particular Friuli Venezia Giulia's municipalities, which nowadays are still the center of the cluster: Brugnera, Sacile and Prata di Pordenone. Vice versa, for what concerns the Veneto side of the district, the furniture industry has faced a slower evolutionary path.

[4] Azzano Decimo, Brugnera, Budoia, Caneva, Chions, Fontanafredda, Pasiano di Pordenone, Polcenigo, Prata di Pordenone, Pravisdomini, Sacile

[5] Cessalto, Chiarano, Cimadolmo, Codognè, Cordignano, Fontanelle, Motta di Livenza, Oderzo, Ormelle, Orsago, Ponte di Piave, Portobuffolè, Salgareda, San Polo di Piave, Annone Veneto, Pramaggiore.

This is also proved by data on the level of employment in Friuli Venezia Giulia and Veneto on those years.

MUNICIPALITY	NUMBER OF EMPLOYEES		
year	**1951**	**1961**	**1971**
Azzano Decimo	19	44	256
Brugnera	216	981	2112
Budoia	11	21	30
Caneva	21	42	231
Chions	7	8	37
Fontanafredda	49	123	388
Pasiano di Pn	35	42	827
Polcenigo	26	16	53
Prata di PN	104	387	1496
Pravisdomini	5	5	189
Sacile	376	901	689
Total main furniture municipalities	869	2580	6308
Total pordenone province	1934	3973	7758
Cessalto	10	26	77
Chiarano	3	8	18
Cimadolmo	54	105	108
Codognè	24	66	124
Cordignano	25	61	707
Fontanelle	7	10	201
Gaiarine	66	394	957
Godega di Sant'Urbano	152	108	266
Gorgo Al Monticano	7	56	287
Mansuè	3	4	410
Meduna di Livenza	13	125	295
Motta di Livenza	73	209	250
Oderzo	59	157	210
Ormelle	10	39	254
Orsago	28	23	35
Ponte di Piave	17	35	39
Portobuffolè	12	135	140
Salgareda	29	26	164
San Polo di Piave	26	24	20
Annone Veneto	15	14	47
Pramaggiore	9	9	137
Total main furniture municipalities	642	1634	4746
Total Treviso Province	4710	9121	16642
total district	1511	4214	11054
Total provinces	6644	13094	24400

Tab 2.1: number of employees divided by Municipality in the Livenza furniture district in 1951-61-71. Source: ISTAT – Author's elaboration

As can be seen from the tab, the municipality of Sacile is the one with the highest number of employees, followed by Brugnera and Prata di Pordenone. Vice versa, for what concerns Veneto's municipalities the number of employees is significantly inferior, sign that the development of the furniture industry in the region has been delayed in the next years, as can be seen comparing the number of employees in 1951 and in 1961. In particular, the number of employees in Brugnera has grown by 3,5 times and the municipality of Prata di Pordenone has nearly triplicated the number of workers in the industry. However, it is Veneto region that sees the more rapid growth, with the

municipalities of Gaiarine and Motta di Livenza, which respectively had grown from 66 to 394 employees and from 73 to 109 employees.

Moreover, during the decade and especially at the end of 1960s a fragmentation of the supply chain starts, with a consequently increase in number of economic realities. This phenomenon has been triggered by a double and complementary evolution of the industry. In fact, big leading firms started to leverage the entrepreneurial spirit of some workers, pushing them to open new supply firms specialized in a specific productive passage or in the production of a specific component. As result, it is possible to evidence a consistent growth in the number of local units and an evolution of the geographical economic environment which abandon the vertical integration in favor of a horizontal integration model, which gives birth to the district.

MUNICIPALITY	NUMBER OF LOCAL UNITS		
year	**1951**	**1961**	**1971**
Pordenone (main furniture municipalities)	127	141	221
Pordenone (province)	466	404	492
Treviso (mian furniture municipalities)	178	185	253
Treviso (province)	1303	1275	1520
Total district	305	326	474
total provinces	1769	1679	2012

Tab 2.2: number of local units in the Livenza furniture cluster in 1951-61-71. Source: ISTAT – Author's elaboration

However, during 1970s the region has to face the very first crisis, due to the contraction in the demand of the Italian market. In this occasion, the nearly formed district is claimed to face and emergency that has never faced before.

The solution found has been once again the decentralization of the production process, with the consequent born of new small and medium companies specialized in specific passages of the supply chain. The strategy, in addition to spread the risk between the firms of the territory, has fostered the innovation process and the specialization of the single companies, which also developed a network of relationship in the territory.

Another benefit that can be evidenced from the division of labor in the territory is the capability of leading firms to benefit from the flexibility of small and medium enterprises and at the same time improve the control over the supply chain without being directly involved in the specific production passage.

The improvement of the district can be seen not only in the number of firms, that grows over time, but also in the increase in number of workers. From '50s to '70s new municipalities have been included in the district, as Pasiano di Pordenone, which passes from 35 to 827 employees in the period, but most importantly the two of the three sites form where everything started (Brugnera and Prata di Pordenone) have increased in dimension and importance for the cluster, with the born of what in the future will be global leading players as Friul Intagli S.p.A., born in 1968.

Also, in Veneto it is possible to evidence a growth in number of production sites and employees too, as can be seen for example in Gaiarine, where the number of workers grows from 66 in 1951 to 957 in 1971, due to the establishment of Mobilclan S.p.A, leader in the production of furniture components.

During 1980s and 1990s another evolution of the market affected the district. Consumers tastes changed and an increasingly interest in tailor made solutions able to transmit to the final user not only the perception of quality, but also an experience.

The district has always offered medium quality products, with an excellent quality/price ratio. The change in consumers' tastes has obliged firms to reposition themselves in the market, bringing out new solutions able to satisfy the evolving demand. Of course, this has not affected only the final furniture producers, but also suppliers, which had to innovate themselves in order to place in the market a new product able to provide a feeling to the final users. A concrete example on this topic can be the introduction of brushed wood, which involved a touch experience beside the classical visive experience of the piece of furniture.

In these years, innovation played a fundamental role. The introduction of automatized lines of production, the born of computer design and its integration in the production process have also opened the boundaries of the district to foreign markets in a period in which the internal market was stationary.

Of course, this evolution has also affected the setup of the geographical industrial region. As can be seen from *tab 2.3* the number of local units has increased and consequently the number of employees involved in the industry. This implies that in the end of twentieth century the furniture industry in Pordenone and Treviso was still in expansion, even if at a slower pace.

MUNICIPALITY	NUMBER OF EMPLOYEES		
year	1981	1991	1996
Azzano Decimo	333	356	474
Brugnera	1920	2148	2304
Budoia	166	202	125
Caneva	315	366	388
Chions	74	227	260
Fontanafredda	469	551	734
Pasiano di Pn	1368	1535	1592
Polcenigo	124	135	134
Prata di PN	1726	2042	2344
Pravisdomini	267	668	757
Sacile	925	788	672
Total main furniture municipalities	7687	9018	9784
Total pordenone province	10042	11478	12491
Cessalto	144	320	371
Chiarano	149	213	226
Cimadolmo	252	273	265
Codognè	253	366	511
Cordignano	1035	720	530
Fontanelle	286	333	472
Gaiarine	1139	1268	1632
Godega di Sant'Urbano	318	323	345
Gorgo Al Monticano	367	360	403
Mansuè	753	870	1018
Meduna di Livenza	232	433	583
Motta di Livenza	526	1201	1479
Oderzo	167	197	454
Ormelle	306	393	353
Orsago	88	140	183
Ponte di Piave	118	185	171
Portobuffolè	75	203	347
Salgareda	237	383	678
San Polo di Piave	112	247	231
Annone Veneto	144	292	271
Pramaggiore	269	429	553
Total main furniture municipalities	6970	9149	11076
Total Treviso Province	23042	25021	27834
total district	14657	18167	20860
Total provinces	33084	36499	40325

Tab 2.3: number of employees divided by Municipality in the Livenza furniture district in 1981-91-96. Source: ISTAT – Author's elaboration

At the beginning at twenty-first century, the geographical industrial region has profoundly changed with respect its conformation at the beginning of its history.

Moreover, the rise of new markets and new international competitors have forced companies to adopt new strategies to maintain a high level of competitiveness. In order to do so, it is possible to evidence a different behavior from the two side of the district.

The geographical region of Treviso has reacted to globalization adopting outsourcing strategies and delocalizing production sites in low-wage countries, especially in eastern Europe. Doing so, firms have been more price competitive and exploiting the Asian eastern market, especially from China, which supplies for semi-finished products have been able to counter the increasingly competition.

Vice versa, firms of the Pordenone district have focused their attention on quality and on the Made in Italy brand and so less examples of delocalization can be found. In fact, as highlighted by Buciuni and Pisano (2018), one of the key success factors of the Livenza

Cluster is the fact that it has been able to reach the global markets maintaining the local production sites. This, also, have given the possibility to companies to constantly fed the industrial commons, integrating them with the new sources of knowledge coming from the foreign markets.

Moreover, it's in late 2000s that the interest of governmental regional bodies of Friuli Venezia Giulia and the knowledge brough by Universities of Trieste, Udine and Venezia that have triggered the transformation of the district into a cluster. The involvement of institutions and the presence of complementary industries, as the household appliance district in Pordenone too and the chair district of Manzano, alongside the double dimension of cooperation and competition of the geographical region, gives us the possibility to consider the geographical region of Pordenone as an industrial cluster.

Nowadays the cluster of Pordenone has profoundly changed, and this is reflected also in the number of firms and of employees.

Tab 2.4 shows the evolution in number of local units associated to Ateco codes 16 and 31[6] from 2012 to 2017 (Istat, 2020).

MUNICIPALITY	NUMBER OF LOCAL UNITS					
year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Pordenone (main furniture municipalities)	2.284	2.239	2.202	2.185	2.148	2.130
Pordenone (province)	24.076	23.722	23.473	23.188	23.384	23.325
Treviso (mian furniture municipalities)	6.654	6.510	6.317	6.230	6.186	6.191
Treviso (province)	78.122	77.254	76.415	75.917	76.203	76.250
Total district	8.938	8.749	8.519	8.415	8.334	8.321
total provinces	102.198	100.976	99.888	99.105	99.587	99.575

MUNICIPALITY	NUMBER OF EMPLOYEES (year average)					
year	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
Pordenone (main furniture municipalities)	36.895	35.946	34.310	34.129	34.318	34.769
Pordenone (province)	102.461	100.843	97.616	97.454	98.275	101.412
Treviso (mian furniture municipalities)	85.811	83.766	82.565	80.889	81.833	83.650
Treviso (province)	307.372	301.909	301.306	300.354	306.598	314.107
Total district	122.706	119.712	116.875	115.019	116.151	118.419
total provinces	409.833	402.752	398.921	397.808	404.872	415.519

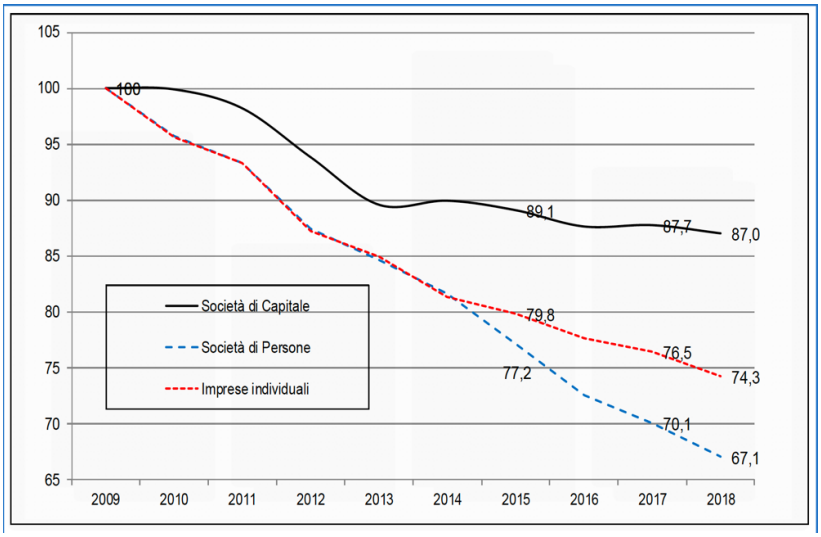
Tab 2.4: number of local units divided by Prvince in the Livenza furniture district in the period 2012-2017. Source: ISTAT – Author's elaboration

Tab 2.5: number of employees divided by Prvince in the Livenza furniture district in the period 2012-2017. Source: ISTAT – Author's elaboration

After several years of expansion, due to the ability of the industrial cluster to satisfy the evolving internal demand and the incremental global demand, a phase of contraction in number of companies involved and in number of employees begun in 2008.

[6] Ateco are alphanumeric codes associated to a company to individuate the related industry.
Ateco 16: manufacturing of wood, cork, straw and planting materials products, included cutting and planing of wood, excluding furniture production
Ateco 31: furniture production

The two crisis that have characterized the global economy in the last twelve years have heavily affected the industrial composition of the cluster. Tab 2.5 shows the fall in number of firms in Pordenone region divided by typology, considering 2009 as base year (Pordenone Chamber of Commerce, 2020).



Tab 2.6: evolution in the number of companies – base year 2009. Source: Chamber of Commerce of Pordenone and Udine

The black line draws the evolution in number of limited liability companies (in Italy indicated as "S.p.A" and "S.r.l"), which felt by 13% in 10 years. However, individual enterprises and partnerships suffered most, as can be seen from the red and the blue line in the graph. They respectively felt by 31.9% and 25.7% in the considered period.

The furniture industry has particularly suffered from the crisis in 2008 and 2012, firstly because of the strong contraction in the demand. Moreover, other concatenated factors have contributed to the fall of the industry and, consequently, affected the solidity of firms. In particular, two other elements have affected the downward spiral. The first one is the rise of eastern Asian markets, able to provide cheaper products at a lower but not bad quality necessary to satisfy the remaining demand, and, secondly, the weakness of the firms of the territory.

As for almost very Italian industrial district and cluster, the majority of the companies is small and medium sized and have as clients few leading firms of the territory, which usually are bigger in size. Those bigger companies constitute the major source of revenues for SMEs, so, whenever one or more of them fall due to the crisis, smaller players lost a substantial part of their orders. In addition to this, it has to be considered that rarely SMEs

benefit form a strong financial structure able to allow them to survive during crisis periods. As consequence, per every fall of a big company, the number of SMEs falling for the crisis grows exponentially and this can be seen also in the graph.

This reveals the pros and cons of a cluster, because on one side can benefit from the flexibility and specialization of SMEs, but at the same time, since smaller players depend directly form bigger ones, per every change at the top of the pyramid there is a domino effect at the bottom.

Nowadays, Friuli Venezia Giulia's cluster alone encompasses approximately 870 firms directly involved in the wood industry to which has to be added 1049 firms operating in the furniture industry for a total of 1919 companies (they were 2130 in 2017) and about 19.000 employees involved in (Cluster Arredo FVG, 2020). Reported to the whole region, in Friuli Venezia Giulia the 64% of the firms are related to the furniture and wood industry and they produce the 15% of the total GDP of the region (Federlegnoarredo, 2016). The number of employees grows in Veneto region, where 49.300 operators and 7.700 firms are involved in the industry, covering the 25% of the total production of furniture in Italy (Federlegnoarredo, 2016).

More concretely, the subdivision due to the size of the firms involved in the cluster can be described as follows (Pordenone Chamber of Commerce, 2018):

- Micro-firms or less than 10 operators, which are the 80% of the total
- Small firms, which have between 10 and 19 operators, which weight for 12% of the total
- Medium firms, which have between 20 and 49 operators, which weight for 6% of the total
- Large firms, with more than 50 operators, which weight for 2%

The characteristic of being composed mainly by small and micro firms implies also that there is a huge level of specialization and a consequently horizontal integration. This allows to the cluster to maintain on one side high quality standards, because every passage of the supply chain is made by experts, and on the other to lower costs, that would be higher in a vertically integrated and standing alone firm. Moreover, leading firms play a crucial role from the international point of view. Their pivotal role and their access to international markets allow also to smaller firms to have a variegate portfolio of clients.

Although the contraction that the industrial cluster has faced in the last years, it still has its relevance in the Italian economy. For this reason, what is necessary also to face the

actual “corona-crisis” (as defined by The Economist, 2020) is to design the proper polices in order to revive the industrial cluster in order to boost the economy by exploiting the potential of Made in Italy.

2.2.3 Main players and institutions: leaders of the cluster and their role on the territory

Friuli Venezia Giulia and in particular the furniture cluster of Pordenone is the cradle of small and medium enterprises. In fact, 98% of the total enterprises of the region have less than 50 employees and directly depend from the big leading players in the cluster.
Despite what could be thought, they are not all producers of finished products, but in most of the cases they are producers of semi-finished products and furniture components for other global reselling firms.
According to this, the first firm that has to be mentioned as global player of the cluster is Friul Intagli Industries, the biggest producer of furniture components in the world and first supplier of IKEA in Europe.
The company has been founded in 1968, during the second wave of expansion of the cluster, when Inaco Macan, still the president and CEO of the firm, understood the potential of the territory and started to exploit the first technological innovations in the production process.
During the years the company has grown at an incredible pace and today it counts more than 1300 employees in Italy, USA and Russia and a turnover of more than half a billion euros[7].
Friul Intagli Industries is the perfect example of family firm that has seen in the district the fertile ground to create an international reality, becoming during the years what has been defined by Gary Pisano a “Knowledge Integrator”. In fact, its vanguard in terms of technological progress and its participation in the global supply chains has been crucial also for smaller firms, which had the possibility to absorb the knowledge brought in the cluster by the leading player. This is one of the triggers of the evolution of the district into cluster.
At the second place of the list of main players it is placed Fantoni S.p.A, born in the same period of Friul Intagli Industries to respond to an increasingly demand of office furniture.

[7] Data have been found on http://www.friulintagli.com/it/azienda

The idea of Fantoni is to bring in the market modular pieces of furniture which can be adapted to almost every space. The company understood the need of customers of redesigning workspaces, always thought with a hierarchical structure, into open spaces in which furniture does not cover only a practical role, but also a decorative one.
Today the company counts 700 employees and revenues for 240 million euros, that places it at the second step in the list of leading players of the cluster.
Overall the first five bigger companies of the cluster cover half of the total revenues of the cluster, for approximately one billion euros.
In the range of more than one million of revenues, it is possible to list also ILCAM S.p.A, leader in Europe for the production of frontal panels, Calligaris S.p.A., historic producer of furnishing, and Bipan S.p.A., company that produces semi-finished products and in particular wood panels.
Considering, then, the next nine firms in the list of leading players of the furniture industry in Friuli Venezia Giulia, made by the Chamber of Commerce of Pordenone and Udine, the total revenues amount to more than 1.5 billion euros which corresponds to 70% of the total revenues of the cluster.
Previously it has been stated that the geographical industrial area of Pordenone cannot be considered only as a district, because of the presence of private and public institutions that have a proactive role in the furniture system, especially for what concerns the creation of synergies and promotion of innovation
In particular, governmental regional bodies have demonstrated a particular interest in the province of Pordenone and in the furniture cluster, especially considering its proximity with the household appliance district of Pordenone, where Electrolux is the leading player.
In 2016 Friuli Venezia Giulia governmental bodies recognized clusters as regional systems of firms, public and private institutions which participate to the same or complementary industries which have as final aim the development of network economies, synergies and improvement of competitivity of the territory. In order to promote a similar regional structure, the Region finances the operational expenses necessary for the implementation of the cluster economy through promotion of the

territory, favoring the exchange of knowledge and skills and contributing to the creation of networks between companies and other institutions involved in the cluster[8].

In particular, the region recognizes the "home system" as a single topic of interest, considering the sum of the furniture cluster of Pordenone, the chair district of Manzano and the household appliances of Pordenone.

Beside the presence of the governmental bodies of the region, another private institution has to be necessarily mentioned: Cluster Arredo FVG.

Cluster Arredo FVG is a consortium which operates in the territory offering to companies and institutions working in the furniture industry a series of services and projects aimed to the development of the territory. According to the definitions of Cluster provided by the European Union, Cluster Arredo FVG can be considered a cluster organization, since it is a legal entity that supports the strengthening of collaboration, networking and learning within the cluster.

Among the services offered by the consortium environmental certifications and the support for the creation of business networks have a particular relevance. Cluster Arredo FCG provides to companies the necessary management tools aimed to certificate the quality and sustainability of products thanks to a constant control and monitoring process of the supply chain. More than 160 certifications are managed by Cluster Arredo FVG, as FCS and PEFC, which track the origin of the materials used, and ISO 9001, ISO 14001 and ISO 45001, which certificate the quality and the sustainability of the products.

The presence of Cluster Arredo FVG has also favored the collaborations between the furniture cluster and the academic context. In particular, in 2019 an entire course in Hospitality Interior Designed developed and promoted by the consortium has taken place at the University of Trieste. The lectures had the aim to provide to students the necessary knowledge on the theme of interior design applied to hotels, restaurants and other collective spaces connected to the tourism sector and it has been promoted by the Engineering Department of the university.

But more concretely, in the territory of Pordenone are several the high schools which have specific programs aimed to form and train the future labor force that will constitute the future human capital necessary for the cluster to develop innovation and grow during the years.

[8] Decreto del Presidente della regione 29 Settembre 2016, n.183/Pres

These are only two examples of the efforts made within the geographical region by the cluster to enhance the value of the territory, which is not composed only by interconnected firms, but owes its success also to the presence of public and private institutions.

The Livenza furniture Cluster has been the focus of the research conducted in "Knowledge Integrators and the survival of manufacturing clusters" by Buciuni G. and Pisano G. (2018). On the research section, the authors evidence the key success factors that have led the cluster to survive to the two crisis that have jeopardized the Italian economy, and in particular the presence of knowledge integrators in the territory.

The existence of companies like Friul Intagli Industries and Mediaprofili S.p.A, which are the two main IKEA's suppliers for the European market, represent a key resource for the Livenza furniture cluster, especially for what concerns the flow of knowledge and innovation that may come from abroad. Moreover, the position of similar leading players on the market provides to the cluster an international viewpoint, that combined with proximity and the establishment of strong network relationships, allows also to smaller companies to participate to the global value chains.

When a local leading player have the opportunity to innovate, the process does not stop within the boundaries of the company, but within an ecosystem as a cluster the flow of information passes through the network and pervades all the territory, feeding the existing industrial commons.

The second key success factor that have led the furniture cluster to survive during the years is the capability of leading firms to maintain the production sites in the territory, avoiding forms of offshoring and delocalization.

So, leading firms have developed over the time strategies aimed at preserving the local production knowledge and improved technical and development capabilities in order to partake in global customers' product innovation (Buciuni, Pisano, 2018).

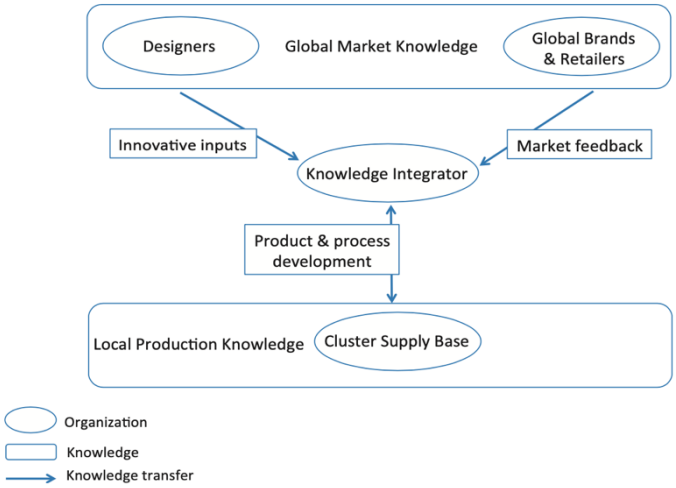
The result is that most of the innovative inputs and ideas are brought in the cluster and shared thanks to the proximity and stable relationships between all the companies.

Even if this is a necessary condition for the improvement of industrial commons, it's not sufficient. In fact, the key passage that companies have been able to implement has been the internalization of the input.

Internalizing the external input, companies have been able to evolve the supply chain and adapt it to the evolving demand and to the new needs of the market.

This also led to a co-evolution of the cluster, since that leading players and local players benefitted of the information brought in through pipelines, developing therefore a "process embedded innovation strategy".

The following scheme made by Buciuni and Pisano (2018) describes the flow of knowledge and the role of knowledge integrators.



Tab. 2.7: Knowledge integrators in the Livenza Furniture clusters. Source: Buciuni, G., Pisano, G. (2018)

2.2.4 Innovation in the Livenza furniture Cluster: Contratto di rete and EMAS registration

Since its birth, the companies of the geographical industrial region of Pordenone and Treviso have followed a constant path of innovation, both technological and strategical.

The economic agents which inhabit the area have immediately understood the potential that synergies may create and, especially from 1970s, the born of small and medium enterprises have led the district to redesign its asset in order to face the new economic events and changes.

Beside the strategical changes, the Livenza furniture cluster has pinpointed innovation as one of the key points for success and a crucial role in the process has been covered by leading players as Friul Intagli Industries which have been pioneers in the automatization of the production processes.

However, nowadays the implementation of new technologies are not sufficient to face the new challenges that the world economy is bringing to light. The competition on costs coming from the east and globalization have reduced the competitiveness on innovation.

For this reason, the cluster has focused its attention on new strategical innovations able to enhance the competitiveness of the firms and of the territory as a whole, leveraging the capability of companies to act as a single entity, whenever is needed, and its reputation also from the environmental perspective.

Two important innovation that came to light in the last years have to be analyzed.

The first one is the creation of business networks.

In 2009 the Italian Law introduces a new legal instrument called "*contratto di rete*" which allows to an aggregation of enterprises to establish among them a form of collaboration still maintaining their autonomy as single legal entities and to benefit from incentives and fiscal facilitations.

Generally, firms involved are small and medium enterprises operating in the same industry or at least complementary industries that persecute the same goals and so establish a strong relationship that inevitably affect the behavior of the single entities.

The reason that may push firms to establish a similar collaboration with other entities is firstly the possibility to leverage each other's strengths. In fact, within the cluster SMEs are generally focused in a specific passage of the production process and this implies that they may be considered experts in their field. Thanks to the union of small and medium sized companies operating in the same industry is possible to obtain a superior quality product able to satisfy the customers' requests.

Considering the furniture industry, *contratto di rete* is often used in the case of contract projects in which the firms involved in the network, called "contractor", get charged of decorate the whole room despite providing only the single piece of furniture. Contract is a complete service provided by the contractor in which it takes the responsibility to provide the finished project by the deadline and respecting the technical specification.

Within the Livenza furniture cluster and in general in Friuli Venezia Giulia's furniture industry, which encompasses the Manzano chair district too, several examples of business networks can be done. Some of them are also managed by Cluster Arredo FVG, which offers consulting services with the aim of building, managing and develop a collaboration between companies.

In particular, Cluster FVG assists places itself as a common body of reference and assist the network from the birth to the development of the projects. Right now, six business networks are managed by Cluster Arredo FVG for a total of 43 companies.

Within the whole Friuli Venezia Giulia region, it is possible to count 36 business networks operating in the furniture industry as furniture producers (Ateco code 31) and as manufacturers (Ateco code 16), almost all of them located between Pordenone and Udine within the furniture cluster and chair district[9] (Registroimprese, 2020).

Among the 36 networks, two examples of success can be done:

- *Italia for contract*, a company network which merges the visions of eight of the most important economic realities of the territory: Crassevig, Frag, Neod, Moroso, Fantoni, Kenius, Molaro and Practic. The main characteristic of these companies is that they come from different but complementary industry and each of them represent the excellence in its own economic sector.
- *Tailor Made contract*, a similar network of firms, but made of small and medium companies with the purpose of responding to smaller clients' demand of tailor-made furniture.

Acting as a single entity, company networks have the possibility to transmit to the market a different perception and at the same time have the possibility to become known in the industry. This is important especially for small suppliers, which usually maintain strict relationships with only few clients of the territory and so, entering in a network of enterprises, have the possibility to expand their boundaries and enhance their competitiveness and the competitiveness of the cluster as a whole.

The second fundamental innovation tool that have taken roots in the furniture cluster of Pordenone is the adoption of the Eco-Management and Audit Scheme (EMAS).

EMAS is a management instrument developed by the European Commission for companies to evaluate, report and improve their environmental performances. It spans all economic and service sectors and is applicable worldwide (European Commission, 2020). It has been designed to reduce and improve the environmental impact of firms, especially small and medium enterprises.

The European regulation has seen three improvements during the years and the third edition EMAS III, developed in 2009, promotes the participation of SMEs for which special opportunities are provided in the case in which companies operate in a well-defined geographical region and in the same industry. So, the third EMAS regulation introduced

[9] Data extrapolated from the database provided by Registroimprese updated in 03/08/2020

the “EMAS cluster approach”, particularly suitable for Italian districts and clusters (Novelli *et al*., 2020).

The EMAS registration consist in ten steps and four key principles: Plan-Do-Check-Act.

In the first phase, an environmental self-review is produced in collaboration with the competent body of the geographical area. In it are highlighted the causes that produce environmental issues and in particular the direct aspects, as the consumption of energy and raw materials and the production of waste and emissions, and indirect aspects, intended as all the activities of the organization that have an impact on the environment.

After this, four core steps take place:

- *Plan*: definition of the set of environmental action and management tools aimed at improving the environmental performances, also called “environmental management system” (EMS). This procedure has to be reviewed constantly over the time in order to ensure a successful implementation of the programme.
- *Do*: implementation of the action and management tools. In this phase a particular attention has to be reserved to the fit of the plan with the organizational structure. The company which decides to develop an EMS has to be sure of an active employee participation.
- *Check*: monitor the performances of the implemented procedures and practices in terms of environmental aspects. The organization which develops the EMS has to produce a management control panel based on indicators in order to keep track of improvements reached over the time. The use of a common set of indicators improves clarity and transparency in this phase. Environmental audit is essential to get the EMAS registration.
- *Act*: improvements of the EMS. Over the time the organization has to readapt the plan to new environmental goals and produce continuous improvements.

Finally, the organization has to produce a report in which the achievements in terms of environmental objectives are outlined.

The report will be examined by and external committee and, whether there will be an approval, the company will be registered.

Beside the environmental benefits, EMAS represent an occasion for all the organizations to foster their environmental goals, but also to enhance their reputation, transparency and credibility on the market. on one side, EMAS leads companies to reduce energy wastes

and raw material consumption, optimizing the production process, but provides a marketing tool too.

Moreover, the company keeps track constantly of its environmental and financial performances, so having the possibility to enhancing them by ameliorating the EMS. Finally, the workplace itself may be improved and, due to the involvement of employees, a greater team-building capacity may be reached.

In 2006 the Livenza furniture district has been the first cluster in Italy to obtain the EMAS registration, with a second renew in 2016.

In terms of benefits, the following tab compares the Ecological Footprint (EF) of the cluster in 2005 and in 2015 (Novelli *et al.*, 2020).

As can be seen, the wooden raw material consumption represents the main factor responsible for the EF and it directly depends from the production level and that can be reduced by using recycled wood.

The description of the two innovations developed and brought in the cluster reveals that nowadays the crucial changes have to be developed in strategical terms despite only in technological ones. The development of new technologies is crucial for the evolution of the cluster, but what is fundamental is to reinforce the credibility of firms and institutions and establish strong and stable networks able to enhance the competitiveness of the system as a whole, despite of the single entities.

2.2.5 Foreign markets: analysis of export and its evolution over the years – focus on the nine most important foreign markets

Livenza furniture cluster has been characterized by a certain openness to the global markets since 1970s, when the evolution of the Italian demand had pushed firms to explore new markets outside the Italian boundaries. In particular, in 1990s the focus has been posed don the European market, specifically on Germany, UK and France, which have always been the three most important foreign markets for the Livenza's furniture industry. One of the key factors that has contributed to raise the level of exportations has been the 7% devaluation of Italian Lira after the "Black Wednesday" in 1992, the day in which Italy the European monetary system, which had made Italian products cheaper for foreign markets.

Nowadays, according to the studies conducted by Pordenone's Chamber of Commerce and Cluster Arredo FVG, nine foreign markets have to be highlighted: UK, France, Germany, US, Spain, Austria, Russia, Belgium and Poland.

For what concerns the furniture industry, Friuli Venezia Giulia covers the third place in the list of the Italian regions that are furniture exporters with almost 1,5 billion in value which is equal to 15% of the total Italian exportations of furniture, behind Lombardia and Veneto, both with 2,7 billions of furniture exports, equal to 27,7% of the total Italian value[10]. Considering therefore the two provinces of Livenza's cluster, Treviso and Pordenone cover the first and second place in the list of the most important exporters at a province level. Treviso, with 1,8 billion euros weights for 18,3% of all Italian furniture exportations and Pordenone, with 859 million euros weights for 8,8%. Considering also the nearest province of Udine, which has an active participation in the furniture industry, especially because of the presence of the chair district of Manzano, the sum of Friuli Venezia Giulia Provinces amount to 1,33 billion euros.[11]

The proximity between the two geographical industrial regions preserve a double advantage. On one side, firms of the furniture industry can leverage each other, as a single cluster. On the other, the geographical position of the two sides of Livenza can be a key success factor that can be exploited by companies and big groups.

In particular, the Friuli Venezia Giulia side firms can take advantage from the logistic pole of Treviso, which allow to companies to reach not only the Italian market, but also the west Europe one, as France, Spain and UK. However, the proximity of Friuli Venezia Giulia with Austria, Germany and east Europe becomes crucial for Treviso's district too and the logistic pole of Trieste becomes also a hotspot for the exportations via sea.

This implies that the geographical position in which the Livenza furniture district is located is strategical to reach almost every foreign market.

Data on furniture industry in Friuli Venezia Giulia show that in the last years there is a slow, but constant growth in the level of exportations, especially for the Province of Pordenone.

The following tab describes the trend designed by exportations of Friuli Venezia Giulia in the last ten years.

[10] Data on 2019 provided by Pordenone's Chamber of Commerce.
[11] Data on 2019 provided by Pordenone's Chamber of Commerce.

TAB EXP 1. EXPORT FVG FURNITURE 2009-2019				
YEAR	EXPORT ateco 31	EXPORT ateco 16	TOTAL EXPORT FVG	TOTAL EXPORT PN (9 paesi importanti)
2009	1.174.644.895,00 €	98.790.085,00 €	1.273.434.980,00 €	432.306.760,00 €
2010	1.214.693.924,00 €	127.564.524,00 €	1.342.258.448,00 €	431.708.706,00 €
2011	1.261.863.540,00 €	135.126.786,00 €	1.396.990.326,00 €	493.644.187,00 €
2012	1.210.715.560,00 €	168.947.393,00 €	1.379.662.953,00 €	446.213.992,00 €
2013	1.186.663.967,00 €	143.466.217,00 €	1.330.130.184,00 €	456.994.437,00 €
2014	1.242.977.827,00 €	154.946.432,00 €	1.397.924.259,00 €	502.304.842,00 €
2015	1.293.666.529,00 €	149.610.055,00 €	1.443.276.584,00 €	529.857.887,00 €
2016	1.255.575.739,00 €	150.539.942,00 €	1.406.115.681,00 €	541.374.737,00 €
2017	1.372.511.418,00 €	173.687.519,00 €	1.546.198.937,00 €	614.510.273,00 €
2018	1.430.672.316,00 €	171.538.415,00 €	1.602.210.731,00 €	643.254.605,00 €
2019	1.476.447.159,00 €	173.455.364,00 €	1.649.902.523,00 €	

Tab 2.7: Friuli Venezia Giulia exportations divided by ATECO code from 2009 to 2019 for the 9 most important countries. Source: ISTAT – Author's elaboration

The tab 2.7 describes the trend in level of exportations for the region, dividing the data by ATECO code.

In ten years, the level of exportations has grown by 30%, passing from 1,27 billion to 1,65 billion. The most critical years that can be highlighted are 2013, the year after the European crisis that heavily affected consumption levels, and 2016, year in which, according to Intesa San Paolo report "*Monitor dei distretti del Triveneto*", it has been registered a growth in UK and France, but a strong contraction in the German demand has affected the level of exportations. Therefore, 2017 registers a growth of nearly 10% with respect the previous year.

Considering in particular the area of Pordenone, it is possible to analyze the impact that the area has on exportations.

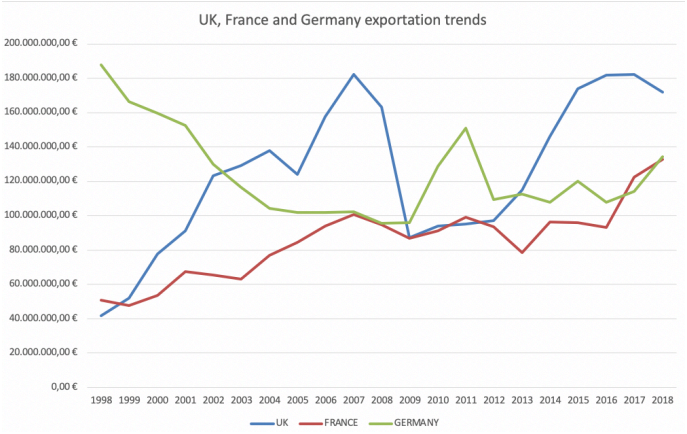
The following tab represents the trend of exportations in Pordenone province from 1998 to 2018 considering the nine most important countries of exportation (Istat, 2020).

	countries	UK	FRANCE	GERMANY	US	SPAIN	AUSTRIA	RUSSIA	BELGIUM	POLAND	TOTAL	TOTAL EXPORT PN	TOTAL EXPORT FURNITURE FVG
EXP1998	ATECO 16	184.515,00 €	1.397.393,00 €	3.455.120,00 €	1.007.920,00 €	347.787,00 €	908.395,00 €	1.441.530,00 €	0,00 €	53.552,00 €			
	ATECO 31	41.641.630,00 €	49.255.539,00 €	184.211.164,00 €	42.309.953,00 €	6.947.245,00 €	29.633.972,00 €	44.520.468,00 €	0,00 €	6.300.362,00 €			
	TOTAL	41.826.145,00 €	50.652.932,00 €	187.666.284,00 €	43.317.873,00 €	7.295.032,00 €	30.542.367,00 €	45.961.998,00 €	0,00 €	6.353.914,00 €	413.616.546,00 €	8.137.020.020,00 €	
EXP1999	ATECO 16	171.484,00 €	1.736.862,00 €	4.021.689,00 €	818.208,00 €	965.289,00 €	508.698,00 €	943.263,00 €	350.812,00 €	160.251,00 €			
	ATECO 31	51.801.885,00 €	46.030.709,00 €	162.341.443,00 €	496.863.775,00 €	9.133.444,00 €	27.259.185,00 €	28.401.936,00 €	18.847.266,00 €	7.143.382,00 €			
	TOTAL	51.973.369,00 €	47.766.571,00 €	166.363.132,00 €	497.681.983,00 €	10.098.733,00 €	27.767.883,00 €	29.345.199,00 €	19.198.078,00 €	7.303.633,00 €	857.498.581,00 €	7.640.270.108,00 €	
EXP2000	ATECO 16	203.271,00 €	1.817.471,00 €	3.999.717,00 €	238.467,00 €	809.333,00 €	515.551,00 €	1.649.464,00 €	585.568,00 €	264.586,00 €			
	ATECO 31	77.571.750,00 €	51.693.633,00 €	155.475.393,00 €	75.887.957,00 €	12.213.827,00 €	24.079.663,00 €	38.681.507,00 €	21.258.366,00 €	702.599,00 €			
	TOTAL	77.775.021,00 €	53.511.104,00 €	159.475.110,00 €	76.126.424,00 €	13.023.160,00 €	24.079.663,00 €	40.330.971,00 €	21.843.934,00 €	967.185,00 €	467.132.572,00 €	8.936.379.576,00 €	
EXP2001	ATECO 16	542.967,00 €	4.450.338,00 €	3.540.786,00 €	416.069,00 €	715.652,00 €	336.721,00 €	854.005,00 €	416.700,00 €	110.268,00 €			
	ATECO 31	90.498.429,00 €	62.796.692,00 €	148.891.395,00 €	65.759.237,00 €	14.546.062,00 €	18.530.768,00 €	43.199.879,00 €	17.132.172,00 €	9.517.796,00 €			
	TOTAL	91.042.396,00 €	67.247.030,00 €	152.432.181,00 €	66.175.306,00 €	15.261.714,00 €	18.867.489,00 €	44.053.884,00 €	17.548.872,00 €	9.628.064,00 €	482.256.936,00 €	9.306.610.644,00 €	
EXP2002	ATECO 16	429.553,00 €	4.523.371,00 €	2.410.169,00 €	38.268,00 €	1.785.949,00 €	403.339,00 €	2.396.077,00 €	613.356,00 €	120.637,00 €			
	ATECO 31	122.920.089,00 €	60.788.634,00 €	127.961.065,00 €	57.782.288,00 €	17.699.270,00 €	16.683.641,00 €	41.300.793,00 €	16.362.161,00 €	8.532.918,00 €			
	TOTAL	123.349.642,00 €	65.312.005,00 €	129.971.234,00 €	57.820.557,00 €	19.485.219,00 €	17.086.980,00 €	43.696.870,00 €	16.975.517,00 €	8.653.555,00 €	482.351.579,00 €	9.092.794.377,00 €	
EXP2003	ATECO 16	194.755,00 €	3.326.651,00 €	3.686.384,00 €	179.282,00 €	1.402.183,00 €	440.006,00 €	3.621.814,00 €	333.461,00 €	302.723,00 €			
	ATECO 31	129.075.530,00 €	59.546.834,00 €	112.599.649,00 €	46.767.341,00 €	17.575.042,00 €	15.161.827,00 €	44.230.022,00 €	15.827.096,00 €	5.355.591,00 €			
	TOTAL	129.270.285,00 €	62.873.485,00 €	116.286.033,00 €	46.946.623,00 €	18.977.225,00 €	15.601.833,00 €	47.851.836,00 €	16.160.557,00 €	5.658.314,00 €	459.626.191,00 €	8.325.734.513,00 €	
EXP2004	ATECO 16	75.473,00 €	4.916.519,00 €	2.268.945,00 €	238.322,00 €	1.553.064,00 €	427.595,00 €	6.590.179,00 €	771.268,00 €	195.057,00 €			
	ATECO 31	137.863.293,00 €	71.956.392,00 €	101.936.387,00 €	40.244.324,00 €	19.781.315,00 €	11.912.735,00 €	59.385.830,00 €	16.002.022,00 €	4.593.416,00 €			
	TOTAL	137.938.766,00 €	76.872.911,00 €	104.205.332,00 €	40.482.646,00 €	21.334.379,00 €	12.340.330,00 €	65.976.009,00 €	16.773.290,00 €	4.788.473,00 €	480.712.136,00 €	9.886.081.042,00 €	
EXP2005	ATECO 16	3.048.354,00 €	2.126.044,00 €	1.811.424,00 €	493.417,00 €	578.111,00 €	398.875,00 €	7.420.674,00 €	587.950,00 €	91.875,00 €			
	ATECO 31	120.982.783,00 €	82.254.396,00 €	99.944.301,00 €	44.611.157,00 €	25.475.045,00 €	10.859.491,00 €	79.271.631,00 €	16.855.238,00 €	5.869.583,00 €			
	TOTAL	124.031.137,00 €	84.380.440,00 €	101.755.725,00 €	45.104.574,00 €	26.053.156,00 €	11.258.366,00 €	86.692.305,00 €	17.443.188,00 €	5.961.458,00 €	502.680.349,00 €	9.643.352.827,00 €	
EXP2006	ATECO 16	5.061.263,00 €	2.182.329,00 €	1.854.790,00 €	1.939.056,00 €	1.040.869,00 €	324.310,00 €	7.061.825,00 €	565.202,00 €	821.215,00 €			
	ATECO 31	152.693.487,00 €	91.842.731,00 €	100.090.181,00 €	37.750.608,00 €	28.764.703,00 €	9.607.900,00 €	94.662.354,00 €	16.484.880,00 €	5.601.093,00 €			
	TOTAL	157.754.750,00 €	94.025.060,00 €	101.944.971,00 €	39.689.664,00 €	29.805.572,00 €	9.932.210,00 €	101.724.179,00 €	17.050.082,00 €	6.422.308,00 €	558.348.796,00 €	11.074.875.441,00 €	
EXP2007	ATECO 16	5.467.634,00 €	2.483.475,00 €	1.770.101,00 €	1.964.941,00 €	1.855.618,00 €	425.163,00 €	7.079.750,00 €	595.157,00 €	822.970,00 €			
	ATECO 31	176.905.862,00 €	98.111.613,00 €	100.541.420,00 €	43.959.689,00 €	33.863.508,00 €	11.241.488,00 €	88.039.719,00 €	19.777.232,00 €	7.839.401,00 €			
	TOTAL	182.373.496,00 €	100.595.088,00 €	102.311.521,00 €	45.924.630,00 €	35.719.126,00 €	11.666.651,00 €	95.119.469,00 €	20.372.389,00 €	8.662.371,00 €	602.744.741,00 €	12.413.280.830,00 €	
EXP2008	ATECO 16	7.633.804,00 €	2.523.706,00 €	1.242.133,00 €	1.629.091,00 €	1.499.595,00 €	202.950,00 €	11.110.242,00 €	596.278,00 €	1.593.178,00 €			
	ATECO 31	155.730.580,00 €	92.151.010,00 €	94.339.982,00 €	23.885.541,00 €	26.986.568,00 €	10.801.629,00 €	130.452.073,00 €	17.924.666,00 €	11.368.712,00 €			
	TOTAL	163.364.384,00 €	94.674.716,00 €	95.582.115,00 €	25.514.632,00 €	28.476.163,00 €	11.004.579,00 €	141.562.315,00 €	18.520.944,00 €	12.961.890,00 €	591.661.738,00 €	13.243.933.799,00 €	
EXP2009	ATECO 16	6.736.653,00 €	1.733.292,00 €	1.215.450,00 €	934.901,00 €	486.053,00 €	196.935,00 €	5.090.340,00 €	537.202,00 €	1.636.521,00 €			
	ATECO 31	80.411.725,00 €	84.867.259,00 €	94.781.665,00 €	25.238.438,00 €	16.227.340,00 €	12.411.375,00 €	71.270.937,00 €	18.905.717,00 €	9.624.957,00 €			
	TOTAL	87.148.378,00 €	86.600.551,00 €	95.997.115,00 €	26.173.339,00 €	16.713.393,00 €	12.608.310,00 €	76.361.277,00 €	19.442.919,00 €	11.261.478,00 €	432.306.760,00 €	10.741.664.260,00 €	1.273.434.980,00 €
EXP2010	ATECO 16	7.340.488,00 €	1.181.212,00 €	1.344.154,00 €	547.414,00 €	610.684,00 €	445.281,00 €	2.437.437,00 €	637.527,00 €	2.649.920,00 €			
	ATECO 31	86.448.376,00 €	89.938.554,00 €	127.358.478,00 €	33.664.928,00 €	20.064.558,00 €	11.695.773,00 €	20.064.558,00 €	19.927.115,00 €	5.352.249,00 €			
	TOTAL	93.788.864,00 €	91.119.766,00 €	128.702.632,00 €	34.212.342,00 €	20.675.242,00 €	12.141.054,00 €	22.501.995,00 €	20.564.642,00 €	8.002.169,00 €	431.708.706,00 €	11.673.613.912,00 €	1.342.258.448,00 €
EXP2011	ATECO 16	7.876.851,00 €	1.105.092,00 €	1.557.127,00 €	968.139,00 €	602.198,00 €	579.394,00 €	2.697.605,00 €	740.019,00 €	2.983.811,00 €			
	ATECO 31	87.238.629,00 €	97.853.848,00 €	149.154.599,00 €	41.629.050,00 €	22.867.190,00 €	17.508.249,00 €	22.867.190,00 €	27.578.509,00 €	7.836.687,00 €			
	TOTAL	95.115.480,00 €	98.958.940,00 €	150.711.726,00 €	42.597.189,00 €	23.469.388,00 €	18.087.643,00 €	25.564.795,00 €	28.318.528,00 €	10.820.498,00 €	493.644.187,00 €	12.574.678.452,00 €	1.366.990.326,00 €
EXP2012	ATECO 16	8.624.496,00 €	1.858.408,00 €	828.446,00 €	1.171.948,00 €	417.426,00 €	393.436,00 €	4.079.359,00 €	715.801,00 €	3.938.854,00 €			
	ATECO 31	88.352.787,00 €	91.687.721,00 €	108.656.766,00 €	37.460.273,00 €	22.782.086,00 €	21.322.829,00 €	22.782.086,00 €	24.367.079,00 €	6.774.191,00 €			
	TOTAL	96.977.283,00 €	93.546.129,00 €	109.485.212,00 €	38.632.221,00 €	23.199.512,00 €	21.716.265,00 €	26.861.445,00 €	25.082.880,00 €	10.713.045,00 €	446.213.992,00 €	11.465.476.957,00 €	1.354.181.777,00 €
EXP2013	ATECO 16	8.203.693,00 €	2.079.793,00 €	724.657,00 €	1.524.546,00 €	1.014.665,00 €	344.761,00 €	2.507.863,00 €	984.492,00 €	3.880.567,00 €			
	ATECO 31	106.793.200,00 €	76.339.496,00 €	111.709.419,00 €	29.031.189,00 €	22.526.683,00 €	21.287.901,00 €	40.003.528,00 €	21.571.705,00 €	6.466.279,00 €			
	TOTAL	114.996.893,00 €	78.419.288,00 €	112.434.076,00 €	30.555.735,00 €	23.541.348,00 €	21.632.662,00 €	42.511.391,00 €	22.556.197,00 €	10.346.846,00 €	456.994.437,00 €	11.437.193.295,00 €	1.341.610.399,00 €
EXP2014	ATECO 16	9.513.350,00 €	2.733.985,00 €	884.758,00 €	1.416.376,00 €	733.910,00 €	556.305,00 €	2.938.732,00 €	815.387,00 €	576.568,00 €			
	ATECO 31	136.806.771,00 €	93.683.228,00 €	106.721.303,00 €	23.064.514,00 €	28.305.233,00 €	22.176.282,00 €	42.878.461,00 €	21.943.835,00 €	6.555.844,00 €			
	TOTAL	146.320.121,00 €	96.417.213,00 €	107.606.061,00 €	24.480.890,00 €	29.039.143,00 €	22.732.587,00 €	45.817.193,00 €	22.759.222,00 €	7.132.412,00 €	502.304.842,00 €	12.018.191.122,00 €	1.392.587.882,00 €
EXP2015	ATECO 16	11.879.290,00 €	2.017.189,00 €	800.860,00 €	1.706.098,00 €	639.603,00 €	330.412,00 €	2.182.559,00 €	922.698,00 €	335.646,00 €			
	ATECO 31	162.076.245,00 €	93.931.410,00 €	119.065.746,00 €	26.367.161,00 €	29.384.350,00 €	23.519.401,00 €	28.327.809,00 €	19.528.092,00 €	6.843.318,00 €			
	TOTAL	173.955.535,00 €	95.948.599,00 €	119.866.606,00 €	28.073.259,00 €	30.023.953,00 €	23.849.813,00 €	30.510.368,00 €	20.450.790,00 €	7.178.964,00 €	529.857.887,00 €	12.456.702.224,00 €	1.444.206.471,00 €
EXP2016	ATECO 16	13.025.260,00 €	1.202.032,00 €	1.677.169,00 €	2.440.025,00 €	640.652,00 €	457.240,00 €	2.338.602,00 €	571.755,00 €	346.433,00 €			
	ATECO 31	168.944.354,00 €	92.092.723,00 €	106.034.981,00 €	35.335.573,00 €	33.719.159,00 €	22.476.234,00 €	32.741.206,00 €	17.355.687,00 €	9.975.652,00 €			
	TOTAL	181.969.614,00 €	93.294.755,00 €	107.712.150,00 €	37.775.598,00 €	34.359.811,00 €	22.933.474,00 €	35.079.808,00 €	17.927.442,00 €	10.322.085,00 €	541.374.737,00 €	13.254.995.515,00 €	1.429.263.258,00 €
EXP2017	ATECO 16	11.133.189,00 €	1.892.819,00 €	2.056.655,00 €	1.501.343,00 €	663.560,00 €	520.198,00 €	1.450.537,00 €	794.904,00 €	170.107,00 €			
	ATECO 31	171.021.908,00 €	120.474.188,00 €	112.045.415,00 €	52.360.247,00 €	42.317.305,00 €	24.389.418,00 €	32.544.190,00 €	19.356.681,00 €	19.817.609,00 €			
	TOTAL	182.155.097,00 €	122.367.007,00 €	114.102.070,00 €	53.861.590,00 €	42.980.865,00 €	24.909.616,00 €	33.994.727,00 €	20.151.585,00 €	19.987.716,00 €	614.510.273,00 €	14.734.476.611,00 €	1.544.198.937,00 €
EXP2018	ATECO 16	10.546.382,00 €	1.396.019,00 €	3.355.741,00 €	1.430.738,00 €	261.958,00 €	567.139,00 €	1.053.372,00 €	1.204.276,00 €	389.952,00 €			
	ATECO 31	161.481.356,00 €	131.286.773,00 €	130.787.271,00 €	53.774.622,00 €	42.913.993,00 €	27.490.359,00 €	25.786.144,00 €	26.874.144,00 €	23.492.724,00 €			
	TOTAL	172.027.738,00 €	132.682.792,00 €	134.143.012,00 €	55.205.360,00 €	43.175.951,00 €	28.057.498,00 €	26.017.158,00 €	28.078.420,00 €	23.882.676,00 €	643.254.605,00 €	15.504.980.782,00 €	1.622.210.731,00 €

Tab 2.8: exportations in the 9 most important foreign markets from 1998 to 2018. Source: ISTAT – Author's elaboration

As can be seen, UK, Germany and France still remain the most important foreign clients and a particular growth in the levels of exportation in UK can be evidenced.
Taking in consideration only the nine reference countries and comparing the data with the total exportations of the region, what can be seen is that Pordenone region covers a percentage between 32% and 40% of the total furniture exportations of the region. Considering also the remaining countries, the cluster of Pordenone becomes the most important exporter in the region, covering the 54% of the total exportations in 2019.
Currently, even if the most valuable foreign market is still UK, a relevant growth trend for what concerns the French market has to be highlighted.

	UK	FRANCE	GERMANY
1998	41.826.145,00 €	50.652.932,00 €	187.666.284,00 €
1999	51.973.369,00 €	47.766.571,00 €	166.363.132,00 €
2000	77.775.021,00 €	53.511.104,00 €	159.475.110,00 €
2001	91.042.396,00 €	67.247.030,00 €	152.432.181,00 €
2002	123.349.642,00 €	65.312.005,00 €	129.971.234,00 €
2003	129.270.285,00 €	62.873.485,00 €	116.286.033,00 €
2004	137.938.766,00 €	76.872.911,00 €	104.205.332,00 €
2005	124.031.137,00 €	84.380.440,00 €	101.755.725,00 €
2006	157.754.750,00 €	94.025.060,00 €	101.944.971,00 €
2007	182.373.496,00 €	100.595.088,00 €	102.311.521,00 €
2008	163.364.384,00 €	94.674.716,00 €	95.582.115,00 €
2009	87.148.378,00 €	86.600.551,00 €	95.997.115,00 €
2010	93.788.864,00 €	91.119.766,00 €	128.702.632,00 €
2011	95.115.480,00 €	98.958.940,00 €	150.711.726,00 €
2012	96.977.283,00 €	93.546.129,00 €	109.485.212,00 €
2013	114.996.893,00 €	78.419.289,00 €	112.434.076,00 €
2014	146.320.121,00 €	96.417.213,00 €	107.606.061,00 €
2015	173.955.535,00 €	95.948.599,00 €	119.866.606,00 €
2016	181.969.614,00 €	93.294.755,00 €	107.712.150,00 €
2017	182.155.097,00 €	122.367.007,00 €	114.102.070,00 €
2018	172.027.738,00 €	132.666.792,00 €	134.143.012,00 €



Tab 2.9 and 2.10: export in UK, France and Germany from 1998 to 2018 and their trend. Source: ISTAT – Author's elaboration

As can be seen form the graph 2.10 the UK (blue line) has an inconstant trend over the years, affected also by the exchange rate, and Germany (green line), except from the spike between 2009 and 2011, registers a down trend in the years. The country that have demonstrated a continuous uptrend is France (red line). Companies of the territory collaborate with French companies especially for the nautical industry and for the production of wood panels that are used in the furniture production.
However, the crisis brough out by Covid-19 is heavily affecting the furniture industry and the cluster too. In the first trimester of 2020 it has been registered a decrease if 13,8% in the furniture exportations if compared with the same trimester of 2019, but an increment of 5,7% in the wood sector which suffers from the influence of the furniture industry with a little delay.

Diversely from Pordenone province, the district of Treviso has registered a slowdown for what concerns exportations in the last year, mainly because of the contraction of the French demand, even if in US and Germany it has been registered ad increment (Intesa San Paolo, 2020).

Export represent the major source of revenues for the furniture industry in the Livenza cluster, especially for Pordenone and Friuli Venezia Giulia, where the 60% of revenues come from foreign markets. Considering also that part of the internal demand is referred to other clusters and districts, as Monza Brianza and Pesaro Urbino provinces, the incidence of exports in the total outcome is even higher.

For this reason, over the years one of the targets that the cluster of Pordenone has pointed out is the openness to the global markets, favored also by the pivotal role of leading firms that have invested in pipelines in order to allow to the system to grow.

2.2.6 Financing forms: banks and regional and European funds – The role of Rilancimpresa

The forms of financing adopted by the Livenza furniture district are considerable traditional and nowadays do not encompass any form of financial innovation.

In particular, it is possible to evidence three instruments adopted by companies and institutions in order to finance the process of innovation:

- Bank lending
- Regional and European financing programs
- Institutional intermediation aimed at favoring the innovation process within the cluster

Bank lending is the most commonly used form of financing adopted by cluster's firms, especially whether small and medium enterprises are considered. In general, borrowings are used to finance the day-by-day activities and the new necessary investments. Beside this side of traditional use of funds, intermediaries work together with banks in order to ensure to the cluster the possibility to reach funds for innovation and, recently, to allow firms the possibility to restart after the Covid-19 forced stop.

However, considering the weak financial structure that characterize SMEs, the access to bank funds may be difficult for certain companies.

For this reason, the role of intermediaries becomes crucial in order to allow to companies to innovate and reinforce the competitiveness of the cluster.

For instance, a deal between Cluster Arredo FVG and Carifvg (Cassa di Risparmio del Friuli Venezia Giulia, merged with Intesa San Paolo in 2018) has been signed in 2017. The two parts have dealt on a plafond of 150 million euros of funds as support of investments in research and development programs, in the internationalization and digitalization of the cluster's firms.

According to the survey carried on by Intesa San Paolo in October 2018, the furniture industry has the highest level of non-digitalized firms, especially whether companies outside districts are considered. At the same time the wood and furniture industry has faced consistent difficulties in hiring specialized workers, especially considering companies within districts. This latter aspect is mainly driven by the fact that the production process has not evolved consistently, especially in the last 20 years when the computerization of machines has been adopted in the production process.

For this reason, the efforts that currently are carried on by institutions are aimed at renewing the cluster, introducing it in the 4.0 era.

Joint efforts are conducted also by the political bodies of the region and by the European union themselves.

In particular, a specific program designed by Friuli Venezia Giulia has to be underlined: Rilancimpresa.

As said before, Friuli Venezia Giulia region has recognized the cluster structure only in 2015, but it has also immediately understood the importance and the potential of the model and so favored the implementation of a network able to produce synergies and to enhance the competitiveness of the region.

Rilancimpresa is an industrial policy reform developed in 2015 by Friuli Venezia Giulia region which have four main purposes:

- Attract new investments on the territory and favor the development of industrial agglomerates, favoring the settlement of new economic realities also by reducing the tax burden and creating production areas ecologically developed or APEA (Italian acronym for "area produttiva ecologicamente attrezzata");
- Enhance the competitiveness of the regional economic fabric, favoring the growth of districts and clusters by raising European and national funds, creating a network able to favor the flow of knowledge and information between the economic agents and favoring the development of a new entrepreneurship able to follow the evolution of the economic world;

- Simplify and reduce bureaucracy;
- Sustain the local production systems and districts by valorizing the territorial framework, also favoring the creation and evolution of consortiums as support the local community and providing contributes for the development of the supply chain.

The enhancement of the competitiveness of the system is for sure the core of the reform. The development and growth of clusters and districts has been considered a crucial point by the regional political bodies and, in particular, have put at the disposal of firms and institutions several economic incentives under the form of non-refundable aids, guarantees for new credit lines and fiscal measures. These tools are aimed at innovating technologically the system, investing for instance in new machineries, and develop new strategies able to allow to cluster and district firms to reach international markets and participate to the global value chains.

Funds are provided by the region under the form of regional calls and companies and institutions have the possibility to apply within the pre-determined terms, whether any exist. In particular, programs developed for the ease to credit lines are constantly active and can be exploited to finance long-term and short-term operations. For instance, D.P.Reg. 175/2019, also called "Sabatini Friuli Venezia Giulia", allows to companies to get access to non-refundable aids for the investment in new machineries, but D.P.Reg. 113/2012 has been studied in order to help firms to get access to short-term credit lines for the day-by-day operations, as the financing of warehouse.

However, investments are not aimed only at innovating the territory, but the region is aware of the importance of the information sharing within a properly built network. The creation of an innovative environment passes from the creation of a fertile ground made of relationships between the several economic agents. For this reason, the region finances the necessary expenses for the creation of enterprises' networks able to produce synergies and knowledge and information share. In particular, regional policies have as target the marketing campaign aimed at attracting new firms and investments in the region and the maintenance of infrastructures which allow the flow of information within the region.

In these cases, firms and institutions, whether they meet the requirements, have the possibility to get access to funds by applying to regional calls.

Concerning the development of knowledge and information, with Rilancimpresa the region has set as a goal also the development of small and medium enterprises entrepreneurship, trying also to favor the managerial succession within firms. In particular, regional programs allocate funds for the use of temporarily management services, for hiring qualified managers for a maximum of 24 months and for attending to managerial training courses.

The development of the regional ecosystem and innovation are also sustained with European funds. In particular, in order to. Maximize the effects of the policies, especially for what concerns SMEs, the industrial plan detect very specific themes of intervention connected to the capability of firms and, in general, of the productive system to be competitive on the market in order to act with targeted interventions for triggering research, development and implementation of innovative systems.

Decisions are also taken according to the guidelines provided by the European Regional Development Fund (ERDF), which have been created for the first time in 1975 for the growth of the less developed European regions. Programs are designed every six years and each program defines the focuses of investments.

ERDF 2014-2020, in particular, had four main goals:

- Innovation and research
- The digital agenda
- Support for SMEs
- The low-carbon economy

Within six years, the fund has provided 185 billion euros and 230 million euros have been allocated in Friuli Venezia Giulia and used to sustain the regional policies determined by Rilancimpresa, in particular for the development of the territory and its competitiveness. Funds provided by ERDF are allocated directly by the European Union according to their level of development and to their commitment in low-carbon economy projects. Funds are then provided to regions which, thanks to the intervention of public and private intermediaries committed in the development of the industrial fabric, distribute them to firms and institutions for the implementation of the projects.

Considering the goals set by the European union, Friuli Venezia Giulia Region provides incentives to:

- Buy innovation services, as market analysis, and fund research projects
- Develop activities for innovating processes, materials and produce patents

- Produce research and development activities, favoring also the joint commitments between scientific structures, universities and firms
- Sustain innovative start-ups and find new funds from potential entrepreneurs
- Enhance the competitiveness of the system by expanding production sites and creating new ones in order to develop a more technological production chain
- Revive those area which have been hit mostly by the crisis

The regional plan is also subjected to the surveillance of a specific committee, which has the role of valuate and examinate all the aspects that have an incidence on the program, also proposing modifies.

The next step of ERDF is the development of a plan for the next six years 2021-2027 and the new priorities will be based on creating a smarter and more connected Europe, try to reduce at zero the carbon emission and be more close to citizens, supporting locally-led development strategies and sustainable urban development across the EU.

2.2.7 Swot analysis

The following SWOT analysis sums up the framework in which the Livenza Cluster is entangled.

Strengths:

- Horizontal integration and hierarchical structure: the main characteristic of the cluster relies on the strong presence of small and medium sized firms. In particular, the 91% of the companies has less than 20 employees and most of them are suppliers of bigger leading firms of the territory. This confers to the cluster the possibility to benefit from the flexibility of SMEs, which adapt to a constantly evolving environment and to the evolution of the markets, establishing, so, a form of horizontal integration. Since that the production process is mainly externalized to small suppliers of the territory, big firms have the possibility to focus their efforts on different processes, as product development, R&D and marketing. Usually they cover only the last few passages of the production chain, as assembly.
- Knowledge integrators: in the cluster it is possible to evidence the presence of leading firms able to be the conjunction point between the local manufacturing reality and the global market. The existence of this kind of firms embedded to the

territory for the production process, but that at the same time have the capability to reach global markets, is a crucial strength for the cluster that have given to it the possibility to survive during the years and to enhance its industrial commons.

- Proximity: according to the data provided by Intesa San Paolo Veneto and Friuli Venezia Giulia are two regions characterized by a low average supply distance, respectively equal to 82 km and 94 km. moreover, the distance reduces within the Livenza Cluster, where the average supply distance is 75 km. Proximity becomes a key success factor within a similar environment, because it allows to reduce transaction costs, have a better control over the passages of the production process and develop stronger relationships and partnerships with the surrounding economic agents and institutions, with the consequent possibility of creating new synergies.
- Position on the territory: the cluster is positioned between Veneto and Friuli Venezia Giulia region in proximity with other complementary industrial realities. In particular, close to the furniture region in Friuli Venezia Giulia is strictly related to the household appliance district of Pordenone and to the chair district of Manzano, all included in the category of "Home Systems". Moreover, closer to the furniture region of Treviso there is one of the most important logistic poles of northern Italy, which allows to companies to reach the domestic and the foreign markets easily and the same goes for the logistic pole of Trieste.
- Presence of institutions in the territory: especially in the last years, the political bodies of the regions have expressed a particular interest in the cluster model and developed new programs aimed at enhancing the competitiveness of firms within the territory. Moreover, the existence of private institutions as Cluster Arredo FVG increases the capabilities of the cluster to implement new innovation forms and create a more sustainable environment. The result can be highlighted in two particular forms of strategical innovation: Business networks and the adoption of EMAS.
- Development of human capital: within the territory is possible to evidence the presence of educational institutions with the aim of train new labor force for the cluster, but also the proximity with the Universities of Venice, Udine, Pordenone, Trieste and Padova can be considered a critical resource.

- Export: European countries, and in particular UK, France and Germany, constitute the main source of revenues for the cluster. About 40% of the revenues comes from the nine countries in **tab n. export**, and considering all the export data, the revenues coming from foreign countries constitute the 60% of sales. Moreover, considering that the majority of the revenues are denominated in euros, there is not a substantial exchange risk, even if the fluctuation of GBP has to be monitored.
- Quality control supply: the presence of small and medium enterprises focused on a specific passage of the supply chain in the territory allows to bigger firms, which are their main clients, to have more control over the passage of the supply chain without exercising expensive forms of control. This is mainly due to the trust relationships established among the actors in the territory, which knows each other and have had a supplier-customer relationship which lasts from years.

Weaknesses:

- Strong interdependence: the connection between SMEs and big firms is a strong advantage for both the economic actors, but at the same time constitutes a risk. In fact, the dependance from bigger players is a double hedge sword for SMEs, since per every fall of a big player there is a chain reaction that affects all the supply chain. This has been revealed during the 2008 and 2012 crisis, in which there is a consistent reduction in the number of companies.
- Geographical position: the cluster expands its boundaries between two regions. this implies that the regional policies applied by the political bodies of the region might be misaligned and some companies may be favored by their geographical position. This could not consent the uniform development of the environment and consequently may reduce the competitiveness of the cluster.
- Lack of technological innovation in SMEs: the level of technological development has faced a sudden slowdown in the last years, also due to the crisis that have drained the liquidity of SMEs which have difficulties to invest in new technologies. This implies that the innovation of product has faced a slowdown too.
- Absence of local brand: the cluster is not characterized by the existence of a local brand that contradistinguish the products of the geographical region, as it could be the chairs of Manzano or the furniture of Monza Brianza. A local brand could

help especially small and medium enterprises to develop marketing strategies based on the brand and also enhance the reputation of the cluster.

Opportunities:

- East market: Covid-19 has represented a huge threat for the furniture industry and this is reflected on severe slowdown of the exportation level. In particular, the Italian furniture industry has registered a -9% in the furniture industry and a -4,7% in the wood industry and the wood and furniture industry of Friuli Venezia Giulia has registered a -13,8% in the furniture industry and a + 5,7% in the wood industry with respect to the same period in 2019 and the countries with the major downward trend are Spain, Germany, UK and China. However, what has to be considered is that China will be one of the few countries that, according to early estimations, will maintain a positive GDP in 2020 and a positive level of consumption. China right now does not represent a main market for the Livenza furniture Cluster, but exploiting the Made in Italy brand, it could be a new target for the exportations.
- Transnational cooperation: right now, the level of internationalization has been reached mainly by big players which have been able to expand their markets. However, what is missed is the capability of the cluster as a single entity to communicate and collaborate with other European clusters and establish a commercial and professional connection. The European Cluster Collaboration Platform has over the years developed several programs aimed to support the international cluster collaboration and to promote cluster partnership, especially between SMEs. A transnational cooperation, especially between SMEs, has on one side the potential to open smaller companies to completely new markets and on the other to be the trigger for the development of innovation, since new knowledge can be brought in and exploited to reinforce the ecosystem.
- Creation of an observatory: the monitoring of the evolution of the cluster is currently carried on by private institutions, as Intesa San Paolo, which have therefore developed an observatory of clusters in general, not properly focused on the furniture industry. The implementation of a local observatory focused only on the evolution of the cluster can be a key instrument that, combined with the

national observatory of FederlegnoArredo, can be exploited by companies for developing their short-term and long-term strategies.

- Covid-19 and redesign of rooms: The coronacrisis, as it has been defined by The Economist, has brought to light the necessity of people to redesign the spaces in which they leave. The imposition of a lockdown, in particular, has forced everybody to consider the house as a complete space in which a person has the possibility to plan the entire day between work and leisure time. The necessity is particular evident whether small condos are considered, and this reveals new challenges for the design and furniture industry that have to deal with a totally new demand, which requires a clear definition of spaces. The need expressed by consumer is also directly linked to the requirement for healthier spaces of living that could be cleaned easier and without using chemical products. Moreover, these needs have not to be referred only to private consumers, but also to all the corporate clients, as hotels, restaurants, and in general public spaces, which have had a substantial impact in the furniture and design industry with the implementation of the contract production. in particular, in this case the new need is to redesign spaces in order to maintain the safety distances expressed by the decrees. therefore, also the production methods should be updated to satisfy the evolving demand. The cluster for this reason, and in particular SMEs, has also the possibility to dive a new phase of innovation, implementing new technologies and new strategies, adapting a new production method to the instable and evolving demand.

Threats:

- MNEs on the market: the competition of the market in the last year has been based mainly on cost-cutting strategies, in order to reduce prices, especially considering the working on semi-finished products and service providers, with a consequent loss of quality. However, highly vertically integrated groups have the possibility to exploit the scale effect and consequently reduce the final cost drastically, strategy that cannot be pursued in a cluster. For this reason, part of the demand, especially the one who does not consider design as a key factor, can be stolen and competition represent the main threat on the market.

- Globotics and automatization of manual work: from the point of view of the labor market, the evolution of technology represents a consistent threat, especially considering the globotics revolution (Baldwin,2019). The creation of a mechanized labor market could lead to the depletion of industrial commons that have been developed over 70 years of history, with a consequent loss of the capability of producing a high-quality product.
- Dependance on market tastes: the commitment in different markets implies that cluster's firms have to deal with different tastes and different consumers' needs. This means that whenever the demand changes, the cluster has to promptly react to variations and this is not always possible, since it may requires new investments and re-planning of the production chain and that on the market are present big highly vertically integrated groups able to re-shape the productivity chain in order to adapt their products to new consumers' needs. Moreover, Livenza cluster – and especially the Pordenone province – has based its products on wood as main raw material. So, radical changes on tastes of materials could represent a consistent threat for the furniture industry of Friuli Venezia Giulia.
- Dependance on complementary markets: in general, the furniture industry is highly correlated to the performances of other industries, such as the construction sector. A shock in a complementary industry could have consistent effects on the cluster and, due to the interconnection between firms, have chain reaction could happen. Similar effects can be triggered by changes in consumers' tastes in complementary products, but in this case it all depends from the strength of the demand and its capability to influence the correlated industries.
- Dependance on few European markets: one of the major strengths of the cluster is its presence of the European market and data on exportations prove this. However, has highlighted before, nine countries above all represent about 40% of all sales and this implies that a drop in the demand of a single country, triggered by the saturation of the market or other external agents, could cause a shock in the level of sales.
- Loss of part of the demand due to covid-19: the effect of covid-19 has drastically cut of part of the demand that was met by the cluster, in particular considering the HORECA sector and the naval industry. Right now, is unpredictable the effects that the evolution of Covid-19 could have on the furniture industry in the next 12

months and for this reason it represents a variable that has to be constantly monitored.

- Amplification of the external economic conjunctures due to interdependences: Considering the strong interdependence between SMEs and leader firms, whenever the economic scenario is modified by macroeconomic, political and other external events, the effects are spread through the whole cluster, as it is a single body. For instance, substantial changes in interest rates affect the capability of firms to get access to credit lines necessary not only to finance new investments, but in most of the cases also the day-by-day activities. This implies that on one side the cluster has the capability to react to the economic conjuncture as a single body, but the weakness of SMEs, especially when the financial structure is considered, makes difficult for the ecosystem to react promptly.

2.2.8 Methodology

The analysis of the Livenza furniture cluster has been mainly based on the most recent ISTAT data available obtained from ISTAT's online database and on the sectorial studies produced by Pordenone and Udine Chamber of Commerce.
In particular, ISTAT's database has been necessary to gather all the information concerning the number of economic activities and employees from 1950s to today and to identify the exportations trend form 1998 to today.
For both the datasets, on ISTAT's database has been created a filter in order to extrapolate the most precise data as possible. It has been created considering the ATECO codes (ATECO 16 and ATECO 31), the geography (Provinces of Pordenone and Udine) and the time period (the maximum possible).
However, a consideration concerning the financing tools has to be done. The author has tried to contact Friuli Venezia Giulia Region in order to obtain information on how many public funds have been distributed to companies through Rilancimpresa. The first call has been done on August 28th, 2020 firstly to the regional call center, which has passed the call to the specific regional department – Agenzia Lavoro e SviluppoImpresa.
After a series of e-mails, every one of them necessary to specify what the author needed, the director of the regional department have proposed herself to gather the necessary data concerning four Rilancimpresa's lines of financing: Research and Development, Innovation, technological investments and helps to crisis areas ("Aree di crisi diffusa").

After 37 days, the department re-called the author asking again for the necessary informations to gather the data and shifted the request to Area Science Park, a department created one year ago. After a third request for the data, the department assessed that it was not possible to extrapolate the data, since that the Region does not keep track of every line of investments but only of few of them.
For this reason, it has not been possible to assess how many funds has been provided to Pordenone's and Udine's wood and furniture firms.

CHAPTER 3: THE COVID-19 OUTBREAK AND THE EFEFCTS ON THE FUNITURE INDUSTRY

3.1 Introduction

The Italian economy is living one of the most critical periods of its history. After the 2008 financial crisis, only weak signals of growth have been registered, configuring a period of stagnation.

Covid-19 outbreak, therefore, has and it's still having disruptive effects on the Italian economy, putting in knees the nation.

From March 9th, Italy has been subjected to a very tight lockdown imposed by the government to safeguard the national health. Of course, the health measures have touched also the economic activities, which have been forced to stop in most of the cases. The only economic activities allowed were the essential ones, as supermarkets, pharmacies and firms appertaining to complementary industries. The lockdown has, so, forced the 48,8% of the firms, equal to 2,1 million units, to temporarily stop (Ansa, 2020) and this has jeopardized an already critic situation.

However, Covid-19 has not hit every country simultaneously, causing discrepancies on the implementation of the various lockdowns all over the world and misalignments on the stop of activities. moreover, the different implemented legislations have caused different effects, depending on the tightening of the measures applied by different States. Italy, being at the beginning of the emergency one of the most affected States, and for a period the most hit, has implemented a very rigid protocol, necessary to safeguard the national health and health system.

From the economic perspective, the lockdown has brought out all the companies' weaknesses, especially whether small and medium sized firms are considered. In particular weaknesses have to be referred to liquidity issues and weak financial structures

From the economic perspective, the lockdown has brought out all the weaknesses of companies, especially small and medium sized, and in particular the liquidity issues and the positive, but weak trend of exportations, due to the partial stop of foreign demands.

This has inevitably triggered a crisis which today has still uncertain effects on the future of Italian economy, since that the emergency has not been overcome.

The following analysis will describe the effects on the "corona-crisis" firstly at an Italian national level, designing the framework of what happened and which instruments have been implemented to contain the crisis. Also, a brief consideration on the phenomena of re-shoring will be done.
Secondly, the focus will be shifted on the wood and furniture industry, with a particular attention to the North-East of Italy and the cluster of Friuli Venezia Giulia. The last section will analyze the potential new paths that the furniture industry may undertake to revive itself and reshape the trajectories for a new beginning.

3.2 Effects on the Italian economy: how Covid-19 have changed it

During the pandemic, Italy has been one of the hardest hit countries, both from the health system and economic perspective.
The almost three lockdown months have brought to light all the weaknesses of an economic system that still had the visible scars of 2008/09 financial crisis.
As highlighted by Moreno *et al.* in their "The Global Financial Crisis and the COVID-19 Pandemic", is possible to sketch some linkages between the effects of the financial crisis and the outcomes of covid-19 pandemic.
2008 crisis affected mainly the economic system mainly from the financial perspective, but this had an effect also on the public expenditure, especially on the healthcare system, and on the economic fabric and market labor, where several cases of "zombie firms" continued to survive thanks to financial helps from banks and government despite their incapability of produce real sources of value.
This vicious circle made the system weaker and during the explosion of the pandemic it has not been able to respond promptly to the emergency.
Moreno *et al*. highlight three main problems that have conducted the system to be weaker. The first are the costly bank bailouts which during the years have drained the governmental public expenditure, especially on the healthcare system, and this have made the pandemic more challenging.
Moreover, the fragmentation of the Italian healthcare system has created profound discrepancies between the various regions, which have responded differently to the pandemic. For instance, Veneto and Lombardia, two of the most hit regions have adopted very different approaches to contain the outbreak. In particular, Veneto has immediately

closed the “red zones” of pandemic, in order to restrict the outbreak in a limited area, and simultaneously decided to test the population despite the quantity of symptoms and recreating the network of contacts of the person who manifested the illness; differently, Lombardia, faced the problem testing only the persons which manifested all the Covid-19 symptoms and, despite this, the health system has faced an overload.

The differences on the progression of the outbreak have also to be attributed to the density of population, which have contributed to spreading the virus especially in high density regions as Lombardia.

The second issue that has been carried on by 2008 crisis and that had repercussions also on the corona-crisis is the constrained SMEs credit, which had reduced the capability of firms to innovate, to grow and to constantly feed the labor market, causing a raise in the youth unemployment rate.

Beside this it has also to be highlighted the weak financial structure of several SMEs, which have found themselves without enough liquidity to survive to the thee lockdown months, especially whether firms with high fixed costs are considered.

The forced stop of activities has drained the capability of firms to produce liquidity but, at the same time, the cash outs related to suppliers, bank loans, taxes and employees have only partially been contained causing an imbalance on the cashflows of companies. These problems can be seen especially within manufacturing industries, characterized by high fixed costs. In Italy manufacturing activities weight for about 15% of the national GDP and services for 66% (Istat, 2020).

Moreover, considering also that quarantine measures have not been applied uniformly in all the European countries, the level of exportations during the three months of pandemic have seen a consistent drop.

The presence on the market of Zombie banks is the third issue highlighted by Moreno *et al*.. Zombie banks are financial institutions that are able to continue operating thanks to the implicit or explicit support of the government. Their presence on the market together with zombie firms makes the economic system weaker and unable to respond to unpredictable events as Covid-19 outbreak.

These three issues reveal that there is a connection between the two crises and that the financial crisis had undermined the system.

Two months after the ease of lockdowns is possible to evaluate the damages caused by the pandemic on the economic system at a micro and macro level, even if the overall

effects are still unpredictable because of the impossibility of foresee the evolution of the events.

During the first quarter of 2020, the Italian GDP has seen a first contraction of 4,7% which have incremented to 9,2% during the second quarter (Banca d'Italia, 2020). The three elements that have contributed to the shrink of Italian GDP are the reduction of consumption, the contraction of exportation level and the reduction of investments.

In particular, lockdown measures have forced families to stay at home in most of the cases, allowing only the necessary needs. This has produced a strong contraction in the consumption of 4% in the first quarter (Istat, 2020) of every kind of good except from food and home goods, and it's expected to be -8,9% in 2020.

In fact, only primary necessity activities were allowed to stay open during the quarantine. Also, the stringent rules implemented to reduce the diffusion of the outbreak have caused several problems on deliveries and many industries strictly connected to the primary necessity goods (e.g. packaging producers) have not been able to satisfy an unexpected increase in demand.

However, according to forecasts produced by Banca D'Italia, expectations for the next two years are positive, with a rise of 4,7% in 2021 and 1,5% in 2022 in family consumption levels.

The two components of the Italian GDP that have been most hit are surely exportations and investments.

The foreign demand of Italian goods and services is principally referred to European countries and USA, which have faced a slightly delay in the explosion of the outbreak. This conjuncture has triggered worsen effects on the level of Italian exportations, because initially the lockdown has stooped the ongoing orders and now even if containment measures have been eased and production can restart, Italian firms approaches themselves to a shrank market.

Moreover, what has to be considered is that in the previous years the foreign demand of goods and services was already facing a slowdown, due to the overcoming political and economic events in Europe as Brexit and the saturation of German demand.

The background in which the Italian exportations were sailing was not the best at all and, as highlighted before, the residual effects of the 2008 financial crisis have contributed to make the corona-crisis even worse.

However, the first quarter of 2020 has registered a positive, even if low, increment in the level of exportations, which have been crashed during the second and third auarter.
According to data produced by Banca D'Italia and ISTAT, in the first quarter the exportations have registered a +1,7%, while forecasts for 2020 are very negative, with a -15,9%.
Repercussions on the Italian economy has also to be attributed to the fall of tourism and consequently affecting also the related complementary industry, included furniture, and the labor market, in particular the seasonal labor market. The stringent rules imposed by governments and the common fear of people has caused a reduction of 93,2% of the foreign presences, but also the domestic market has seen a slowdown, with a reduction of 67,2% (Federalberghi, 2020).
The worst data that contributes to the shrink of Italian GDP is for sure the reduction of investments. The impossibility of firms to produce cashflows during the lockdown period and the reduction of the internal and foreign demand produce awful effects on their capability to invest.
Data forecast a fall in the level of investments of -15% in 2020 but also a growth in the following two years of +7,4% in 2021 and +4,9% in 2022 (Banca D'Italia, 2020).

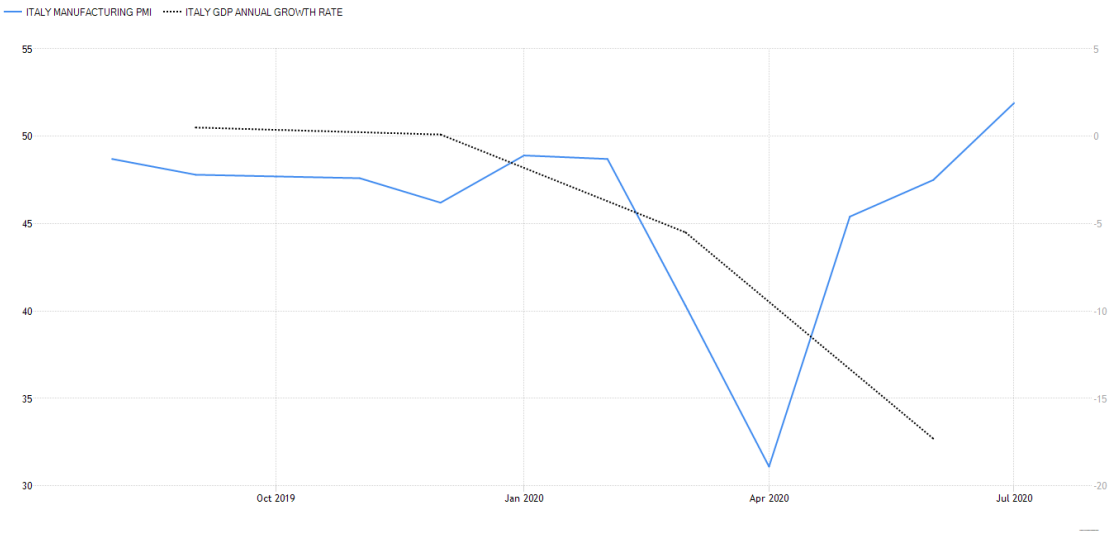
		Giugno 2020			Gennaio 2020		
	2019	**2020**	**2021**	**2022**	**2020**	**2021**	**2022**
PIL (1)	0,3	-9,2	4,8	2,5	0,5	0,9	1,1
Consumi delle famiglie	0,4	-8,9	4,7	1,5	0,8	0,8	0,9
Consumi collettivi	-0,4	1,4	0,5	2,4	0,3	0,3	0,2
Investimenti fissi lordi	1,4	-15,0	4,7	4,9	0,4	1,7	2,1
di cui: Investimenti in beni strumentali	0,4	-16,4	7,4	4,2	0,4	1,6	2,3
Investimenti in costruzioni	2,6	-13,3	1,6	5,8	0,3	1,9	1,9
Esportazioni totali	1,4	-15,9	7,9	5,4	1,7	2,5	2,7
Importazioni totali	-0,2	-17,4	9,5	4,8	2,3	2,4	2,6
Prezzi al consumo (IPCA)	0,6	-0,1	0,0	0,8	0,7	1,1	1,3
IPCA al netto dei beni energetici e alimentari	0,5	0,5	0,2	0,3	0,7	1,1	1,4
Occupazione (ore lavorate)	0,4	-9,9	5,1	2,8	0,4	0,6	0,7
Occupazione (numero di occupati)	0,6	-3,9	2,4	1,1	0,4	0,5	0,6
Tasso di disoccupazione (2)	9,9	10,6	11,0	10,9	9,7	9,6	9,4

Tab 3.1 forecasts on Italian GDP. Source: Banca d'Italia

Another indicator that describes the situation of the Italian economy is the purchasing managers' index (PMI). PMI is an index of the prevailing direction of the economic trends in the manufacturing and services sectors and is derived by monthly surveys sent to 400

companies in the 19 primary industries. It is based on five surveys areas: new orders, inventory levels, production, suppliers' deliveries, and employment.

The following chart describes the monthly changes of the Italian PMI in the last year[12].



Tab. 3.2: Italian PMI and GDP in the last years. Source: Tradingeconomics.com

The blue line describes the Italian manufacturing PMI and, as can be seen, after a flat end of 2019, a slightly grow was registered in the beginning of 2020.

The consistent fall is highlighted especially in April, the central lockdown period in which nearly almost all manufacturing activities were closed. However, the most interesting data is surely the uptrend after April's fall, which implies a restart of the Italian manufacturing activity.

In particular, the Istat's monthly report on the Italian economy evidences an increase in export and import level, raised respectively by 35% and 5,6% with respect to the previous month and this is the first sign of the reaction of the Italian economy after the lockdown moths. The recovery is expected to extend in the moment in which this thesis is written and in the following months, also thanks to the improved business confidence.

Also, consumption levels have reached the pre-crisis levels, sign that also consumers have restarted to adapt their daily routines, even if the lifestyle has changed.

[12] Data have been downloaded from https://tradingeconomics.com/italy/manufacturing-pmi

However, losses registered in the first quarter will inevitably affect the results of the current year and the recovery will also depend by the economic relief measures issued by the Italian Government to support business and families.

3.3 Instruments adopted by the Italian government to contain the effects of the outbreak and favor the restart

Immediately after the start of the outbreak, the Italian government have activated a series of financial and fiscal measures aimed at stem the effects of the upcoming crisis.
On March 17th the emergency decree "Cura Italia" have been presented and it have been focused on the reinforcement of the healthcare system and on the problem of liquidity of enterprises. In particular, 5.15 billion euros have been allocated in the healthcare system in order to hire 20 thousand healthcare workers, to buy and stock breath masks and materials for their safeguard and to increase the ICU beds. For workers and families, 10 billion euros have been allocated for the Wage Integration Fund and Supplementary Fund - also known as "Cassa Integrazione" – and other 5 billion euros have been allocated for the supply of liquidity for companies. Also, the decree has stated the temporarily suspension of mortgages and loans and provided new guarantees incrementing the SMEs Guarantee fund.
Guarantees for SMEs have than been raised in April with the "Liquidity Decree" which provides a public guarantee in respect of new loans that will be granted to Italian companies by banks and financial institutions (Cerved, 2020).
However, due to the extension of the outbreak, new measures have been presented with the decree published in the Official Gazette on May 19th, also called "Rilancio Decree", reviewed on August 14th.
With its 266 articles, the decree states 155 billion euros to support the restart of the Italian economy and to incentivize the internal expenditure of families.
In particular, for companies two measures have to be highlighted:

1) Cancellation of the IRAP balance and June deposit payments: measure principally aimed at sustaining small and medium enterprises up to 250billions in revenues
2) Provision of a non-refundable aid for companies with an annual revenue between 0 and 5 million euros and, in addition, 1,5 billion euros for facilitations on business rents

Moreover, another 34 billion euros have been allocated to the SMEs guarantee fund and 12 billion euros have been allocated to Regions for the payments of the public administration dues.
For the restart of consumptions, measures on the reduction of the fiscal pressure and, in particular, the postponement of the tax payments to September 16th, reduction if the VAT on medical dispositions and the cancellation of the safeguard clause until 2021 that force the government to increment the VAT to respect the fiscal boundaries imposed by the EU.

3.4 Covid-19 and reshoring

The rapid spread of Covid-19 and the unexpected closure of China has revealed the weaknesses of the outsourcing and offshoring strategies that have been adopted by companies, especially considering big and highly integrated groups, and the vulnerability of Global Value Chains.
In the last 30 years companies have developed their production strategies exploiting the low wage Chinese labor and many critical nodes of the GVCs have been located there too. However, the spur of Covid-19 and the consequent stop of production in China has demonstrated that the fall of only few critical nodes can produce disruptive effects on the global economy. All the investments done to establish a direct line of contact with China has revealed to be unsuccessful during the outbreak, as well as the reliability on China for the supply of intermediate goods.
The idea that most of the companies are developing right now is to re-shore, or at least near-shore, part of the production chain in order to gain more control over the production process also during unexpected future events.
During the last years, many firms have started to considered re-shoring as a new long term strategy, in part due to the lower cost of labor , but also to thanks to the growth of new automatization processes which require less and less low skilled workers, but at the same time highly qualified technicians (Corò, 2020).
Also, proximity, which has been considered a minor variable before Covid-19, is now element of great interest in the reshape of the production strategies and design of the supply chain.
The idea is that firms have figured out that, since GVCs are mostly based on the trade of intermediate goods, relying too much on a fragmented system characterized by long

distances might reduce their resilience on external shocks and that fining a new supplier during a similar event can be difficult and very costly (Cerved, 2020).

The same configuration of events would not have happened whether a similarly fragmented system, but developed with a certain proximity, were established. The production chain developed within a cluster might have reduced the effects of the break of the GVCs, simply because there are not misalignments between the supplier and the producer. Also, considering that in most of the cases the supplier is characterized by a specific knowledge that is necessary to produce the semi-finished product, finding another firm prepared enough can be very difficult and very costly.

For these reasons many companies have started to think to reshape their strategies looking at re-shoring as a potential solution to be less exposed to unpredictable events or, in the case in which a similar strategy was already planned, Covid-19 outbreak may accelerate it.

Many industries are obliged to pass from China to be supplied. The most threated industries are for sure automotive, pharmaceutical and textile that exploit the lower costs of China and directly depend from it.

Probably, the phenomenon of re-shoring will not take place in the short run, since companies might adopt a "wait and see" strategy, waiting for the re-establishment of normal levels of uncertainty. But for sure in the medium and long run companies will consider the possibility of locating part of the production near the core businesses, reaching a trade-off between costs and control.

3.5 Covid-19 in the furniture industry: how the internal and external demand has changed – focus on the Livenza furniture cluster, Pordenone's area

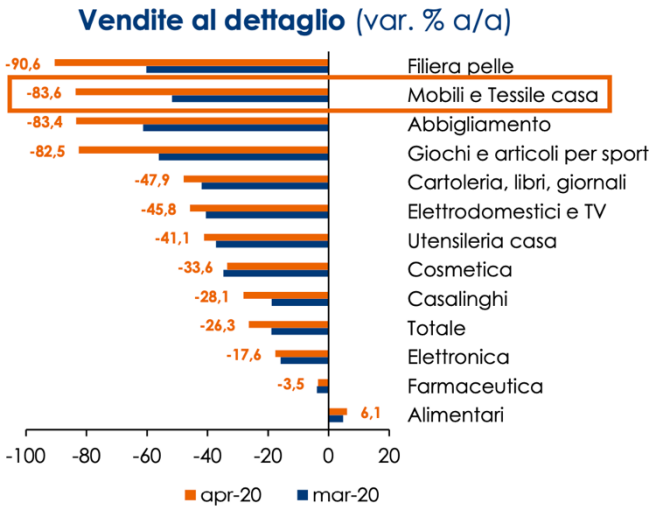
Furniture and wood industries have a particular relevance on the Italian economy and is considered as a core component of the Made in Italy.

A great contribution to this success has to be attributed to the foreign sales, which weighted for 11,8 billion euros in 2019 and made Italy the third most important exporter of furniture behind Germany (17,8 billion euros) and Poland (15,4 billion euros). For sure, a substantial contribution to the Italian success has to be attributed also to the lineup of the production chain, based on the presence of mostly small and medium suppliers able to provide to leaders of the industry the best quality and, at the same time, a form of flexibility.

The Covid-19 crisis has inevitably affected the wood and furniture industry, in particular because of the drop of consumptions, as evidenced in the previous paragraph, both internal and external.

Moreover, the forced stop and the delay in the activation of lockdown measures in different countries have depleted the performances of the industry.

The framework pictured by Foresti and Moressa (2020) for Intesa San Paolo confirm the severity of the crisis. The only sector that has registered a positive growth in sales is food, with a +6,1% from year to year. All the other industries analyzed register a negative sign. In particular, leather and furniture industries, which are in part complementary, have registered respectively -90,6% and -83,6% from year to year making them the worst performers in April 2020.



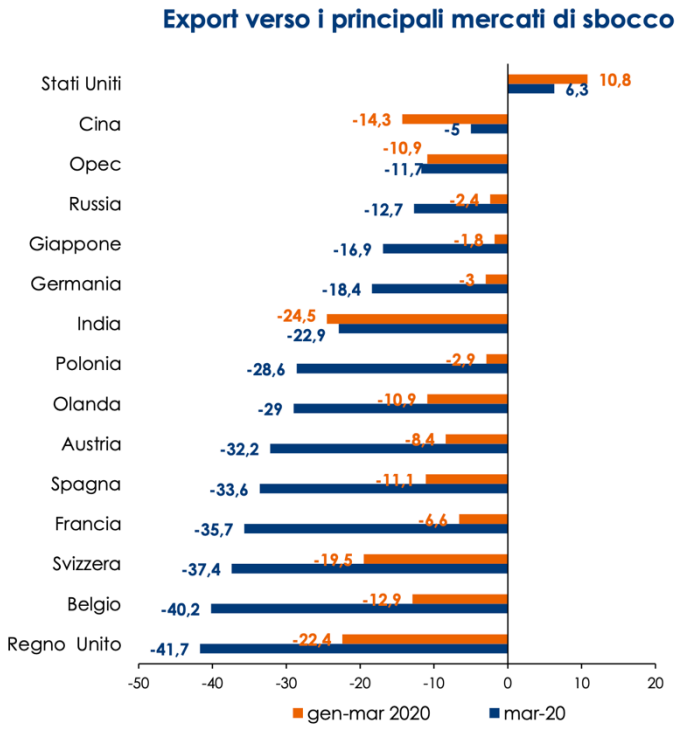
Tab 3.3: percentage change of retail sales in March (blue) and April (orange). Source: elaboration by Foresti and Moressa for Intesa San Paolo on ISTAT's data

According to the analysis conducted by Confartigianato on July 2020, micro and small enterprises in the wood and furniture industry have lost the 72,2% of their revenues on April, due to the consistent drop on new commissions by the leaders of the market. The same study evidence a slightly recovery on May, but the economic downturn is still heavy, with a revenues' drop of -41,8%.

The problem has not to be attributed only to the consistent reduction of the exportation, caused mainly to the delay in the application of lockdown measures, but also to the drop of internal demand.

In the bimester March-April 2020 exportations of the wood and furniture industry have registered a drop of 46,3%, equal to 1 billion euros, which, if considered in the first third of 2020 is equal to a -24,1% in exportation, nearly double with respect to the decrease in the whole manufacturing system (Confartigianato, 2020).

In particular, the drop of exportations has to be referred to European countries, the most important foreign trade area for the furniture industry. The following tab shows the data on furniture export for the main external trade markets.



Tab. 3.4: Export of the furniture industry divided by country. Source: elaboration by Foresti and Moressa for Intesa San Paolo on ISTAT's data

As can be seen, only the United States have registered a positive value. All the other countries have reduced drastically their expenditure in furniture and wood products, especially considering the Euro Zone, which is the main market for Italy. UK, which is also the main external market for the furniture industry of Friuli Venezia Giulia registers a -22,4% in the first trimester of 2020 and the most consistent drop whether considering only March.

Despite the severe effects of the outbreak on the Chinese economy, represented also by the strong drop in demand in the *tab 3.3*, it has not to be considered a real problem. In fact, China is still not the most important foreign market, even if before the outbreak there

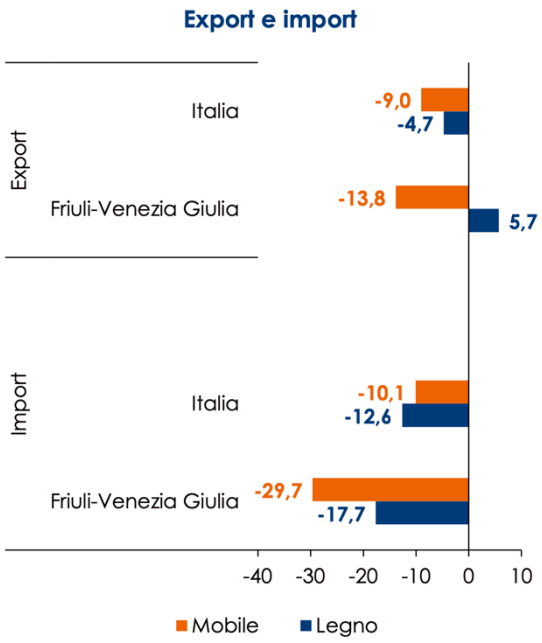
were all the conditions for establishing a new important channel thanks also to the creation of the New Silk Road and consequent implementation of the logistic system.
At the same time, the internal demand has faced even a more consistent drop, with a -13,1% in revenues between January and March (Intesa San Paolo, 2020), which have dropped to -53,7% in the three months of lockdown (March, April and May) (Confartigianato, 2020). In this case the main issue has been represented by the closure of the furniture showrooms that have re-opened with a certain delay with respect to the restart of the production.
Considering, now, the outbreak in Friuli Venezia Giulia, data reveals some countertrends. The analysis conducted by Foresti and Moressa reveals that the level of exportations of Friuli Venezia Giulia for the furniture industry have registered a worse performance with respect the average in Italy. Exportations have decreased by 13,8%, while the average on Italy is -9% from January to March 2020.
This may be due by several reasons. First of all, the external demand was already weak, especially considering Germany, which is facing a slowdown from 2018, especially considering the manufacturing industries, particularly affected whether considering the issues related to the automotive industry and the CO2 emissions (Döhrn, 2019)[13]. This has caused inevitably a reduction on consumptions and the Italian furniture industry has been affected too. Moreover, looking at the medical development of the outbreak, Northern Italy has been particularly hit and this have had a reflection on the level of consumptions. Also, again, the main issue is that furniture showrooms have re-opened to the public with a certain delay, so, even if the needs of consumers have changed due to the forced lockdown, people was not able to produce a demand.
Similarly, also imports have diminished more than the rest of Italy, for the same reason. A 29,7% for the furniture industry and -17,7% for the wood industry, which is mainly referred to the semi-finished product markets, have been registered. This is mainly due to the fact that Friuli Venezia Giulia wood industry exploit mainly foreign raw materials, coming from Austria and Germany. However, the forced stop in production has imposed firms to cancel their orders, whether it was possible, causing a reduction in the import levels.

[13] Interview Il Sole 24 Ore February 14th, 2019 "La Germania cresce meno: perchè? Rispondono cinque guru tedeschi" by Bufacchi, I.; link: https://www.ilsole24ore.com/art/la-germania-cresce-meno-perche-rispondono-cinque-guru-economisti-tedeschi-ABulDtTB

What is interesting to notice is that the wood industry has registered a positive variation in the level of exportations. The fact hast to be attributed to the relationship that there is between the furniture and the wood industry. Even considering historical data, there is always a certain delay in the effects of a shock for the wood industry. Since that the wood industry is at the beginning of the supply chain and that the outbreak has hit firstly consumers, the effects of the shock arrives with a slightly delay and for this reason exportations for the wood industry have registered a +5,7% from January to March. Similarly, of course the positive effects that may come from a revive of the demand may be registered with a similar delay.

Overall, the wood and furniture industry of Friuli Venezia Giulia have registered a weighted average of -11,6% in the exportation levels.

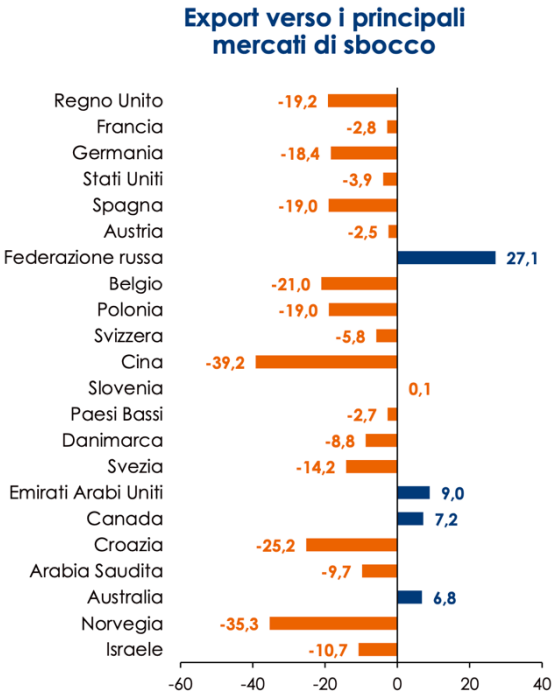
All data are summarized in *tab 3.5*:



Tab 3.5: import and export in the wood (blue) and furniture (orange) industries in the first three months of 2020. Source: elaboration by Foresti and Moressa for Intesa San Paolo on ISTAT's data

Looking now at the main trade markets, what can be seen is again an interesting result. The Euro-zone overall is the most affected and the main cause of the reduction in the level of exportations. UK, Germany and Spain, three of the main markets have decreased their importations of Italian furniture of almost 20%. The most consistent variation has to be

attributed to China and Norway. However, those are not neither in the top ten of the most important foreign markets for Friuli Venezia Giulia, even if China was recording a very positive trend in the previous years, due to the pact between Friuli Venezia Giulia and China for the implementation of the necessary infrastructures to connect the two markets, a project started thanks to the creation of the New Silk Road.



Tab 3.6: Friuli Venezia Giulia exportation data in the first three months of 2020. Source: elaboration by Foresti and Moressa for Intesa San Paolo on ISTAT's data. NB: countries are in descendent order considering their weight on Friuli-Venezia Giulia's furniture industry performances

Going deeply on the effects of the Covid-19 outbreak in the Friuli Venezia Giulia furniture industry, Cluster Arredo FVG has conducted an interesting survey among the principal companies operating in the territory in order to outline the dimension of the damages caused by the shock. The 59 surveyed companies come from the wood industry (ATECO 16) in 25,4% and from the furniture industry for 61,1% from the furniture industry (ATECO 31).

The first data that have to be considered is the rate of orders cancellation. 93,3% of the surveyed firms have not registered a reduction of the already confirmed orders or, in the worst case a reduction of 25% in the first two quarantine months. Probably, the cause of concern is the fact that the 78,1% of the interviewed which have faced cancellations in

orders has declared that they have not been able to recover them after the reopening. This implies that 4 out 5 orders have not been recovered during the restart of the production activity.

In fact, only nearly 17% of companies have reopened at their full capacity, but the 59,3% of them have reopened with a capacity between 50% and 100%. During the lockdown period, the 99% of the surveyed companies have required the "Cassa Integrazione". The full capacity restart may be associated not only to a restart of the internal demand, which have been weak especially during the first days of the reopening, but mostly to evade the old orders that have been stopped six months ago.

For what concerns revenues, during the months of March and April the 39% of the firms have registered a revenues' drop up to 25% and the 35,6% of them a drop up to 50%. So, the champion is divided in two parts. What is reasonable to think is that the remaining 39,6% that have suffered more are mainly contractors who directly depend from the leading firms' orders.

The data describes a situation of suffering for the companies of the cluster. In fact, even if the cut of orders has only partially touched companies, the data on revenues reveal that firms have been hardly hit by the outbreak and the forced closure. Moreover, considering the high level of fixed costs that companies have to bear and the absence of cash inflows, the major problem that has to be highlighted is the potential lack of liquidity, especially for companies that in the previous months have invested in new fixed assets.

Also, considering the expected performances set before the outbreak and the new orders, companies have revealed a weak restart. 40,7% of them have registered a decrement of orders up to 70% and 30,5% of them a decrease up to 50%. This picture, taken immediately after the ease of the lockdown measures is also due to the fact that the demand has not restarted immediately, because of the delay in the reopen of furniture showrooms, the main vehicle for sales, but also because the foreign restrictions have been eased with a certain delay too and so the foreign demand has not restarted contextually with the reopening of the production lines.

3.6 Opportunities brought out by the crisis: which are the new trajectories that should be followed by companies and how the corona-crisis may change the furniture industry

What is clear from the previous analysis is that wood and furniture have been two of the most hit industries by the outbreak.

However, another consideration has to be done.

All the shocks that have caused the drop of the performances of the furniture industry has to be considered exogenous. None of them is internal to the market and none of them has to be attributed directly only to the furniture industry.

For this reason, what is necessary to analyze is the key variables that may determine a potential recovery in the next months and in the next years.

The first one has surely to be the change in consumers' needs, both from the business to consumers and the business to business perspective.

Being forced to stay at home for a long period, people have understood that houses were not functional as how it was thought. In particular, the introduction of work from home has revealed the need for a house spot dedicated to working hours and different from every space used for leisure time. Moreover, new needs concern also the cleanliness of surfaces, which have become a request that have forced companies to develop new technologies. Beside these critical requests, consumers have also understood how to live in their private spaces and focused new needs in terms of practicality of the spaces.

In order to stimulate the new demand for furniture, the Italian government has also extended the "furniture bonus" that provides a fiscal incentive to consumers up to 50% of the value of the expense for a maximum of 10.000€.

A similar reasoning can be done for working spaces, as offices. The new disposition provided by the Italian Government force workers to maintain a safe distance in order to reduce the threat of virus spread. For this reason, as like houses, offices have to be re-designed and spaces have to be re-thought in order to make them safer and more practical.

According to Giulia Molteni, chief marketing officer and member of the board of director of the furniture group Molteni&C., one of the most important furniture groups in Italy, the challenge of the next months will be the redesign of working spaces, in order to respond to an increasing demand of healthier and more practical offices in which employees have

the possibility to work in safe and at the same time interact, exchanging ideas and exploiting all the synergies that can born from co-location[14].

Simultaneously, the adaptation of the offer to the new demand may open the furniture industry to new markets that previously were only partially exploited, for instance hospital and school supplies.

The outbreak has revealed all the weaknesses of the healthcare system and its low level of readiness for unexpected events. For this reason, it is reasonable to think that in the next years an upgrade of the whole medical system, included on the furniture perspective. However, the specialized producers are not able to satisfy the skyrocketing demand, as can be seen for the school supplies in the days in which this thesis is written.

The production system will necessarily be in part converted to satisfy the demand and this can be an opportunity for the industry to innovate.

Other variables that have to be considered concern the production chain. In particular, are the healthiness of workplaces and proximity.

The speed of adjustment of the production lines is right now a fundamental variable that has to be considered since that changes in the chain may slowdown productivity and reduce the capability of the firm to be competitive and make time elapse. In order to do so, companies have to innovate and invest not only in new technologies, but also on designing new strategies able to improve productivity without losing customers.

For instance, within the Pordenone furniture cluster, many firms have adopted beside all the mandatory breathing equipment a new working schedule, especially considering small enterprises that before the outbreak have always planned working day of 8 hours divided between morning and afternoon.

The new working schedule has been designed in order to concentrate all the working hours in the first part of the day, avoiding in this way gatherings during the lunch break[15]. Moreover, similar changes do not only constitute a form of protection for the workers, but it has revealed as an improvement of the production chain.

In fact, beside the improvements in terms of healthiness of the workplace, a single work shift has the advantage to reduce wastes of time and wastes of energy. It has to be considered that the Pordenone furniture cluster has the characteristic to work mainly

[14] Interview published on Youtube by Marco Montemagno (July 29th, 2020). Link: https://www.youtube.com/watch?v=olSoAbC0dP8

[15] The strategy has been described by cluster's entrepreneurs during the interviews conducted by the author.

with the just in time production philosophy and this implies that several times during the working hours machineries have to be reset.

Designing a single work shift and planning properly the working day, companies have affirmed that they have been able to improve the production process and also reduce wastes of energy caused by the switching on and off of the production lines.

The key factor that allows to the cluster to elaborate a similar planning of the production line is proximity.

Veneto and Friuli Venezia Giulia furniture firms which are part of the Livenza cluster are characterized by the lower average supply distances. Veneto, at the first place, registers a distance of 68 km and Friuli Venezia Giulia 78km. This implies that firms have established strong relationships during the years and developed the capability to synchronize themselves and adapt the production chain to any shock.

The cluster economy that have been formed can be a critical success factor for the restart after the covidi-19 outbreak. The territory, which is already fulfilled by knowledge and strong relationships represent a fertile ground for the development of innovation, both strategical and technical.

Firms of the supply chain have always combined their work and skills to provide to the market a high-quality product but with a competitive price. In fact, the cluster has the fame to provide one of the best quality price ratios.

Within a market that is evolving rapidly, proximity becomes a critical resource that have to be exploited by companies and that can provide rapidity in the development of new surfaces and new solutions able to fulfill the requirements tightly connected to the redesigning of spaces.

First sign of innovation after the outbreak have already been developed. For instance, “Welcome Area” is a project developed by Cluster Arredo FVG which keeps track of all the logistic system in order to safeguard the life of every worker. With the use of a QR code, the operators have the possibility to register themselves at the entrance of the company that adhere to the project and in this way it’s possible to keep track of all the movements that take place within the cluster.

Another innovation that have been introduced in the cluster is the surface treatment. Several companies have started to develop new antibacterial treatments that, in most of the cases, exploit the disinfectant power of silver in combination with nanotechnologies.

This also introduces new certification standards, increasingly required by consumers, beside the environmental certification already introduced in the cluster.

The corona-crisis that we are still living has heavily affected the wood and furniture industry, especially the area of Pordenone and Treviso, and all the data that describe the drop of exportations and the reduction of internal demand prove it.

However, the cluster has developed over its history a complex system of relationship and a shared knowledge that have to be considered the starting point of the restart, in order to revive the industry.

As every shock, also the covid-19 outbreak brings with it a series of opportunities that have to be exploited as fast as possible. The change of internal and external demand, the openness of new markets, which before were considered niches, and the possibility to innovate a supply chain that was stuck from several years have to be considered the focus for the design of the new trajectories and long-term strategies.

Unfortunately, it's impossible to forecast precisely the new scenarios that will be outlined after the end of the outbreak, since it still does not have a definite end. However, the restart has not to wait and companies, all together, have to respond to the crisis, exploiting the success factors that have led the cluster to be one of the cardinal points of the Italian furniture industry.

3.7 Methodology

The analysis of the data presented in the chapter has been based on the most recent and reliable data produced by ISTAT, Intesa San Paolo, Cerved and Banca d'Italia and Cluster Arredo FVG.

1) ISTAT monthly reports are available on the website and are produced by the ISTAT's division for data analysis and economic, social and environmental research. On monthly basis they report the outlook at a global and Italian level of the Covid-19 effects at a macro level, comparing it with the previous month.
    a) March 2020 report have been necessary to understand the initial impact of the outbreak in the Italian and world economy and the first estimation on the short-run, especially considering the already existing framework in which Covid-19 have hit;

b) May 2020 and June-July 2020 reports have than been used to understand the evolution of the outbreak and to analyze the potential restart of the economy.

2) Cerved report, available on the website, has been necessary firstly to analyze the purchasing managers' index in the first months of the outbreak, but also to compare data on the Italian GDP provided by the most important institutions. This has been useful to figure out the expectations on the potential restart in 2001
3) Banca d'Italia's report, available on the website, has been necessary to analyze the variation on the GDP components and to summarize the forecasts for the next two yeras on the growth of Italian economy.
4) Intesa San Paolo's report produced by Forest and Moressa (2020) have been gently provided by Cluster Arredo FVG. The report has been based mainly on ISTAT's and internal data – Intesa San Paolo has an observatory for all the Italian districts and clusters divided by region. The outlook produced have been necessary to picture the framework designed by the outbreak in the furniture industry and in particular to understand the evolution of the dynamics of internal and external demand. in order to contextualize them, an analysis of the contributing factors have been produced by the author
5) Cluster Arredo FVG's survey has been gently provided by the authors and it's not freely available. It summarizes the actual framework in the wood and furniture industry in Friuli Venezia Giulia region and the forecasts for the future from the perspective of the local entrepreneurs. The survey has been based on 59 champion firms, mostly small and medium enterprises. The champion has been carefully selected in order to have the most reliable dataset considering the actual configuration of the events. The survey reports also the future expectations of the interviewed entrepreneurs.

The analysis of the effect of the outbreak in the Pordenone furniture cluster have also been based on interviews conducted by the author from August 10th to August 14th in which five managers and entrepreneurs have been interrogated on the effects of the outbreak and on their future expectations. The respondents have asked to remain anonymous. Similar questions have been done to Carlo Piemonte, Director of Cluster Arredo FVG which have expressed his concerns and forecasts about the future of the Friuli Venezia Giulia wood and furniture industry.

CHAPTER 4: SMART SPECIALIZATION STRATEGY – HOME SYSTEM'S INNOVATIONAL PATH IN THE NEXT SEVEN YEARS

As described in the previous chapter, Covid-19 has neutralized almost every effort produced to revive the world economy after the previous 2008 and 2012 crisis.
Italy, being one of the first countries that went through the effects of corona-crisis, especially considering the healthcare emergency, is now facing the economic side effects produced by the lockdown.
However, as every previous crisis, also covid-19 brings to light new potential opportunities, considering, for instance, the new consumer's needs in terms of redesign of work and home spaces, social distancing and safety measures.
Considering the Italian economy and its conformation, this crisis represents, so, a valid opportunity to innovate. Especially for the wood and furniture industry the requirements that the market is doing nowadays represent the opportunity to reshape and renovate a sector that has been partially sticked in old work methods and old materials. In simple words, this is the opportunity for the industry to innovate.
The following chapter has been written with the aim of reason on the potential evolutionary path that companies of Home System – a Friuli Venezia Giulia's specialization area which includes the wood and furniture industry – may face in the next seven years. In order to do so, Smart Specialization Strategy will be used as a tool. Finally, in the end, the four potential innovational paths will be presented under the form of "development trajectories".

4.1 The Smart Specialization Strategy

4.1.1. From the Lisbon Strategy to S3

In the past twenty years, the European Union has developed several ambitious strategies aimed at achieving long terms goals, such as the reduction of poverty, the economic and social development and the enhancement of the competitiveness of one or more European regions (Borrás and Radeaelli, 2011).
According to Borrás and Radaelli (2011), these initiatives are mostly related to governance architectures, since they respond to three fundamental requirements: they

adopt a strategic approach, holistic and long term oriented for the resolution of a long term issue; they set concrete output oriented goals; and they include the coexistence of old and new organizational structures.

The first attempt to pursue similar goals is the Lisbon Strategy in 2000. Its goals were very wide: reduction of unemployment, enhancement of competitiveness of the EU member states, social cohesion, all with the aim of creating a knowledge based European economy (Soriano and Mulatero, 2010).

The real change brought out from the Lisbon Strategy is for sure the governance methods adopted in order to pursue the strategy itself. In fact, beside the classical governance instruments, an open method of coordination has been adopted. In particular, it provides a new intergovernmental framework of operation for which more freedom concerning the adoption of the measures is left to the various national governments.

However, the Lisbon Strategy has not been a true success. According to the European Commission, three main issues has been underlined: the lack of innovative and entrepreneurial culture of the research centers, the scarce private investments in research and development and the incapability of transforming the innovations into commercial opportunities (Soriano and Mulatero, 2010).

For these reasons, in 2009 a group of experts coordinated by Janez Potočnik have developed the Smart Specialization Strategy (S3) with the aim of reinvigorate the Lisbon Strategy.

The theoretical framework that describes S3 has been published in *Knowledge for Growth*, which also defines some guidelines for its implementation.

The need for a new plan has also to be linked to three main issues of the European union with respect the other developed economies and their investments in innovation plans:

- Fragmentation: with respect the US, for instance, the European Union is characterized by a deep fragmentation, *in primis* considering its 27 Member States, each of them with a variable number of Regions. This aspect implies that every Region is characterized by its own field of knowledge, developed over the years. For instance, in Germany the Baden-Württemberg is the cradle of the automotive industry or the widely analyzed Livenza Furniture Cluster, which is one of the European reference points for the wood and furniture industry. This heterogeneity has its pros and cons, since on one side it is possible to evidence the presence of

hotspots, but on the other may cause miscomprehensions in terms of knowledge sharing and this reduces competitiveness.

- Silicon Somewhere: beside fragmentation, two dangerous convergent trajectories have forced the European countries to copy the old US system instead of exploiting the already existing strengths of the territory. In fact, whether the European firms were investing in R&D in foreign countries, US Firms started to transfer their research centers abroad, exploiting the lower labor costs and the bundle of knowledge acquired by the nearly developed China and India (Foray and Van Ark, 2007). These two convergent trajectories have forced the European firms to try to develop the so-called *Silicon Somewhere* (Florida, 2002) instead of exploiting the already existing hotspots of innovation.
- Picking Winners Syndrome: in addition to the nearly drawn framework, it has to be underlined the top-down approach adopted by the policy makers. Incentives and financial resources were allocated according to the specialization of the different industries (e.g. high tech of biotechnologies) and this has caused a *picking winners syndrome*, emulating foreign policies (Foray *et al*, 2012)

With *Knowledge for Growth* the European Union pass over the old concept of innovation, biased by the three issues nearly described and focuses on two cardinal points. They are: the need to focus on pre-determined sectors in order to reach economies of scale and exploit knowledge spillovers; the need to invest in what would be considered the specialization areas of the future, which have the potential to produce innovation and so enhance the competitiveness of the regions and countries (Morgan, 2013). Smart Specialization Strategy is based on the concept for which every region has its own characteristics in terms of natural resources and industrial fabric and for this reason is necessary to develop an *ad hoc* strategy that considers the specificity of the geographical and historical context of the region.

There is, in this sense, an inversion of the trend with respect the previous Lisbon Strategy, which were mainly based on the enhancement of R&D investments. In particular, a bottom-up approach is preferred with respect to the top-down one.

Moreover, the S3 has the characteristic to be placed-based. As underlined before, the EU is a highly fragmented territory characterized by the presence of several hotspots of knowledge and, in several cases, they cannot be considered leaders in their science domain. For this reason, enhancing the intensity of knowledge investments in the form of

high education or public and private R&D could be a waste of resources most of the times. After the unsuccess of Lisbon Strategy, a strategy able to encourage investments in programs aimed at exploiting the existing assets and enhance interregional competitive advantage was needed. For this reason, "Smart Specialization Strategy" have been developed (Foray *et al.*, 2009). In other words, a S3 has been designed to take advantage and emphasize the role of the territorial assets instead of create something new.

Of course, it creates also more diversity among regions, but at the same time enhances the single capability of the hotspot to produce unique sources of innovation and focus on the long-term perspective.

However, this underlines also the fact that S3 does not act in favor of a single region with respect to another one only because of its development potentials. Vice versa, every region has the capability to adopt the strategy to enhance its competitiveness, and at an aggregate level the whole system benefits from the knowledge spillovers produced and from the relationships established between the regions (OECD, 2009).

The second inefficiency that is fixed by the smart specialization strategy concerns the allocation of incentives and financial resources.

In particular, S3 has been considered as an *ex ante* requirement in order to get access to the ERDF in the period 2014-2020, already quoted in chapter 2 paragraph 6, in order to enhance the research, the technological development and innovation, but also to ease the access to informational and relational technologies (Foray *et al*, 2012).

The policy maker, basically, in order to favor the development of a territory and the creation of new knowledge, directly allocate funds to those firms and institutions already involved in the research and development process. His top-down approach is adopted mainly to control the allocation of funds and, so, to avoid wastes of resources.

However, this kind of approach in which the policy maker decides alone where and how much resources have to be allocated has been revealed as inefficient in most of the cases, mainly due to informational asymmetries. In fact, the political class most of the times has not sufficient knowledge and data to understand which are the most prominent regions in which invest (Hospers *et al*. 2009).

According to Foray *et al*. (2009), the Smart Specialization Strategy does not impose specialization with a form of top-down industrial policy detected with a pre-conceived "grand plan", not it comes from the foresight exercise of an external agent, as a consulting firm. S3 is based on the ideas for which the policy maker has to work in direct contact

with the subjects with entrepreneurial capabilities and this collaboration will produce the regional area of specialization in which the funds have to be allocated.
Foray *et al*. (2009) call this the "Entrepreneurial Process of Discovery"[16] and it reveals which countries or regions do best in terms of science and technology.
As can be understood, the governance framework is a crucial element of S3, since the relationships established among the actors involved determine the success of the region. The complete governance scheme adopted by regions for the definition of the regional area of specialization will be analyzed in a dedicated paragraph.
So, S3 partially revolutionize the framework designed by the Lisbon Strategy, on one side enhancing the fragmentation, but in favor to the development of those worthy regional specialization areas which, at an aggregate level, have the capability to enhance the competitiveness of the system as a whole.

4.1.2. S3 and innovation

At its beginning, S3 has been designed in order to focus the policy makers' attention on the innovative process strictly related to the scientific and technologic research (Iacobucci, 2007). In other words, S3 has been initially thought as industrial plan aimed at providing financial support to firms and research centers embedded to the specialization areas detected by the Entrepreneurial Discovery Process.
This idea was totally coherent with the dominant line of thought concerning innovative processes.
As highlighted by Jensen *et al.* (2007), scientists and policy makers have always adopted STI methods (Science, Technology and Innovation), based on the production and use of codified scientific and technical knowledge, in order to identify and recognize technological and innovative hotspots.
However, thanks to the re-elaboration of the strategy during the years, the application of S3 has been expanded to those innovation strictly related to the practical experience, realized with the DUI method (Doing, Using and Interacting).
Thanks to this evolution, the Smart Specialization Strategy has been applied to all the European Regions, also to those areas with a lower research capacity (Iacobucci, 2017).

[16] The entrepreneurial process of discovery will be analyzed in paragraph 4.2.4

This allows to conclude that S3 does not follow only the traditional frameworks to identify the knowledge and innovational hotspots, but it combines the STI and DUI methods in order to ensure to all the European Regions the possibility to follow a path of innovation and enhance their competitiveness.

In fact, the European Union is characterized by a strong heterogeneity in terms of regional innovative capacity and the first vision (STI) adopted by S3 was limitative, since it considered only those technologies born from a rigorous scientific path. In particular, in the final version of the strategy, a dichotomy between General Purpose Technologies (GPT) and co-innovation is applied (Foray *et al.*, 2009):

- General Purpose Technologies are the basic inventions that generates new opportunities for developing applications in particular sectors. They can be considered the core inventions that are successively spread horizontally though the whole economy that benefit from them;
- Co-innovations are the inventions that directly come from the application of GPT in a specific case and in a specific market.

Generally, what happens is that central regions, thanks to the presence of highly developed research centers, develop GPTs and the peripheral ones develop co-innovations, applying the innovation to the specific issue.

Basic innovations generate new opportunities also for the development of an innovative path in regions in which there is not the possibility to create a new invention starting from zero, but most importantly, co-innovation increase the application markets and improve the economic return of the GPT (Foray *et.al* 2009).

As result, Europe will be characterized by regions specialized in basic inventions (GPT) and regions specialized in specific applications of GPTs or co-inovations.

However, this procedure does not erase the gap between the different European regions. First of all because every region, regardless of their scientific capabilities, can find several issues in translating GPTs in co-innovations and, in most of the cases, are necessary also social and organizational adaptations (Powell and Snellmann, 2004).

Secondly, considering less developed European Regions, the gap is related to their capability to transform GPTs into co-innovations. In particular, what is missing is the human capital, especially in terms of necessary knowledge, in order to proceed with a similar innovation path in a specific productive site. This is not always immediately possible, and a training process may be required.

4.1.3 Governance in S3

The development of Smart Specialization Strategy has put significant pressure on single states/regions that have had to reflect firstly on their governance innovation policies (Marinelli *et al*. 2018).

In fact, on one side S3 has required to local governmental bodies to involve in the policy process new figures, also coming from different environments and often private; on the other, S3 requires a high level of internal and external coordination across the different actors embedded to the process, in order to pursue the Region's socio economic objectives. In addition, the high level of fragmentation and heterogeneity that characterize the European Union has to be considered, which implies again more difficulties in terms of communicability.

This implies that the governance framework designed at state/regional level plays a fundamental role in the implementation of the strategy and a great part of the success depends from it and from the socio-economic actors involved.

During the Years, S3 has faced several changes. However, considering the vision of the governance structure, a multi-actor framework has always been considered as essential for the success of the plan. Just think of Foray *et al*. (2009) which considered as essential the participation to the entrepreneurial process of discovery of local stakeholders in order to develop a bottom-up process. In fact, S3 switches the focus from "interests" to "needs", trying to understand which are the socio-economic requirements of a specific region in order to develop a more complete structure based on the existing environment instead of recreate the model applied elsewhere in the world (Marinelli *et al*. 2018).

However, considering the high level of heterogeneity that characterizes the EU, it would be reductive and inefficient to impose a constant governance to every region. What is needed is the core idea of the governance structure that has to be applied and then leave to the regions of interest the freedom to adapt the model according to their needs.

The first requirement that has been partially underlined is the multi-actor framework. S3 is based on a wide view of innovation and does not focus its attention only on the most profitable industries or on the technological industries. S3 has been designed in order to be embraced by all the most promising sectors of every country, which have the potential to grow in the next years.

This implies that stakeholders of different type and levels have to participate in the design of the long-term plans derived from the application of the strategy.

The first plan, designed for 2007-2013 has applied a Triple Helix model, involving in the process industry, education and research institutions and government. However, due to the evolution of the socio-economic system, such a framework would be reductive and may not bring to light the real needs of the region.

For this reason, for the 2014-2020 program a Quadruple Helix model has been adopted, placing alongside the three bodies of the Triple Helix also other societal stakeholders, as innovation users or groups representing demand-side perspectives and consumers and relevant non-profit organizations representing citizens and workers – in other words, this evolution takes into consideration also the civil society and not only the political and industrial world (European Commission, 2020).

The characteristic of being multi-actor becomes fundamental considering the internal perspective and the pursuing of key goals as the growth of the territory and the enhancement of competitiveness through innovation. The multiple perspective brough by different actors implies the possibility to understand the needs of the territory and avid biased decision undertaken considering only the partial information in the hands of the governmental bodies.

Especially considering the Entrepreneurial Process of Discovery, the multiple point of view has been fundamental for the definition of the areas of interest – also defined as specialization areas – in which regions have decided to invest more.

The characteristic of being multi-actor is not sufficient at all. A multi-level governance structure is needed form the team that has to pursue S3's goals. This kind of structure has to be flexible enough to allow each actor to take part to the processes and eventually take a lead position in a specific phase according to its capabilities and background.

According to Schmitter (2004) a multi-level governance (MLG) is "an arrangement for making binding decisions which engages a multiplicity of politically independent but otherwise interdependent actors – private and public – at different level of territorial aggregation in more-or-less continuous negotiation/deliberation/implementation, and that does not assign exclusive policy competence or assert a stable hierarchy of political authority to any of these levels".

In fewer words, an MLG describes a mixed structure in which the power is spread vertically between the various level of government and horizontally across the several actors involved, independently from their nature.

From this perspective, the governance model adopted at a regional becomes less hierarchical and more network-like structure, since the various stakeholders involved in the decision-making process cover a precise role and influence each other. Doing so, the responsibility for policy design is distributed among the different level of governance which are supported by both contractual relations and trust (Larrea *et al*. 2019).

S3 requires a high level of interaction and cooperation between the actors and the involvement of sub-regional government levels increments the capacity of involving entrepreneurial actors, essential for the definition of regional needs.

This approach to is necessary to switch the attention form "interests" to "needs". Actors are summoned to express their point of view to the other parties, which are asked to collaborate in order to design the proper plan for the enhancement of regional competitiveness.

The other aspect that supports the idea for which an MLG structure is required, concerns the relationships between the regional, national and EU level.

Again, because of the heterogeneity that characterize the European Union, every country will design its governance structure according to their needs. So, the Member State will define the level responsible for the development of S3.

According to S3 Platform, more than 200 Smart Specialization Strategies have been designed at European level and in general government levels responsible for the development of S3 have been national or both national and regional. Only six member states have decided to keep the regional level[17]. However, this does not imply that they do not have any form of interaction at national level, but only that the responsibility of S3's implementation has been kept at regional level (Larrea *et al*. 2019)

The decision of maintaining a regional approach or a national one depends directly on the political conformation of the Member State, which decides to allocate responsibilities according to the model that best fits its aims.

So, an MLG structure is all but easy to be applied, since it requires a precise definition of the roles covered by the involved stakeholders and a high level of trust. However, MGL

[17] Belgium, Denmark, Finland, France, Netherlands, UK (data refers to 2018)

has not to be considered only as a tool for the coordination of the different level of governance involved in S3, but more as a process of co-creation of strategies.

In conclusion, what has to be stated is that the governance model adopted by the State (both at a national or regional level) has to be designed in order to best fit the final purposes of the national/regional Smart Specialization Strategy.

The two main characteristics of the governance framework are:

- Multi-actors: the governance model have to be based on the quadruple-helix model, involving in the policy making process industry, education and research institutions, government and the civil society. This characteristic allows to the team in charge of the definition of the long-term industrial plan to focus on the needs of the Nation/Region instead of the simple interests.
- Multi-level: the governance model has to favor interaction and cooperation between the agents summoned to participate to the policy making process. The complex structure that results is characterized by a subdivision of responsibilities and powers vertically, along the levels of governance, but also horizontally.

However, the purpose of implementing a complex structure based on the multi-level governance model is also connected to the need of monitoring constantly the path that is developed by the region. It has to be remembered that the policies implemented through S3 evolve during the years and are subjected to variation, depending on the micro and macro events that may change the environment.

In particular, the European Commission (2015) has identified three main purposes for monitoring.

- Monitoring as a system to gather and process information: at a European level, the monitoring system has to provide a picture in real time of what is happening in the region or country with regard to the key goals defined by S3. This is particularly necessary to detect those regions who are not following the right innovation path and may not improve the competitiveness of the system as a whole and consequently correct it.
- Monitoring as transparent crystallization of the logic of intervention: monitoring can be used as a tool to analyze the logic of intervention behind the long-term plan. In particular, once that the six years plan is fully designed, monitoring can be used to define which are the priorities and which policy instruments can be used to pursue the. Of course, a similar process has to be applied constantly over the

evolution of the plan, because needs and focuses may change over the years. Doing so, monitoring can also be used as an evaluation tool, framing the evolution of the plan in a specific moment.

- Monitoring as communication device: monitoring can be used to increase transparency and cooperation between the stakeholders involved in the delineation of the plan. In this sense, monitoring can help to maintain dialogue and consensus, reinforcing trust and commitment.

4.1.4 Entrepreneurial process of discovery

In their first draft, Foray *et al*. (2009) suggested in their "simple idea" – as they have defined it – the inclusion of entrepreneurs in the process aimed to understand what a country or region can do best in terms of science and technology.

In fact, according to the authors, the entrepreneurial figure has the capability to understand which are the more promising areas of future specialization, since they are, first of all, in direct contact with the concrete regional economic fabric, but, most importantly, they have the direct access to the public shared knowledge that is necessary for the formation of social capital assets (Foray *et al*., 2009).

This implies that the role of entrepreneurial actors becomes fundamental in the discovery of the field of expertise, because their vision comes directly from experience and from the reality.

The considerations done by the group of experts that outlined *Knowledge for Growth*, probably derives from the reasoning for which entrepreneurs have the capability to recognize the economic opportunities coming from a technological discovery. In fact, in order to develop new processes, products, markets and organizational methods it's necessary the recognition of the business potentials of the technological breakthrough by entrepreneurial figures, which exploit it for their own purposes (Shane, 2000).

Considering this perspective, it is possible to underline S3 embraces the principle of the Austrian School, which states that the market is composed by different actors each of them with different information (Hayek, 1945).

Implicitly, in fact, the idea behind S3 recognizes that not every economic agent has the capability to take advantage from the innovations produced by the region, but only some of them, which have exclusive information, have the capability to understand the potential

behind the technological discoveries and the possibility to translate them into businesses (Shane, 2000).

Moreover, what has to be considered is also the entrepreneurial point of view, which is mainly based on the idea of making profits. At the contrary of the political class, which focuses its efforts on equity and has a narrowed viewpoint, the direct involvement of entrepreneurs in the economic fabric allows to discover more opportunities coming from the application of technological breakthroughs Actually, the strict relationship between the entrepreneurial system and the political class can help to switch the vision of innovation from supply-driven to demand-driven (World Bank, 2015), favoring the needs of the region instead of injecting funds only with the purpose to imitate other successful models, but also creating an environment able to translate innovation into concrete markets and products.

However, a clarification on the figure of the entrepreneur has to be done. In the vision of Foray *et al* (2009) the concept of "entrepreneurial figures" embraces both public and private subjects that focus their efforts in the production of innovations and in their translation in related new by-products. In fact, entrepreneurs assume any number of forms, coming from firms, higher education institutions public research institutes and independent innovation ones (Foray *et al.*, 2011). Each of these actors have insights, perspectives and knowledge directly coming from their experience that, usefully combined with the other stakeholders' knowledge, combined may create a comprehensive knowledge that can be used for the definition of the regional "areas of specialization" and for the policy design process.

In fact, the main purpose of the entrepreneurial process of discovery is *in primis* to detect the fields in which the county/region excels, not focusing on the single industries embedded to the territory but having a broader view. So, the goal is to detect which are the specialization areas.

The involvement of non-political bodies makes the entrepreneurial process of discovery a bottom-up process. This characteristic is fundamental to be highlighted, since it is at the core of the development of S3.

According to the European Commission (2016) the entrepreneurial process of discovery emphasizes the importance to prioritize "investment based on an inclusive and evidence-based process driven by stakeholders' engagement and attention to market dynamics".

Two passages of this statement have to be analyzed.

First of all, it is an evidence-based process: the entrepreneurial process of discovery has as main aim the detection of those industrial areas which deserve particular attention because of their intrinsic potential in terms of growth an innovation. So, the role of entrepreneurs[18] provides a level of knowledge that the policy maker by itself is not able to reach. The regional government does not have the innate wisdom to understand which are the technological trajectories in which to focus, they may at least copy a successful model that has been applied elsewhere. But the success of a model in a certain area of the world, characterized by its own environment and its own historical development, does not imply that the same success can be reached in any place. In this sense, the role of the entrepreneurs is fundamental also to describe the key features of the territory, its strengths and weaknesses, its opportunities and threats[19].

So, entrepreneurs provide that point of view necessary to draw a complete framework of the territory that is necessary to the S3 team to develop the set of policies able to favor a technological development and growth.

The second point that has to be focused is related to the "stakeholder engagement". As highlighted by Marinelli and Perianez Forte (2017), the entrepreneurial process of discovery is beneficial to building trust, engaging stakeholders in regional development and improving public policy decision-making. This reflects again the idea for which the process starts from the bottom and that the way in which the governance framework is designed to pursue the main regional goals is critical, because from it depends the great part of the success of the strategy.

The main tools for making it an inclusive and interacting bottom-up process are (ERDF, 2019):

- Participatory models, as workgroups, advisory boards, partnerships and public/private committees, but also tailored websites able to allow to the fourth part of the quadruple helix, identified with the civil society, to participate to the processes
- Evidence-based approaches, as highlighted before, as the SWOT analysis, technical and technological studies and stakeholders' surveys

[18] The concept of entrepreneur has always to be considered in the broad sense of "entrepreneurial figures", coming from firms, higher education institutions, public research institutes or independent innovation institutes.

[19] In fact, in many cases, the entrepreneurial process of discovery starts from the SWOT analysis

- Regional innovation governance structures able to foster the implementation of the quadruple-helix model[20], but most importantly able to ensure collaboration among the actors
- The concept of "economic relatedness" (Balland *et al*. 2018), for which new industrial sectors derives directly form pre-existing regional industrial sectors. This concept has been explained in terms of innovation when, previously, it has been analyzed the relationship between General Purpose Technologies and Co-Innovations. This concept provides an essential analytical tool to the workgroups to understand the possible future development of a region and forecast the evolutionary paths of the territory. As consequence, policy makers together with stakeholders are able to design the proper policies in favor of the region.

In order to understand concretely what the entrepreneurial process of discovery is, it's necessary to provide some concrete examples.

In Poland, one of the countries that have decided to establish both national and regional governmental levels for the implementation of S3, for the detection of the areas of interest have included in the process the top-management of the most successful small and medium enterprises, creating a "Smart Lab" in which stakeholders coming from firms, research and development institutes, the public administration and civil society (with its representants) have the possibility to discuss about the development trajectories of the region (World Bank, 2015). This is a concrete example of quadruple-helix governance framework.

Also, in Spain, more precisely in Andalusia, the government have designed a process of "collaborative leadership", implementing a multi-level governance framework able to strength the relationships among the stakeholders involved, especially at an interregional level. Doing so the Andalusian model have applied a participatory model.

However, it's necessary to underline that the stakeholder engagement and the quadruple helix model are not related only to the entrepreneurial process of discovery. For sure, they are the core element that allows to the process to discover the worthier areas of development, but the collaboration between public and private actors have to be pursued along all the S3 phases, even the definition of the regional policies.

[20] Involvement of policy makers, academics, entrepreneurs and civil society

The detection of a trajectory in which the policy maker has the possibility to act is only one of the steps that allows to the workgroup to plan a path of growth. The dialogue between stakeholders is necessary to maintain the focus on the needs instead of on interests and collaboration is the key to foster innovation in the territory.

Nevertheless, the entrepreneurial process of discovery hides also some risks.

The stakeholder engagement, which is considered at the core of the entrepreneurial discovery process and of Smart Specialization Strategy, may be biased by the representativeness of the figures that are chosen.

In fact, considering the opinions of the entrepreneurs involved in the process is for sure the right way to discover the most prominent fields in which innovation may take pace, but what has to be underlined is that very often the relationships between entrepreneurs and research & innovation institutions are not balanced. So, there is the risk for which the opinion of one entrepreneur may be considered more valuable than the opinion of another one, depending very often from its fame and not from its validity.

Because of this problem, the entrepreneurial process of discovery may be biased.

Moreover, what has to be remembered. Is that it is a "foresight process", meaning that it's aimed at finding the physical areas and the industrial fields in which can be produced innovation and that have the potential to grow.

With a biased foresight there is the risk for the region to miss the searched progress path or to unsee the worthy area of specialization.

So, the critical passage becomes the choose of stakeholders, since their opinion can provide a shape instead of another to all the strategy.

As highlighted by Piirainen *et al*. (2017), the foresight process is fundamental, because it allows to identify the evolutionary trends of the region, but at the same time it may be very risky, because it may be biased by the participation of external stakeholders.

The same reasoning has been described also by Porter (2000) which highlighted that, under certain circumstances, a sort of groupthink may retard innovation.

The same risk may be evidenced also in the workgroups formed to design S3, since, generally, the stakeholder engaged are always the same, especially considering less developed European areas in which the choose of entrepreneurs and research institutes is forced.

Also, the described risk does not lower engaging different stakeholders, since that the opinion of the most powerful one will always be considered as more valuable – in general,

this kind of stakeholders are strictly related to the most important firms of the considered geographical area.
A similar bias may difficultly be removed. The only way to limit it is to design a proper governance framework, with a high engagement rate, able to guarantee the effective collaboration between public and private stakeholders. Otherwise, the risk is to maintain the same specialization areas of the region, and face a no-progress path (Benner, 2014) (Mieszkowski and Kardas, 2015).

4.1.5. Smart Specialization Strategy in practice

The following paragraph will summarize the core components of Smart Specialization Strategy, its priorities and the associated risks.
Starting from the key elements, the European Commission (2020) highlights five main principles:

- S3 is a place-based approach, meaning that the states which are the opportunities for growth within a specific region starting from the analysis of the existing asses and resources already available. All the goals and challenges set by the plan are, so, based on the existing structure of the territory and from them are identified the unique opportunities for the development of innovation, intended as General-Purpose Innovation or Co-innovation.
- Defining a strategy also means make the right choices for investment. This means that countries/region shave to identify only a limited number of knowledge-based investments and/or clusters in which focus their attention. “Specialization” means exactly this: finding the excellence of the territory
- S3 should follow an inclusive process of stakeholder’s involvement, based on the “entrepreneurial discovery”. So, the golden rule is that S3 should follow a bottom-up approach instead of a top-down or, worst, a picking-winner one. Priorities have to be set form an interactive process, in which all the private and public bodies involved collaborate and coordinate themselves. This implies that a multi-person and multi-government governance framework has to be applied for the success of the strategy
- S3 has to pursue a broad view of innovation, avoiding focusing only on technological fields, but pursuing growth also in practice-based and social

innovation. this allows to every region/country to pursue its own path of innovation.

- Finally, a good monitoring system allows to the strategy to be constantly evaluated and corrected whether there is the need.

Moreover, the developers of the long-term plan have to bear to mind that S3 is an *ex-ante* condition to get access to ERDF investments in research and this implies that every policy designed for the region has to be coherent with the line of investment of the European Development Regional Fund.

For what concerns priorities in S3, the first one that has to be considered is the fact that the strategy has to be designed considering first of all the areas and economic activities in which the region or country have created a form of competitive advantage over the years and, so, have the necessary knowledge and skills to follow a growth path and at the same time tackle the major challenges for the society and environment. This is strictly connected to the S3's feature of being placed-based. The key goal is to enhance the competitiveness of the region, exploiting the already existent tangible and intangible assets in the territory, through an innovation path. Doing so, whether every region is able to reach its own priorities, at an aggregate level the result would be an enhancement of the competitiveness of all the European Union, reached by focusing every effort only on the existing strengths and without copying any other model.

Of course, the number and the nature of priorities will change from region to region, since they depend directly on the territory that is considered.

Moreover, priorities can be framed considering different points of view and not considering only the knowledge fields. For instance, a widespread yardstick is the presence in the region of sub-systems, as districts or clusters, but also ranges of application of technologies to specific industrial, societal and environmental challenges. All depends from the existing industrial and societal conformation of the considered region. For some of them the best way to design the strategy could be focusing on technologies, for others could be shaping it according to the presence of sub-systems. There is not a unique way to do it.

Of course, the final aim is the production of innovation. Independently from its nature – social, organizational, market and service innovation or practice-based innovation – it represent a form of progress for the region and this is particularly relevant for less developed areas, which, thanks to S3, have the possibility to develop new sources of tacit

knowledge and experience that can be applied in the immediate present and in future for the evolution of their own economic fabric. As highlighted before, the role of tacit knowledge, combined also with the capability of sharing information, becomes crucial for the design of the growth path of a region. The share of tacit knowledge, in fact, can create industrial commons (Pisano, 2009) and a continuous flow of ideas generate new knowledge in the region. The result is the implementation of a virtuous circle that leads growth and innovation.

Of course, S3 does not come without any risk.

The risk of failure is contemplated and fully accepted by the European Commission, but the way in which this risk is managed influence the whole success of S3.

As stated before, innovation is not applied only at a firm level, but can also be produced for supporting providers and public bodies. Obviously, the risk related to business innovation is higher with respect the risk related to non-innovative activities and, of course, have a higher potential for growth.

The solution to mitigate both the faces of the same risk is to design a proper policy-mix, combining for instance, advisory services able to provide a more objective point of view – often entrepreneurs does not have the right perception of the risk, due to their commitment in the company's projects, and the same behavior may be transmitted in the design of S3's priorities – as well as financial support, necessary for sustain all the worthy projects.

In conclusion, even if S3 seems to be a very subjective plan that can be shaped by every region according to their needs, it has core elements that determine its success. For this reason, country/regions have to develop the right policy-mix in order to pursue an overall and aggregate innovative growth. At the base this path there is a properly designed governance structure, able to involve multiple actors coming from different backgrounds and to favor their cooperation, especially during the Entrepreneurial Process of Discovery. The governance structure also is fundamental for the monitoring process, which evaluates and frame the level of achievement of the strategy.

4.2 Smart Specialization Strategy in FVG – focus on Home System

The following paragraph has as main aim the analysis of the process of implementation of Smart Specialization Strategy in Friuli Venezia Giulia

In particular, along the paragraph it will be analyzed the role of S3 in Friuli Venezia Giulia, focusing on the Entrepreneurial Process of Discovery and the Governance mechanisms that have led the Region to define its six areas of specialization. Then the analysis will be shifted on the Home System specialization area, which embeds the Livenza furniture cluster (Friuli Venezia Giulia's side), understanding the processes that have led to the definition of the old development trajectories for 2014-2020. Finally, considering the same temporary period, the results of S3's implementation will be analyzed, focusing, again, attention on the Home System.

4.2.1 The role of Smart Specialization in FVG

In the last seven years, Smart Specialization Strategy has been considered a pillar for the Friuli Venezia Giulia's development policy. In particular, as for every other region which has adhered to S3, it has been considered as an *ex-ante* condition to get access to the ERDF. The final aim of the strategy is to establish a competitive advantage for the region, starting from the existing regional assets and adapting the territorial productive systems to the continuous and unpredictable changes of the world economic system and market (Regione FVG, 2015).

Before S3, Friuli Venezia Giulia has always posed a particular focus on the concepts of innovation and research for what concerns the development of the territory. So, Smart Specialization Strategy has not been considered a breakdown with the past, but more as a continuum with the previous development policies aimed at developing the territory. Concrete examples of this tendency of the region to follow a path of innovation and growth is represented by the regional plan Rilancimpresa – which has as main source the ERDF - described in the second chapter, but also by the several industrial plans designed for specific industrial agglomerates and clusters which has took roots in the region[21].

So, S3 did not represent an upheaval with respect to the past, but more an evolution and an opportunity to redefine the development of the regional industries with a placed-based point of view, also considering the set of goals defined by the European Union for S3 – enhance the competitive advantage and favor the social cohesion (interregional and intraregional) for the development of synergies.

[21] The list of industrial plans focused on specific regional industrial areas can be consulted at https://www.regione.fvg.it/rafvg/cms/RAFVG/economia-imprese/rilancimpresa/FOGLIA10/FOGLIA1/

The starting point of S3 process is the analysis of the context, which has been developed with a "past-present-future" approach. First of all, the focus has been centered on the history of the Region and on the dynamics that have led the territory to develop several industrial agglomerates in the Region. Secondly, an analysis of the present context[22] has been crucial to understand the needs and the strengths of the region, in order to define the starting point for the development of the strategy. Finally, an eye on the future allowed to define a complete long-term strategy, focusing the attention on the climate and demographic challenges for the future.

This kind of analysis has been providential. In fact, since that S3 has the concept of "place-based" as main pillar, the knowledge of the territory has been a necessary tool for the analysis conducted during the entrepreneurial process of discovery.

Finally, the result of the analysis has been summed up in a SWOT matrix, which have been used for a double purpose: a) support research and development of the most promising industries and territorial realities and b) maximize the effects of the incentives.

The choice of starting from the SWOT analysis signifies that Friuli Venezia Giulia has adopted firstly an evidence-based approach in order to get a comprehensive view of all the shapes of the regional industries. This allows also to identify who are the stakeholders that have to be engaged in the Entrepreneurial Discovery Process and, most importantly, to define the most promising territorial areas.

4.2.2 Entrepreneurial Process of Discovery in Friuli Venezia Giulia

As highlighted by Foray *et al.* the Entrepreneurial Process of Discovery is the tool that has to be used to identify the regional areas of specialization worthy of consideration.

However, before the born of Smart Specialization Strategy, the stakeholder engagement in the elaboration of an industrial plan was nothing new in Friuli Venezia Giulia. In fact, already in 2004, the regional administration had developed a series of sectorial studies in collaboration with numerous private actors, especially coming from leading firms of the territory, aimed at identifying the strengths of the territory and the opportunities for innovation (Regione FVG, 2015).

[22]The past-present-future process has to be referred to 2014, year in which the plan RIS3 for 2014-2020 has been designed.

So, for the first planning 2014-2020 (also called "RIS3"), the dialogue between regional private and public actors was already initiated and naturally continued.

Also, according to S3's guidelines, the stakeholder engagement has been a characteristic not only of the first phase of Entrepreneurial Discovery Process, but also during the review of the plan over the years. This last passage is crucial especially within the single specialization areas, since that every two years the Quadruple Helix stakeholders met in order to express their new needs and evaluate the changes in the regional economic fabric.

From an operational point of view, the process has been divided in two phases: a preliminary phase, which has taken and reviewed every form of stakeholder engagement from 2004 onwards; and a secondary phase, which, starting form the first one, has tried to obtain information on the most promising technologies, on the most interesting industrial areas and on the future evolutionary path of the Region, in order to detect also the future challenges. This last passage has been critical, especially considering the definition of which are the key regional sectors.

The second phase has been developed in three steps (Regione FVG, 2015):

i. On-line survey, necessary to detect the opinions of firms, Universities and research centers concerning the needs of the region
ii. "Thematic tables", meetings with the key stakeholders identified thanks to the surveys in which those invited had the opportunity to express their point of view concerning the most valuable areas in the region
iii. Analysis of results and final confrontation with stakeholders.

This double phase mechanism has been necessary to refine the work done on the previous years, integrating a bottom-up perspective, fundamental to identify the regional areas of interest.

In fact, all the studies adopted before had a top-down approach. Stakeholders were not fully engaged, but they were considered a source of information. All the gathered data, then, were elaborated by the region and, with statistical methods, the most promising areas were defined. This implies stakeholders were not asked to express their point of view.

With S3, diversely, the level of engagement rose. Starting from the preliminary phase, in fact, the market analysis has been integrated with ideas and proposals coming directly form the entrepreneurs and private actors. Specifically, they had the opportunity to

express their opinion on the composition of the regional economic fabric and on the opportunities for the future.

The result of this first phase has been then summed into six proposals of sectorial areas of specialization: Agri-food, Home System and technologies for living environments, Mechanical engineering, Sea economies, Pharmaceutical chemistry and Life Sciences (BioMed, BioTech and BioICT).

This first selection has been necessary in particular to define the set of stakeholders to involve in the second phase. In fact, per every area of specialization a thematic table has been created each of them with its interested parties.

The debates have produced as result a redefinition of the six preliminary areas of specialization, which have been reduced to five and defined as follow:

- Agri-food: choose for its good presence of patents and its expense in R&D
- Strategical production chains - Home System and Mechanical Engineering: choose because both the sectors have an R&D expense higher than the national average and for their good presence of patents
- Sea Technologies: choose for its good presence of patents and its expense in R&D
- Smart Health: choose because of the good presence of scientific publications and the high level of skilled human capital
- Culture, creativity and tourism: choose because of its potential evolution with the application of ICT systems and its high rate of PMI

Of course, since that S3 is in continuous evolution, the areas of specialization are subject to possible changes, according to the needs expressed by stakeholders, similarities in terms of technologies applied and evolution of the regional economic fabric.

A note on the definition of the specialization areas have, therefore, to be done.

According to S3's principles, the process that should led the regions to define their specialization areas should be done in consideration of the twelve thematic areas defined by the Italian PNR[23] (Programma Nazionale della Ricerca) – now became five. However, something went wrong during the process and Regions have been faster in the definition of their own specialization areas. For this reason, in some cases a specialization area may

[23] It is the document that outlines the priorities, goals and actions aimed at enhancing the competitiveness and research and development activities at a national level. It also outlines which are the thematic areas – the industries in which the Italian economy excels.

be reconducted to two or more thematic areas, causing several issues in terms of funds allocation and bureaucracy.

However, the Entrepreneurial Discovery Process does not stop at the definition of the areas of specialization. In fact, per each of them have been defined a series of "development trajectories".

So, every specialization area organizes their Entrepreneurial Discovery Process and during the several meetings, stakeholders express their needs and their opinions on which can be the most promising innovative paths that companies may follow in order to enhance their competitiveness. So, through this bottom up process, the specialization area is able to define which are its priorities for the short and long term and define which kind of innovation should be pursued during the seven years programming.

Innovation can be technological, societal and strategical and are voted in the thematic table at which stakeholders take part.

After the definition of which are the priorities and which are the potential evolutionary paths that can be followed by the specialization area, stakeholders synthetize every valid consideration in what have been defined "development trajectories". Development trajectories are the sub-areas of interest that enclose all the research and development activities, projects and technological implementation concerning one specific topic. For instance, as will be better explained in the next paragraph, Home System has defined a development trajectory for all the projects and technologies aimed at developing new materials and their practical application.

Every development trajectory, then, can be financed by multiple funds, depending on the line of intervention defined by the specific fund.

Of course, this is the maximum expression of the bottom up process, because entrepreneurs are directly asked to express their opinion on which are their needs, and which are their suggestions for the evolutionary paths that should be followed. It has to be also remembered that S3 is the *ex-ante* condition to get access to European Funds, so the development trajectories outline which will be the typology of investments that will be pursued in the years of the programming period.

Again, since S3 is an evolving strategy, as well as the specialization areas, also the development trajectories are subjected to changes and reviews during the period of application.

In particular, in the days in which this thesis is written new thematic tables have been activated in order first of all to understand whether or not the areas of interest have changed during the last seven years, but most importantly which kind of innovation has to be developed or brought in the territory in order to face the actual Covid-19 crisis.
As widely expressed in the third chapter, the outbreak has overwhelmed the Italian economy without any exception of industry.
So, S3 becomes a critical tool for the redefinition of the future paths that have to be followed in order to revive the economy.
Considering what explained till now, Friuli Venezia Giulia has been able to develop over the years a complicated but efficient mechanism of stakeholders' engagement ad this can be an enormous resource that can be exploited in this critical period to express every sectorial needs and take a prompt action to solve them.

4.2.3. Home System and its development trajectories

According to the purpose of this thesis, the only area of specialization which deserves interest is the Home System, enclosed in what has been defined "strategical production chains" - together with mechanical engineering industry. In fact, according to the final Friuli Venezia Giulia S3's drafting, the two areas of specialization have been gathered under a single one because of their similar characteristics of been extremely important for the regional competitiveness[24] and for their high degree of specialization. For this reason, for both the considered industries, according to S3's vision, there is the potential to develop a stronger know-how and apply new technologies, develop stronger relationships and innovate in the territory.
The specialization area defined as Home System encloses two specific strategical industrial realities in Friuli Venezia Giulia, which are the Manzano Chair District and the Livenza Furniture Cluster, in particular the Pordenone province.
So, under the label of "Home System" are enclosed all those economic realities that are part of the wood and furniture industry. However, a clarification has to be done: the evolution of the strategy over the years has led the thematic table to expand and evolve.

[24] Just thinking about the leading players of both industries, they represent a fundamental resource in terms of openness to foreign markets, but also as vehicles for the cohesion between SMEs.

For this reason, the area of specialization in analysis has embraced also other complementary industries, as constructions and the light industry.

The debate has, in fact, risen a simple, but at the same time critical question: what has to be considered home?

Considering only the strategic supply chains in the territory, probably only the wood and furniture companies have to be enclosed in this macro-area. Nevertheless, it is also true that the evolution of the concept of "home" has evolved over the time and still evolves, according to different styles and fashions, but also because of the new market and industry's needs.

For this reason, it's difficult to define exactly what "home system" as a macro area of interest should embrace, since in most of the cases only part of the companies can be categorized under this label.

One example may clarify: the light industry can be considered part of home system, but only whether companies that produce design products are considered. The same reasoning cannot be applied to those companies who produce industrial lights. But technically they are part of the same industry.

So, the boundaries are very faded in most of the cases, except from the wood and furniture industry, which are the core of the Home System and of the Friuli Venezia Giulia's economy.

The importance of the wood and furniture industry in the regional economic fabric has always been kept in mind by the regional political bodies, as widely expressed before, because its leading players – which has taken roots in the territory, but keeping an eye on the global markets -, its conformation and proximity among all firms – which ensures the development of a short supply chain - and, last but not least, the cohesion that companies have been able to develop over the years.

Moreover, as highlighted in the first redaction of S3, the Friuli Venezia Giulia's furniture industry is one of the most promising in terms of patents. 9% of all registered patents come from this sector, second only to the pharmaceutical industry (10%).

Remembering the purposes of Smart Specialization Strategy, the plan has to favor innovation in the territory and pursue a perspective of cohesion between the various stakeholders.

The development of the Livenza furniture cluster and its high rate of small and medium highly specialized enterprises all connected through the supply chain represents, so, a

fertile ground for the establishment of stronger relationships able to favor synergies, but also for the development of an innovation path. Considering also the proximity with the Manzano Chair District, it's easy to state that home system – intended as area of specialization – has to be considered as an anchor of Friuli Venezia Giulia's Smart specialization strategy.

So, because of the importance of Home System in S3, the definition of the development trajectories has been crucial not only for suppling the needs in the immediate short-run period, but also to define the innovation path that should have led the specialization area to pursue the key goals of S3.

During the thematic tables have been interrogated not only the representants of the leading firms in the territory, but also those who were considered critical resources for innovation, as the University of Trieste, because of their nationwide faculties of engineering, physics and architecture, but also the scientific and technological parks, which are at the core of the regional innovation system – only to remember some of them there are Area Science Park, Friul Innovazione and the technological pole of Pordenone.

Beside them, then, other private associations uncharged to represent aggregation of enterprises have been included in the thematic tables.

After the meetings have emerged four main challenges for what concerns the home system, which are:

- Safeguard the regional products also at the international level, with a particular attention to the product's design;
- Enhance the level of competitiveness especially with respect to the emerging countries. This implies an upgrade of the production processes in order to make them mor efficient, through the implementation of innovation and "cross fertilization" methodologies[25];
- Favor the flow of information and tacit knowledge, but also the processes of labor division. This allows to the territory to develop highly specialized companies and, as result, enhance competitiveness;

[25] Cross fertilization is a methodology of brainstorming aimed at favoring the born of new ideas from the creation of workgroups which share knowledge. In this specific context, the concept of cross-fertilization has to be referred to the series of synergies that can be produced form the joint work of different actors in order to enhance the level of competitiveness and the production of innovation in the territory (as expressed in the first chapter).

- Increment the research and innovation programs for sustainability in term of processes, but also for what concerns materials.

The four needs expressed from the thematic tables have led the predisposed private and public actors to identify two categories of innovation able to supply such needs: organizational - innovation based on changes of strategies pursued by companies in terms of repositioning on markets, internationalization, evolution of market strategies and evolution of distributional methods – and technological – innovation focused mainly on processes and materials implied in order to reduce the environmental impact and reduce the unit costs.

The definition of these two categories have, then, allowed stakeholders to define the four development trajectories, intended as specific technologies able to supply in the needs of the territory.

These are:

1. Technologies for materials: in the Home System specialization area materials cover a key role for what concerns the development of new products and new processes. For this reason, in this development trajectories are gathered all the technologies that can be exploited to produce new products placeable in the living spaces, as nanotechnologies and the so-called "smart materials"[26]. The aim of these technologies is to improve the products' life and to integrate them into home automation systems.
2. Methods for the fastening up the designing process: in this development trajectory are gathered all those CAD/CAM systems that have the capability to improve and fasten up the design process, making it also more precise and efficient. In this category are considered also the 3D printers, technologies that can improve the production process.
3. Technologies aimed at improving the buildings' energy efficiency: development trajectories do not focus only on the production line, but also on the environmental impact. For this reason, thematic tables have included among them all the technologies aimed at making the Home System's firms greener, as solar panels and insulating materials. These technologies can be applied also on a market perspective, for the development of environmentally friendly living spaces.

[26] Materials different form the classical veneered wood or steel that most of the time comes from recycled materials.

4. Cloud computing technologies: under this last category are considered all those technologies that promote the automation in living spaces.

These trajectories have been crucial, initially for the resolution of needs expressed by stakeholders, but most importantly to define the technological path that the Home Systems specialization area has followed during the seven years of RIS3.

However, as already said, S3 is subjected to revisions during the years.

In 2017 thematic tables conducted by Cluster Arredo FVG have been reunited and stakeholders expressed their new needs. The result has been condensed in three new trajectories. Two of them can be considered an update of two existent, while the third is considerable new (Regione FVG, 2017).

- Technologies for materials and *innovative design*: under this trajectory are included al the research activities concerning the development of new materials and their application in forms of innovative design. The aim is to improve materials' life and efficiency, but also to enhance products' sustainability.
- Technologies aimed at improving buildings' *and processes* energy efficiency: under this trajectory are included all the projects aimed at ameliorating buildings' and processes efficiency in order to reach a model of circular economy.
- *Home System digitalization*: under this trajectory are included all the systems able to digitalize not only the supply chain, but also all those technologies able to integrate technological innovation in the Home System's products. More concretely, the trajectory promotes all the ICT projects that digitalize the distribution platforms and mechanisms for the traceability of materials along the supply chain. Moreover, for what concerns products, under the trajectory are included also all the technologies able to make Home System's product "smarter" and enhance their usability.

It's clear that the first two trajectories are a review of the first and the third old ones. The need for an update comes in part from the technological evolution, which has allowed to reduce wastes and make processes more efficient, but also from the re-achievement of EMAS registration, which requires a particular attention to processes. Moreover, the inclusion of "innovative design" in the first trajectory comes mostly from an evolution of demand, which required for more sustainable buildings and products for living spaces.

Vice versa, the introduction of digitalization has to be considered a revolution in Home System. The need comes from the evolution of ICT systems that gives the possibility to

revolutionize the way in which home is considered – just think about the upheaval that vocal assistants have brought to our daily living. The concept of "home" right now is closer to the concept of "ecosystem", with the integration of technologies that ease the way in which every day we interact with our habitations.
Also, form the company's perspective, ITC have allowed to producers to keep track of the supply chain and develop new certifications, increasingly required by consumers.

4.2.4. Financial resources and numerical analysis

The following data have been taken from the study conducted by ISRI ("Istituto di Studi sulle Relazioni Industriali"), the independent body uncharged in 2019 to produce the third audit report on S3 in Friuli Venezia Giulia.
Before proceeding with the analysis of the data is necessary to underline that the report represent the most updated source of data. The plan, in fact, expires at the end of 2020 and only then it will possible to have a complete picture of the effects of S3 in the region.
However, as declared by ISRI, in 2019 the 94,4% of the resources has been activated and so the following analysis can be considered as a good proxy for the results produced by Smart Specialization Strategy between 2014-2020.
As evidenced before, Smart Specialization Strategy constitutes an *ex ante* requirement to get access to the European Development Regional Fund (ERDF). In particular, ERDF are included in the broader category of European Structural and Investment Funds (ESIF)[27], aimed at developing research and innovation, digital technologies and green economies in the European Union. So, every fund contained in ESIF has its concrete purposes that have to be respected when funds are allocated to single projects.
For what concerns Friuli Venezia Giulia, S3 has activated through a policy mix aimed at contributing simultaneously at the research and development projects and developing the regional economic system. In particular, S3 is based on a multi-fund strategy that can count on 360 million euros divided in three typologies of actions characterized by the aim of the intervention.
Three typologies of actions have been outlined:

[27] Over half of the EU funding is channeled through the 5 funds included in ESIF: ERDF, ESF, CF, EAFRD, EMFF. For a detailed explanation visit https://ec.europa.eu/info/funding-tenders/funding-opportunities/funding-programmes/overview-funding-programmes/european-structural-and-investment-funds_en

- Direct actions – 133,8 million euros: targeted to the 5 specialization areas and corresponding development trajectories;
- Indirect actions – 110,7 million euros: specific intervention on particular regional projects not constrained by S3's framework, but that can be developed as support of the main trajectories[28].
- "context actions" – 112,7 million euros: more general and aimed at enhancing the competitiveness of the territory and promote innovation in the region. They can be considered as a stimulus to S3's development trajectories.

However, what has to be considered is that S3 is a strategy and non a private plan, so the level of resources has changed during the years depending on the capability of the European Union of providing funds.

The focus of the further analysis has to be based mainly on direct and indirect actions, since they represent the main interventions aimed at supply to the three regional priorities:

a. Enhance collaboration and synergies between companies and between companies and scientific structures, in order to enhance the regional competitiveness
b. Promote investments in innovation and in research and development
c. Promote the innovative entrepreneurship – defined as the intersection between innovative business, young and high-growth businesses and SMEs.

So, to sum up and to provide a better explanation, the process that leads the region to provide funds to every single project can be divided in two parts: the Entrepreneurial discovery process which designs who are those actors allowed to get access to funds and the physical allocation of resources, coming from ESIF.

The EDP, as described before, has determined which are the five specialization areas and which are the development trajectories per each of them.

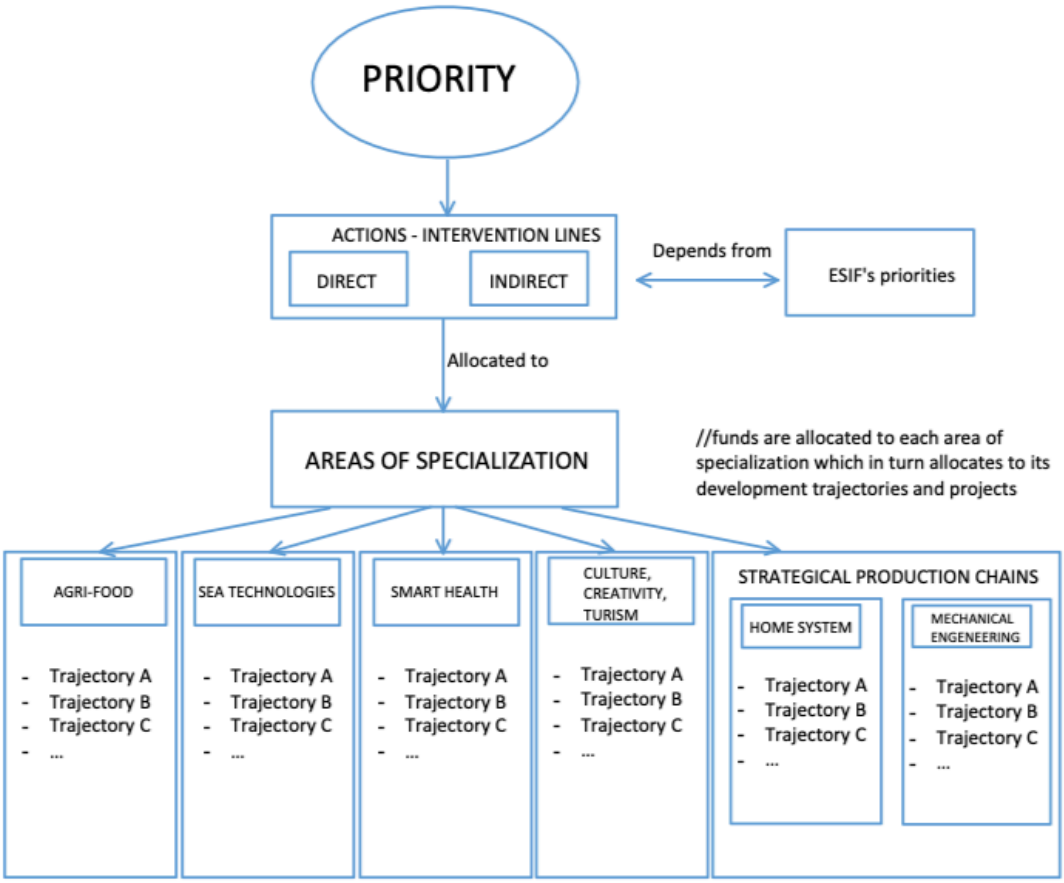
The physical allocation follows a little more interwoven path. In fact, once that the three regional priorities are defined, what is necessary is to define the policy mix able to supply them. The policy mix is expressed in direct and indirect actions, so "intervention lines" aimed at supplying the specific priority. So, per every priority direct and indirect actions are assigned, according to the recalled ESIF fund and its initial aims. Each intervention line has still a general purpose and so embraces all the five specialization areas, each of

[28] For instance, projects aimed at supporting regional research centers, as SISSA, PST and other incubators.

them with their development trajectories and the related projects. So, according to the priorities of every specialization areas, funds are allocated and each specialization areas decide in which development trajectory (more specific in which project) intervene.

The following scheme will try to figure the passages that outline ethe physical allocation of

funds.



Tab 4.2.1: description of the method for the fund allocation. Source: author's private representation based on ISRI, 2019

As said, at the moment in which the report provided by ISRI has been written, the 94,4% of all the resources were already activated. However, a clarification must be made. The fact that almost all the resources has been assigned does not mean that all the funds have been provided to the single projects.

So, considering only direct and indirect actions, resources are classified as:

- Activated – 230 million euros (94% of all the resources): amount of funds obtained by the region and available to be assigned to the projects.
- Employed: - 200 million euros (75% of all the resources): amount of funds assigned to the projects.

- Liquidated – 65 million euros (27% of all the resources): amount of funds physically provided to the projects.

Overall, funds have been used to finance 1166 projects, half of them related to the area of specialization "Strategical Production Chains", in which there is the mechanical engineering and the home system.

Specifically, 625 projects have been activated through the use of S3 funds in Strategical Production Chains: 401 in the mechanical engineering area and 224 in the Home System. The higher number in the first case is reasonable, since the area of specialization is more inclined to innovate, both in field of materials, but especially in production methods considering the evolution of the mechatronics in the last years.

The focus of the analysis, of course, has to be centered on the Home System, according to the purpose of this thesis.

Data gathered by Nucleo di Valutazione e Verifica degli Investimenti Publici (NUVV), the body uncharged to verify the allocation of the different public funds in the region, stated thatfor. The home system the initial budget was estimated to be 21,84 million euros, but during the years it has faced a resizing and in 2019 the amount of resources allocated by the region to pursue the projects connected to the four development trajectories were 17,29 million euros. However, not every financial resource has been liquidated, but only the 46%, equal to 7,98 million euros.

Comparing the amount of resources liquidated, the home system covers the second place, behind only Mechanical Engineering, symptom that the Home System bodies responsible to dialogue with the region have been more efficient with respect to the others.

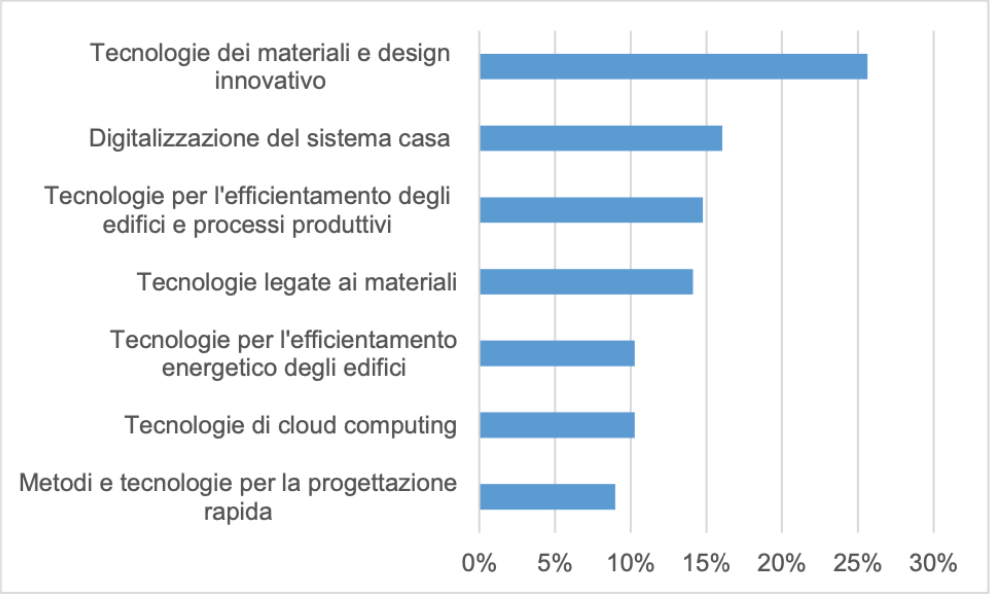
It is fundamental ti underline that the total amount of resources allocated in the Home System's projects do not come only form S3, but for the greatest part come from other sources.

In particular, as highlighted by NUVV, beside he 17,29 million euros coming from S3, another 12,67 million euros have to be attributed to other public resources, mainly coming from Rilancimpresa, and 31,21 million euros from private co-financing.

The private side of financing still covers a substantial part of the total financing of the Home System and this is reasonable, especially whether innovation on materials, which require constant experimentations – and so the constant payment of suppliers and service providers.

Summing all the sources of financing, during the seven years of the plan, the Home System has gathered 61.165.857 million euros for covering 224 projects. With a rapid computation it is possible to calculate an approximation of the resources allocated to each project on average: 273.061 euros. This data shows that on average the Home System's projects are those who have received the second highest financing resources per each of them, behind only to Sea Technologies – €338K with 95 projects and a total financing amount of 31 million euros.

Concerning the division per trajectories in the Home System, the following graph shows the detail:



Tab 4.2.2: percentage of funds allocated per each development trajectory. Source: ISRI, 2019.

As can be seen, there is not a development trajectory that has dominate over the others, but, as can be seen, the one that has aroused interest among firms is the one concerning the technologies for materials and innovative design. Under these trajectories, many projects have been centered on developing new materials able to extend the life of products, but also to make them greener and eco-friendlier. For instance, new varnishes and new wood treatments have been developed in order to reduce the level of formaldehyde[29] in furniture. But also, since that under the label of Home System are included construction companies, methods for reducing the environmental impact of

[29] Formaldehyde is a toxic gas produced by varnished wood

houses have been studied and many projects have been activated. In particular, 15% of the projects financed by ERDF have been focused on reducing energetic wastes.

But materials are only a face of the same medal. So, beside the innovation on materials themselves, also studies on design, in order to improve ergonomicity of products have been pursued.

Another interesting data concerns the typology of firms involved in the innovation path of the Home System.

ISRI's report highlights that 81% of companies are SMEs and only 10% are big leading companies. The remaining 9% is represented by public subjects. This data is quite constant among all the specialization areas.

However, the Home System registers the lowest level of companies that have participated to development trajectories projects (6/7% of the total). This is due mainly to the fact that the wood and furniture industry in Friuli Venezia Giulia is very extended and counts a high number of firms, which gets higher if considering also those firms operating in the construction sector. Considering only the wood and furniture industry, the engagement rate is 10%.

The last consideration that has to be done concerns the success of S3 in the last seven years.

As highlighted before, the 94% of the funds have been allocated, for a total of 1166 projects. What has to be considered is that nearly every one of them is still ongoing and this does not allow to produce a complete framework of the effects of S3 in the region till the end of 2020.

However, considering the export level as a proxy of the regional competitiveness and openness to markets, data show a positive result. In particular, companies related to Home System has registered a +20%, a good level, but lower with respect the other areas of specialization. For instance, Smart Health have gained 78 percentage points in the export level I the last seven years.

It is also true that Friuli Venezia Giulia's wood and furniture industry has always maintained a good level of exportations in the last twenty years, as highlight in the second chapter, so there were less margins to ameliorate its performances.

Nevertheless, the lack of data on completed projects cannot provide any form of result in term of regional innovational capacity.

The only element that can be analyzed is the R&D expenses. In the last seven years, companies have registered an R&D expense equal to 550/580 million euros, which for a half comes from the private co-financing and another 40% comes from funds gained through S3.

This data, even if very rough, describe that Smart Specialization Strategy have gained a good success in the region, and it can be assumed that in the next programming 2020-2027 companies may reveal a higher interest in the strategy, especially considering the next tough challenges that the region, especially the Home System, will face due to Covid-19 outbreak.

This topic will be analyzed in the following paragraph.

4.3 Analysis of the future Home System's challenges and the potential development trajectories for 2021-2027

The following two sections will try to provide an overview of which are the challenges and opportunities that Home System's actors will face in the next future, considering also the upheaval brought out by Covid-19 outbreak. Finally, it will reason on which innovations and technologies may be helpful to face similar challenges, according to the main purpose of the European Union for the next seven years of reaching a "Smarter Europe". Finally, the four potential development trajectories will be outlined[30].

The following analysis will be based partially on the former chapters of this thesis, but also on the evidences that have been collected during the first meeting for the definition of the new development trajectories for 2021-2027, which has taken place in Buttrio on September 25th, 2020.

4.3.1 The new challenges for the next seven years

Since that S3's 2014-2020 plan is coming to an end, it is necessary for the region to redesign which are the main goals that are wanted to be pursued and which re the new needs for the next seven years.

[30] The four trajectories have not to be considered definitive, since that the process aimed at their definition has started on September 25th, 2020, moment in which this thesis was in working process, and will end approximately on the second half of December.

The reasoning that follows will take as reference the context analysis that has been developed in the previous chapters and, undertaking a bottom-up approach, will try to highlight which are the challenges that Home System's firms may face in the next years and which might be the evolving market needs.

For sure, Covid-19 outbreak has to be considered as a variable in order to design the new development trajectories, which means the new technologies that can provide a concrete support to the resolution of specialization area's needs.

According to this thesis' theme, the focus will be based on "Home System" specialization area, which, by the way, has to be slightly redefined due to the pretty recent integration of new technologies in everyday spaces of living. This may modify the typology of firms included in the Friuli Venezia Giulia Specialization Area, provided that the core of area it is still the Livenza Furniture cluster and the Manzano Chair District.

The process aimed at the definition of the new development trajectories starts exactly in the days in which this thesis is written with a new entrepreneurial discovery process.

The body uncharged to mediate and arbitrate the process is Cluster Arredo FVG, which has organized a series of thematic tables with the purpose of gather the territorial stakeholders and highlight all the old and new needs in the territory, considering also the impact of Covid-19 on the industry.

The context that every of us is living right now, the identification of the new needs of private and public stakeholder – firms, market, institutions, … – is very interwoven.

For this reason, three macro topics can be highlighted: environment, Covid-19, "globotics".

The expiring programming for 2014-2020 had considered the environmental issues as one of the core elements in which design the long terms strategy. Efforts have been considerable and, thanks to the development trajectories focused on improving the building efficiency and discovering new green materials, several projects have been outlined with the aim of reducing the impact on the environment.

However, the sustainability issue is everything but expired.

As highlighted in the second chapter, the Livenza Furniture cluster has been the first industrial location to obtain the EMAS registration in 2006 and, after a review, re-obtained it in 2016. So, the environmental commitment of the territory is not. A topic born with the first S3 programming in 2014, but sustainability is an issue that has been considered long time ago.

Recalling the principles provide by the European Commission (2020) concerning EMAS, it represents an occasion for organization – referred mostly to SMEs – to reduce energy and raw materials consumption, optimizing waste production as well, to respect the law limits using the environmental indicators, stimulating the industrial symbiosis (Novelli *et al*, 2020).

In other words, following EMAS, companies have the possibility to enhance their commitment in creating a greener economy, exploiting more sources of clean energy and reduce wastes of raw materials. But this is only the starting point of firm's commitment in creating a clean form of production.

Nowadays world is changing, especially after Covid-19 outbreak, and people is developing a higher awareness of the damages caused to the world in the past years because of the use of fossil energies. Symptoms have been caught also by the political institutions that have decided to intervein properly to contain the environmental issues and ameliorate the way in which energy is consumed.

Few examples that can be highlighted from the past months are related to the decision of the European Union to allocate one third of the Recovery Fund for the decarbonization, which implies that Member States must use 30% of the funds to invest in clean projects able to reduce the CO2 emissions and convert the "dirty" sources of energy in clean ones. The final aim is to reach the climate neutrality in the next 30 years.

So, climate issues are a challenge that continues from the past programming and probably will continue for the next years.

However, this has to be translated in a twofold perspective: companies and market.

On the company's perspective, in order to maintain the environmental standards provided by EMAS, firms have to reduce their impact and reach a higher building efficiency. From the graph 4.4.2 it can be highlighted that in the Home System specialization area approximately 10% of funds have been allocated for projects connected to the improvement of buildings efficiency. This implies that the trajectory is at the third last position for funded projects.

For this reason, the path that has to be followed to create a greener specialization area is already long and difficult and considerable efforts have to be done to fix this issue.

Of course, this is only one of the two faces of the coin. On the consumers perspective, the real estate market has revealed a growing interest for sustainability and for recycled materials.

As highlighted by ENEA – the Italian agency for the new technologies, energy and sustainable economic development – in the last two years a consistent grow in demand for high efficiency houses and for the renovation of low efficiency one has been manifested by consumers.

In particular, 80% of new houses have been classified as B or more and the demand for making buildings more efficient have risen by 36%[31].

Moreover, after Covid-19 outbreak, MISE – the Italian Ministry for the economic development – has started to design the so called "Eco bonus", which states a series of fiscal interventions for those who decide to undertake building renovation and energy upgrading in their houses[32].

So, what is clear is that the Home System's companies have the opportunity to exploit this very particular situation to upgrade themselves and to supply the constantly growing demand for greener houses.

Innovations can be applied to materials, but also to products design, following and upgrading the old development trajectory defined in 2017 "Technologies for materials and design", which is also the most valuable source of projects, as can be seen form graph.

Concerning materials innovation, which is a trajectory that has already been followed in the past years, the present sanitary events have raised more problems than what it could be imagined.

Covid-19 outbreak have exposed several weaknesses for companies and several market needs.

Starting from the market's perspective, which is also the easiest point of view that can be undertaken, the three lockdown months have revealed the fragility of people. Being forced to stay at home all day long, individuals had to face in the first instance the problem of space definition. This issue has been suffered most in big cities, where the average home dimension is lower despite than the outskirts. Whether at the beginning working from home was greeted by employees, nowadays more and more cases of burnout have been registered.

[31] More data can be found at the following link: https://www.efficienzaenergetica.enea.it/vi-segnaliamo/mercato-immobiliare-2019-forte-aumento-delle-ristrutturazioni-con-standard-energetici-elevati.html

[32] More data can be found at the following link: https://www.efficienzaenergetica.enea.it/detrazioni-fiscali.html

This is due to the fact that never before people have had to divide their own homes according to the different hours of the day. So, in most of the cases, employees worked from the kitchen or from the living room, undermining and corrupting the initial purpose of that room. This has caused a lot of confusion, because in several cases it has been (and still is) impossible to design a proper space dedicated to working hours.

The separation of spaces and their design is becoming more and more essential and required by the market. Right now that the evolution of the outbreak is uncertain and that it is impossible to foresee the day in which everything will go back to "normal" – assumed that we will get back to normal – a re-design of spaces becomes necessary in order to split the different hours of the day, not only for employees' efficiency, but most importantly for their sake. The delineation of working corners in houses will be priority, not only a need.

For this reason, the Home System companies have a great opportunity, but most also a great responsibility that has to be caught and exploited in order to offer to the market a more practical and defined zone in which pass the working hours.

Strictly connected to this challenge, there is a reasoning on materials and innovation that has to be done.

Focusing on the same problem of working from home models adopted by companies, people have understood the importance of sound-proof constructions. Especially in bigger cities, this need has always been underestimated or considered as minor, since that people spent most of the time away from home in the workplace. Now, working from home has been adopted also by smaller companies and in large scale in order to contain the risks of the outbreak and for this reason, one potential need that rises from the market in the upcoming months will be a solution for noise externalities.

But the issue is not related only on construction materials. The rapid evolution of the outbreak has also created an awareness for safety in the house spaces. For this reason, in the market will require for safer surfaces and easy to clean pieces of furniture. New materials used in the production process have to be bacteria-proof.

An example of a reality that immediately understood this market's need is Xilia, a small company specialized in wood eco-tactile surfaces based in the Livenza Furniture Cluster. Since its beginning, Xilia has always kept an eye on sustainability issues, researching solutions with the lowest possible environmental impact, as recycled materials and varnishes which does not use any solvent, but water.

Around this philosophy, right after the beginning of the outbreak, Xilia with the joint effort of its varnish supplier has decided to study an anti-bacteria technology for its surfaces. So, adding a nanotechnology that exploits the disinfectant power of silver to its varnishes, the company has developed its "Xilia Antibacterial Treatment"[33].

This peculiar characteristic of silver was well known from the market, which applied similar technologies in the last ten years. For instance, Veneta Cucine – one of the most important players in the Livenza Furniture Cluster, – has a similar treatment for its steel surfaces. However, the form of innovation, in this very specific case, is the material in which the nanotechnology is applied, since that Xilia develops wood surfaces, mostly.

This is a clear example of General-Purpose Innovation that applied with cleverness produce a co-innovation able to meet the potential evolution of the demand.

The other side of the market perspective is represented by offices. The adoption of working from home models, pure or hybrid[34], has revolutionized also the concept of office. The adoption of social communication technologies as Zoom, Google Meet and Skype, distance has not been seen a problem at all. Employees have had the possibility to communicate and get in touch as well, even if at the beginning they had to get used to. because of this, also offices may be restyled in order to meet the new companies' needs.

What is very probable to see in the next future is an office used as sharing ideas and information space.

What has been missed more during the quarantine, in fact, was the possibility of employees to exploit the face-to-face contacts and the possibility to share ideas in a workspace able to foster the knowledge creatin process. In this case technology cannot bridge the gap, because it is the physical co-presence that generates synergies.

The common idea is that offices will be redesigned more as co-working stations and meeting rooms instead of annexes, aimed at hosting employees when the co-presence is needed and clients when meetings have to take place. For the rest of the mansions, a hybrid model may be adopted since it allows to economize in the maintenance costs and reach talents despite their location – as highlighted by McKinsey study "Reimagining the office and work life after COVID-19" (2020) upskilling is critical, but sometimes

[33] All the data have been gently provided by the company itself during an interview in September 15th, 2020.

[34] With "pure" are intended those models which state that the employee works all the week from home, while "hybrid" models require the presence in the office a variable number of days per week.

geographical constraints become an impediment to reach talented people; working from home limit the movements and so distances becomes a surmountable problem.

However, also from the company's perspective an analysis of the imminent needs. as widely highlighted in the third chapter, firms of the wood and furniture industry in Friuli Venezia Giulia have suffered from the forced closure between March and May. In particular, what has to be recalled in order to define the challenges for the future is the partial loss of exportations.

Italy has been the first European country hit by the pandemic and for the social security a global lockdown has been imposed at the beginning of March, while all the other countries have maintained an active production and delayed the activities' closure.

For this reason, companies had delayed the orders to the reopening day, but in the meantime have also lost part f them. Moreover, when the lockdown measured have been eased the situation saw an open Italy, but a partially closed Europe (especially France and England, two of the most important foreign markets for the Friuli Venezia Giulia Furniture industry) and this has caused a further reduction in the commissions.

For this reason, one of the most important questions that Home System companies have to face right now is whether or not get initiated to new markets. The international agreements for the creation of the New Silk Road started few years ago, but it's necessary to think about the potential of these new markets and to understand which are the consumers' tastes and if they can be supplied.

What is required for this purpose is an observatory able to monitor the evolution of the eastern market and understand the potential segments that can be exploited by Home System's firms.

Another issue that comes to light after covid-19 outbreak is the workers' safety. The new rules aimed at reducing the spread of the virus impose measures of social distancing and the use of breathing masks.

This affects the production process, which has to be modified in order to safeguard employees' health. So, whether teams and jobs that require more than a workman, now have to be thought to be safer, but in general every workplace have to adopt the proper measures in order to avoid the spread of the virus.

So, both form the market and companies' perspective, Covid-19 is a challenge that has to be faced as soon as possible. The problem is that is impossible to foresee the evolution of

the pandemic and for this reason is necessary to think also to the long-term strategies, not only to the resolution of the most imminent needs.

In the third paragraph of the first chapter it has been highlighted the evolution of the world due to globalization and globotics.

During the last twenty years globalization and the emergence of new technologies as Artificial Intelligence and Remote Intelligence have completely reshaped the way in which companies do business. In general, what can be reported is an outsource of low value-added activities by big leading companies in order to cut costs and be more competitive on prices, sacrificing in sometimes quality.

As highlighted in the second chapter, the Livenza Furniture Cluster and in general all the industrial realities of North East of Italy have only partially applied these strategies. In part this is due to the size of companies (more than 90% of them are small and medium sized) which does not always allow to relocate the production sites or to bear high transfer costs, but most importantly because there were no needs to do so. Very often companies are gathered in industrial realities in the territory and in some cases create districts and cluster. This allows to all the economic agents to exploit proximity and leverage each other's' strengths, being competitive without recurring to outsourcing or delocalization.

However, this does not imply that SMEs are immune to technological progress. In future the contribution provided by low skilled employees will gradually be lower and lower, because they could be replaced by new more efficient and cheaper technologies.

For this reason, what is necessary to think is a reshape of the "socio-industrial fabric" in the next seven years of Smart Specialization Strategy.

The risk that may be faced is, then, represented by the incapability of the labor market to maintain the same technological progress' pace. Without the correct adaptation through the right training programs, the demand and the offer in the labor market may not find an equilibrium, with a consequent excess of workforce. The aim for the next programming is to train employees in order to reshape the way in which workforce efforts have always been applied to the production process. This means that a knowledge-based workforce has to be trained in order to follow the technological progress and not to lose the bundle of industrial commons that have been created over the years.

This reveals that S3 programming has on one side to think about the imminent stakeholders' needs, but at the same time the long-term perspective must be immediately considered in order to produce the correct effects when they are desired to happen.
The other side of the coin is then represented by those firms who have outsourced or transferred part of the production process in low wage countries and now, after the pandemic have decided to return in the homeland with a reshoring process. This potential evolution that has been manifested by several leading companies needs consistent investments in the future and may be a critical element for the enhancement of competitiveness. Policies and programs able to attract this kind of investments could be the key for the restoring of territorial competitiveness for the Home System in Friuli Venezia Giulia.
Now that the major challenges for the Home System have been highlighted, is necessary to delineate which are the technologies and forms of innovation that can be implemented in order to supply such needs.

4.3.2 Development Trajectories for 2021-2027 programming in the Home System

The previous paragraph has highlighted which are the new challenges that Home System's companies may face in the next years and which might be the evolution of market needs.
Now that the potential evolution of the industry has been highlighted, a question must be answered: which are the forms of innovation that can be exploited by companies and institutions of the territory in order to face such challenges and supply market's needs?
On September 25th, the first Home System's meeting for the Smart Specialization Strategy's revision took place in Brugnera[35].
This pulls the trigger on the new entrepreneurial process of discovery that will define in the nest months which are the new development trajectories for the Home System.
According to the quadruple helix model, various stakeholders from industry, institutions, scholars and private citizens have been invited to participate to the meeting with the

[35] Headquarter of Cluster Arredo FVG, body in charge to coordinate the meetings.

purpose of discussing which have been the results obtained in the past years – which are summarized in paragraph 4.2.4 – and which are the purposes for the next seven ones[36].
In particular, as highlighted by Giada Gamba (representant for Friuli Venezia Giulia Region) during the meeting, one strategical target has been set by the European Union: in the next seven years, regions, with their strategical contribution, have to develop a "smarter Europe".
With respect to the past programming, the new objective sets a break with the past. In the period between 2014-2020, S3 has been considered as an *ex ante* condition for getting access to ERDF funds and this has provided the right stimulus for the development of projects that only with regional funds would have never seen light. However, this implied that S3's main aim has been focused only on research and development activities able to produce innovation in the territory.
This is a big limiting factor, since that the concept of innovation has been considered mostly as technological and not also strategical, organizational and social.
With the development of a "smarter" Europe the focus is shifted on a broader sense of innovation, aimed not only to research and exploit new technologies, but also to create connections within and without the single territories. A Smart Europe aims to enhance linkages and communications between different players, breaking every boundary of innovation and fostering the creation of synergies.
Being aware of this evolution in way of understanding S3, during the meeting in Brugnera, Giada Gamba highlighted the four guidelines that will help the stakeholders to define the new development trajectories during the entrepreneurial process of discovery. They are:

- Enhance R&D processes integrating the newest advanced technologies
- Digitalization
- Enhance SMEs' competitiveness, favoring communication and the implementation of synergies
- Stimulate the flow knowledge and entrepreneurship

What is necessary to do as further step is considering these guidelines together with the challenges that companies might face in the future and the new market needs in order to identify which are the forms of innovations that are most suitable to reach S3's goals.

[36] The author of the thesis had the privilege to attend to the first meeting and had been invited to participate to all the next ones.

However, before proceeding with the definition of the typology of innovations that may be exploited, is necessary to make another consideration on the concept of "Home Systems".

When the area of specialization has been defined eight years ago, the concepts of robotization and integration of home automation were not developed as they are now.

So, within the area of specialization, now, should be reviewed as well. This idea is fundamental especially considering the way in which funds are assigned. According to S3 guidelines, every area of specialization embed a series of ATECO codes and they identify which companies have the right to apply to a specific European Call promoted by ERDF. This distinction worked perfectly in the first years of S3, but due to the evolution of technologies, several cases of companies which were not able to apply because of their ATECO code has been registered.

Considering, now, the evolution of our houses and the technologies that are becoming part of our everyday lives, what becomes necessary is to review the typology of companies that should be included in the Home System area of specialization, or, at least, assign funds according to the projects' topics.

S3 is a plan that evolves during the years and that is subjected to several revisions. It's impossible to maintain the same classification that has been imposed at the beginning, because, such as technologies, also industries face an evolutionary path.

Going back to the forms of innovation that can be reconducted to Home System, they can be categorized, according to their nature, as follows.

Technological innovations

Exactly as the previous programming, technological innovations constitute the main source for the improvement of processes and products. they can be divided in "hard", when the innovation is strictly related to new materials, technologies and techniques, and "soft", when it consists in the use of computer programs.

Technological innovations can be split in two sub-categories, according whether they are referred to processes or products.

In the past programming, *process innovations* were mainly referred to the capability of companies to ameliorate their production plants in order to reduce costs and their impact on the environment, for instance applying sustainable production methods and green technologies.

These kinds of innovations, as highlighted before, were influenced by the process that the Livenza Furniture Cluster had undertaken to re-obtain the EMAS registration.

This description of "process innovation" was very generalist and didn't refer to specific forms of innovation that companies were able to exploit.

Nowadays, thanks to the technological progress companies have the capability of exploit both hard and soft innovations and combine them in order to be more competitive, reducing the price cost per unit, but also to be more sustainable.

The first innovation that should be appointed is 5G, which may improve firm's productivity under several points of view.

This form of innovation stepped into the spotlight in the last months can be the real turning point for the development of technologies able to upheaval the production systems not only in the "Home System" but in almost every industry.

In brief, 5G have the capability to increment the speed with which data are transmitted and, most importantly, ameliorate the cell coverage[37].

Considering the production processes that take place in Home System's firms, 5G can be exploited in several ways.

First of all, considering the "globotics upheaval" described by Baldwin (2019), 5G opens the doors of industrial Internet of things. This implies that robotized mechanisms can be implemented whether mechanical operations – such as assembly – are done. But most importantly, a more powerful connection gives the possibility to collect a series of data on the production processes and foster a series of upgrades. For instance, the quantity of energy necessary to produce a single unit can be measured, but same goes for by-product measurement. So, on one side, 5G applied to IOT does not only represent a way to fasten up processes, but most importantly to keep track of what happens along the supply chain and intervene in real time wherever a problem of a waste appears. Of course, the possibility of monitor the production process has a green implication, since that it's possible to analyze where wastes of energy are or raw materials use and so reduce the impact on the environment, according to the EMAS principles.

Another implication of 5G on the production process is represented by the possibility to upgrade the ways in which prototypes are done. Instead of creating real ones,

[37] Even if in the last years Italy has faced a consistent upgrade in the cell coverage, there is already a substantial problem for what concerns the most peripheral areas, which in some cases still does not have the adequate internet connection. 5G may be the real turning point since it gives the possibility to everybody, independently from their location, to get access to have a sufficiently powerful connection.

technologies as “digital twins” give the possibility to create a virtual representation of the product in its every component, studying the its physical characteristics *a priori*. The concrete implication of this kind of technology is, of course, the capability of testing a product without creating anything, with the consequent savings in materials, energy and time.

The virtual replication of the product, then, can be extended to all the production process and, thanks to the capability of 5G to create a stable internet connection, also different production sites can be synchronized, reducing, again, wastes of time and energy.

As can be seen from these few examples, 5G meet the first three guidelines provided by S3 for 2021-2027 period: it gives the possibility to digitalize the processes which can be constantly monitored and updated; integrates new technologies, as digital twins, in the research and development processes; and, last but not least, gives to small and medium enterprises the possibility to be connected and become part of a network which improves the flow of information.

So, 5G becomes a tool that can be exploited by almost everybody in order to digitalize the production process and overcome the last seven years concept for which process innovations were based only on the reduction of unit costs and on technologies able to reduce processes’ environmental impact.

But innovations can be applied also on what concerns *product innovation*. In particular, in the past S3’s plan, the focus has been centered on materials innovations and on their combinations (eg: plastics, woods, resins, *etc.*).

However, considering the new market needs, especially after Covid-19 outbreak, innovations should again focus on new materials, but also on design concepts.

The research and innovation process on materials has always been developed by companies, which during the years have exploited important innovation – such as the antibacterial peculiarity of silver – in order to introduce in the market more sophisticated products able to satisfy markets needs and to improve products durability.

Nowadays, new technologies as 3D printing might help a lot in the development of new products, but also, thinking bigger, revolutionize the way in which constructions are

made[38]. In particular, in the last years many experimentations of 3D printed homes have been developed and, probably in the future this technology will be widely applied.
3D printing can, then, be very helpful in the creation of smaller details, since it allows to create something instead of crafting it from a solid piece of material.
However, the widest margins of innovation concerning products have to be addressed to design.
Covid-19 outbreak has revealed the urgent need of redesign home and working spaces. As highlighted before, working from home has forced people to find in the house a spot that has to be dedicated to working hours, but very often houses' dimensions do not allow it. So, design innovation should focus its efforts on space-saving solutions.
In this case, many innovations can be applied in order to fill the gap that there is between firms and consumers. In particular, 3D design technologies, LiDAR sensors[39] and Virtual Reality (VR) can be implemented in the on-line distribution.
These two particular innovations may have a twofold purpose:

- Allow to customers to design their own spaces. 3D technologies and LiDAR sensors combined together allow to virtually locate in the room the pieces of furniture exactly where the customers want to place them.
- Allow to customers to avoid futile visits in showrooms until the final decision of buy or not a product – this characteristic may be very important whether a new partial lockdown will be imposed.

Last, but not least, 5G can be a source of innovation for what concerns every technology that concerns with home automation systems. Vocal assistants as Alexa and Google Home are becoming part of our day lives and for this reason is necessary to develop new products able to directly interact with these new forms of home automation. A faster connection implemented by the domestic use of 5G, especially in the peripheral areas, might allow to develop a new demand based on these hi-tech technologies.
Again, the three first guidelines provided by the European Union can be satisfied by these forms of innovations applied to products. in fact, R&D will include the newest forms of

[38] NB: it has to be remembered that in the Home System are included also constructions companies, even if they represent a marginal quota with respect Livenza furniture cluster's firms and Manzano chair district's firms.
[39] LiDAR sensors are technology recently developed by Apple able to trace with an extremely precision all the objects in a 5 meters range. In particular, IKEA has already exploited this new typology of sensors to develop its own application.

technology, looking at the world as digitalized and connected. But most importantly the implementation of similar technologies on products may force small and medium enterprises to even more specialize themselves, for instance, in using 3D printing technologies – developing, so, more sophisticated processes – and re-organize their production lines in order to satisfy the continuously evolving demand.

This particular topic allows to focus on the following theme: strategical innovation.

Strategical and social innovation

Because of the born of global leading players – such as IKEA – small and medium companies must renovate themselves in order to be able to transmit to the market a value added able to provide them a form of competitive advantage.

As highlighted before, over the years, Livenza furniture cluster's companies have been able to develop a sense of being and cohesion that allowed to implement forms of business networks[40]. Moreover, it has to be kept in mind that the cluster is one of the major components of the Home System specialization area.

The previous S3 plan did not considered any form of strategical innovation as essential for the development of new technologies. in fact, it was very R&D oriented, specifically on the single projects that companies were able to purse by their own.

However, considering the four pillars stated by the European Union in order to obtain a "smarter" Europe, enhance the competitiveness of SMEs is one of the main tasks that have to be achieved in the next 7 years.

Remembering all the concepts explained in the first chapter and the strengths of the Livenza furniture cluster, what can be states is that the territory represents a fertile ground for the development of new strategies aimed at reinforcing SMEs competitiveness. Innovation does not pass only form technologies, but also from social cohesion and sense of being that foster the creation of synergies.

By jointing their efforts, companies can reorganize themselves in business networks and leverage each other's strengths. What has to be remembered, in fact, is that the Livenza furniture cluster is made mainly by small and medium sized companies, each of them highly specialized on a specific passage of the supply chain. This makes them experts on their specific field. So, a business network can be a form of strategical innovation that may be sustained by the European funds that have the capability to increase SMEs'

[40] Ref. Chapter 2, paragraph 2.4

competitiveness. it has to be remembered that right now similar business models are financed only by regional funds, as Rilancimpresa, or totally privately financed.

Moreover, with the purpose of a "smarter" Europe, intended in this case as more connected, the capability of SMEs of jointing efforts should not stop within the regional boundaries, but can also be European oriented. Enhancing the competitiveness means to create a value added to the product that is produced. As well as regional business networks, also international business networks can improve SMEs' competitiveness and, at aggregate level, increase the European competitiveness as a whole.

As said before, 5G can be providential, since it provides the capability to everybody to be connected and synchronize the production processes even if there is a substantial distance between two production sites.

However, this form of innovation might raise a problem: the main strength of a cluster derives from the geographical proximity between companies and their capability of sharing tacit knowledge. it is absolutely true that 5G drastically reduce the distances issues, but the cohesion that is formed between the economic agents of a cluster over the years difficultly can be overcame by a technology.

This introduces the second form of strategical and social innovation that have the possibility to improve companies' competitiveness.

Remembering the issue highlighted in the previous chapter concerning the globotics upheaval and the threat generated by robotics on the labor market, the key for the success of a region resides in training programs.

The technological evolutionary path is overwhelming the production processes with an increasingly speed and the only way that a territory as Friuli Venezia Giulia and its Home System has to survive is by training employees in order to create real experts.

In the future every mechanical work will be replaced by a robot, more precise and less expensive. For this reason, funds provided by the European Union should be also focused on training programs promoted by the region or by companies themselves.

This form of improvement, also, might stimulate entrepreneurship. The coming of robotization can fragmentate even more the specializations within the area and, as happened in 1960s for the Livenza furniture cluster, new specialized firms might rise.

In the previous ESF[41] programming for 2014-2020 a specific line of financing was aimed at sustaining the development of new entrepreneurial realities in the territory. In particular, this program provided the opportunity to benefit of training programs and consulting services for newborn societies. However, this line of financing has never seen light in Friuli Venezia Giulia S3 programming.

Whether the same line of intervention will be implemented in the next seven years, also considered the new forms of innovation that may be exploited, the program may have a great success and focus on the fourth guideline provided by the European Union.

Moreover, the potential high future specialization can stimulate the creation of industrial commons, which are the engine for the territorial competitiveness.

Combining the capability of the territory of producing new tacit knowledge that can be exploited in the production process with the creation of a strong network that enhances communicability, the result is an improvement of the flow of information that can be transferred form one spot to another easily and without any barrier.

This reasoning reveals one critical point: every development that has taken place within the Home System specialization areas has been the result of old and traditional strategies applied by the single actors.

Right now, the technological evolution and the possibility of speeding up connections provide to a territory as Friuli Venezia Giulia the possibility to lead to another level every improvement that has already taken place and ameliorate it. Every form of connection based on face-to-face relationships, the sense of being part of an ecosystem, the connections that leading companies have with the foreign markets and at the same time maintaining their production sites on the territory, are only few of the strengths that have led the Livenza furniture cluster – and by osmosis the whole specialization area – the center of the wood and furniture industry.

The forms of innovations that have been developed in the last years are only a way to improve and scale up a regional reality that already has its importance in the industry.

So, the old development trajectory should not be completely forgiven, but reviewed in a futuristic concept.

During the first entrepreneurial process of discovery in Buttrio, entrepreneurs have expressed only positive thoughts on the previous development trajectories and, most

[41] Together with ERDF, the European social fund is one of the main sources of financing that sustain Smart Specialization Strategy.

importantly, underlined that they are not outdated, but need to be re-thought with an optic of evolution.

So, considered the previous reasoning on the market's and companies' needs, considered the contribution that the newest forms of innovation (technological and strategical and social) and according to the unanimous decision adopted during the first Entrepreneurial Process of Discovery meeting on taking into consideration the old 2017 development trajectories as base for the definition of the new ones, the following bullet point will outline which can potentially be the development trajectories for 2021-2027 programming:

- *Technologies for materials and innovative design*: under this trajectory are included all the research and development activities, technologies and forms of innovation aimed at developing new materials and combining existent ones as well as technologies and methodologies necessary for their implementation in the manufacturing cycle as 3D/4D design software and 3D printing. Moreover, under this area converge also all those technologies that can be used as support for internal and external spaces design. The first purpose of this area's project is, according to the previous trajectory, is the amelioration of materials in terms of durability, performances and sustainability, but also the satisfaction of the market demand for more salubrious materials (especially after Covid-19 outbreak). Also, R&D activities included in this trajectory have to be focused on the newest market's need for "smart designed" spaces, considering the adoption of several companies of "working from home" methodologies and the new scope for which offices will be used – conference rooms instead of real offices.
- *Connectivity for the improvement of buildings' and processes' efficiency and sustainability*: under this trajectory are included all the research and development activities and technologies aimed at increase production processes' performances both under the perspectives of efficiency and sustainability by exploiting the newest 5G connectivity technologies. with respect to the previous development trajectory, which focused its attention only on reducing the environmental impact through the implementation of sustainable forms of energy, this upgraded trajectory focuses its efforts on the capability of creating a more connected supply chain. In particular, connectivity has the purpose of synchronize and connect every step of the production process as well as increasing transparency and efficiency,

by keeping track of every passage in the supply chain. Under this trajectory should be included also every technology that exploit 5G and connectivity, such as Digital Twins.

- *Digitalization*: in this trajectory are included all those technologies able to improve the digitalization of business functions as well as every project aimed at including systems of home automation in Home System's products. In particular in this area has to be included every ICT business solution technology aimed at implementing digital distributional platforms and client support solutions. In particular, under this area can be included all those technologies that allow to the final customer to design its own spaces thanks to the 3D representation and the exploitation of sensors. Digitalization includes also all the processes aimed at integrating systems of home automation in Home System's products, expanding their potential use and enhancing their performances with the aim of creating a connected ecosystem.
- *Knowledge share and integration*: under this trajectory are included all the projects aimed at producing, transferring and integrating new forms of knowledge in the territory with the purpose of enhancing territorial competitiveness. More specifically, fall under the scope of the trajectory all SMEs business networks born with the purpose of create synergies, all the knowledge integrators' efforts aimed at transferring information from one hotspot to another and every technology aimed at codifying tacit knowledge. The final aim of the trajectory is to embed in the territory new sources of knowledge able to improve SMEs competitiveness and stimulate entrepreneurship.

The nearly presented development trajectories are only the first result of a process that will be reviewed in the next seven years, but they have been designed in order to be modified and adjusted during the new S3 programming 2021-2027.

Moreover, what has to be considered is that they do not represent the definitive version that will be published, since that the entrepreneurial process of discovery started on September 25^{th,} 2020 and will end approximately on the second half of December. However, they try to respect as closely as possible the four guidelines provided by the European Union, thought to reach a "smarter" Europe.

4.4 Methodology

The previous analysis has been conducted with the gently support of Cluster Arredo FVG, the body uncharged to conduct the Home System's Entrepreneurial Process of Discovery, and in particular to its director, Carlo Piemonte, which has provided to the author most of the references for the drafting of the chapter: the role of S3 in Friuli Venezia Giulia, the sequence with which the process takes place, explanations on the old development trajectories 2014-2020, and the main themes that will constitute the base for the development of the new ones for 2021-2027 S3's programming.

For what concerns paragraph 4.2.4, all the data have been extrapolated from the reports made by ISRI (Istituto di Studi sulle Relazioni Industriali), which have been uncharged to produce every annual report for S3 in Friuli Venezia Giulia, and by Area Science Park, which have analyzed the environmental, social and economic context of Friuli Venezia Giulia.

The author of the thesis has also been invited to attend to all the meetings which will produce the final version of the next seven years development trajectories.

In particular, during the first one in September 25th, 2020 the first meeting has took place in Buttrio (province of Udine), with the participation of 21 stakeholders coming from the four areas outlined by the quadruple helix principle. During the meeting has been analyzed the previous results of S3 for the Home System (paragraph 4.2.4) and the main European Union's purpose of reaching a "smarter" Europe in the next 7 years.

Finally, for the draft of the four development trajectory, the reasoning has been based firstly on the former chapters of this thesis, which has been used as base of every reasoning, but also on the result of the first Entrepreneurial Discovery Process meeting, which has helped to undertake the bottom-up perspective requested by Smart Specialization Strategy.

The four development trajectories proposed are not the final version which will be reviewed firstly by the Regional Commission and then by the European Commission, but they want to be food for thought for reasoning on which challenges the Home System's companies, especially the wood and furniture industry's ones, will face in the next future and which innovations and technologies can be implemented in order to revive a territory that in the last years has lost a lot due to the last three crisis.

CONCLUSION

Cross cutting topics have been analyzed in this thesis. From the concept of cluster, to Covid-19 outbreak, ending with an analysis of the potential future challenges and the possible implementation of new technologies in the Friuli Venezia Giulia's "Home System" specialization area. Also, it is relevant to underline that the Livenza Furniture Cluster, widely analyzed in the second chapter, constitutes the major pool of firms, institutions and, in general, stakeholders for Home System[42].

As stated before, the Cluster has been hardly hit by Covid-19 outbreak and several losses, especially at exportation levels, have been registered. However, the outbreak cannot be considered as a "black swan" – so an unexpected event with an extreme impact. According to Taleb (2020) Covid-19 is more a "white swan", since, even if it has shocked the economic and healthcare systems without any distinctions, it could have been statistically predicted. This gives us a little room for maneuver, since it makes possible to forecast for the immediate future the potential paths that can be followed by Cluster's firms to get back on their feet. Smart Specialization Strategy (S3), with its development trajectories, has exactly this aim: to highlight the potential future technological and innovational paths that should be followed to pursue a homogeneous growth in the ecosystem.

Nevertheless, in order to understand the Livenza Furniture Cluster's opportunities from the adoption of S3's innovational paths, it's necessary to recall its two main features.

As widely outlined before, Cluster's companies' competitiveness finds its roots in territorial capital. According to Camagni and his taxonomy (2008), territorial capital has a double shape: on one side it is represented by all those tangible elements, such as natural resources; on the other, the real source of value is represented by "intangibles" as human, social and relational capital. This last aspect of territorial capital right now constitutes a crucial element that can be exploited by companies in order to revive themselves. In fact, despite "Coronacrisis", every form of relationship and human contact established by the economic agents over the years is not erased, but still persists.

[42] Livenza Furniture Cluster expands its territory among Veneto and Friuli Venezia Giulia Regions. The analysis, in this case, has been based on Friuli Venezia Giulia side. However, also Veneto region has adhered to S3 programs and, similarly, has defined its own areas of specializations. Among them there is "sustainable Living", which is the exact correspondent for "Home System" and, in fact, similar development trajectories have been designed in 2014-2020. Moreover, it's necessary to specify that I personally attended to the first two meetings, aimed at defining the 2021-2027 Home system's new development trajectories.

Along with this element, the capability of companies to create industrial commons (Pisano, 2008) is fundamental, maintaining stuck into the territory their tacit knowledge which becomes available for everybody. Over the years, also, commons have been constantly fed by the new sources of knowledge imported by Knowledge Integrators (Pisano, 2018) which have invested in the creation of pipelines to connect different hotspots.

It's crystal clear that a similar ecosystem constitutes a fertile ground for a consistent upheaval led by the actual critical situation. In fact, as every other crisis, also Covid-19 outbreak does not show only new challenges, but opportunities as well and the Cluster has the possibility to undertake a form of advantage with the proper investments.

In fact, one of the major strengths of Livenza Furniture Cluster resides on companies' capability to create a complex, interwoven, but perfectly functioning network of relationships.

So, this internal mechanism of knowledge production and sharing can be the real engine for the fully exploitation of the opportunities of investment provided by S3 through its development trajectories.

In the previous chapter the four trajectories have been based on the European Union's aim of achieving a "smarter Europe". Following a bottom-up process, they have been developed according to stakeholders' needs and market opportunities.

What they have in common is the peculiarity of being projected into the future, maintaining, at the same time, all the strengths that have led the Livenza Furniture Cluster and the other Home System's components to be one of the most competitive manufacturing hotspots in the world.

Therefore, the main aim of the trajectories is to allow Home System – and in particular the Cluster – to evolve, implementing an innovational path based on enhancing the investments' level in innovation and creating stronger forms of connectivity through new 5G technologies, also where they already exist.

This last point is particularly fundamental. Covid-19 outbreak has, in fact, revealed the fragility of a global value chain based on the Chinese production, since it showed that a missing step brings down the whole supply chain. However, considering the Livenza Furniture Cluster, the production site is located mostly in the same region of Northern Italy and this might be a huge advantage that can be exploited by companies. Connectivity, in this sense, should be aimed at enhancing controlling and monitoring actions over the

supply chain, but also, jointly with investments in digitalization, at opening the virtual boundaries of the cluster to new markets, such as Asia, which is starting his process of "westernalization".

Moreover, the already established forms of connectivity (mostly based on face-to-face relationships) have the possibility to be furthermore enhanced by new technologies powered by 5G. A connected supply chain can produce an infinite series of advantages, such as the possibility to track every process and raw material used to align the production sites that, due to the high horizontal integration, are located through the whole territory. This particular former aspect led to a more profound reasoning. In the last twenty years the Cluster has been used to adopt "Just in Time" (JIT) production methods, in order to satisfy the fragmented demand for tailor made products. With an improvement in connectivity, JIT may evolve into a lean production, focusing efficiency on adding value to the customer. In particular, thanks to the automatization of processes and the continuous exchange of data from one site to another, all the inefficiencies produced by JIT – as, for instance, the waste of time necessary to monitor dislocated passages – can be transformed in precious time dedicated at incrementing the perceived value of the product. So, all the passages, even if in different locations, could be aligned, and the supply chain would be more agile as well. All of this, in one word, can be expressed by "competitiveness", without sacrificing quality as in vertically integrated firms.

However, in order to implement a similar structure, considerable investments in technologies and in training are necessary. So, S3 can be a very powerful tool, since it gives the possibility to every company, without exceptions, to get access to European funds as long as projects and technologies are aligned with the designed development trajectories. Moreover, the existent structure provides to Cluster's firms the possibility to adopt an open innovation model. In fact, Cluster's companies have the possibility to exploit the existent (and improved) connectivity combining it with the set of information coming from external stakeholders, such as consumers. Doing so, the new inflows of knowledge have the capability to accelerate the internal innovation and show new development paths that otherwise would never be considered. Of course, this requires consistent investments firstly for stakeholders' engagement, but also for investments themselves. For this purpose, S3 can be the right tool, providing the necessary funds to clusters' projects and highlighting the right path for innovation. Also, it may lead companies to joint

their efforts under the form of business networks in order to supply the evolving demand for materials and design.

Given the huge success that the old programming has been shown, the next seven years might be the real turning point for the Friuli Venezia Giulia wood and furniture industry. By exploiting the innovational paths defined by S3, firms have the possibility to renovate themselves, invest in the territory and upgrade a production process that in most of the cases has been stuck in old-fashioned manners.

In conclusion, even if Covid-19 effects will be carried on in the short and medium run, the new S3 programming for a smarter Europe represents a huge opportunity for Livenza Furniture Cluster to follow an homogenic growth path, aimed at enhancing competitiveness and implement new sources of innovation.

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