

**THE GOVERNANCE
OF KNOWLEDGE NETWORKS
IN INDUSTRIAL CLUSTERS AND CITIES**

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1. Introduction

The internationalization of markets and production processes indicates that innovation in the long term is the key factor of international competitiveness for European firms and regions, rather than lower taxes and higher corporate profits or greater labour flexibility and lower labour costs. On his turn, innovation is determined by new knowledge, know-how as also by finance and organizational and entrepreneurial capabilities.

Moreover, the transition to the model of the knowledge economy implies a distinct change in the industrial development strategies and in the approach to innovation policies, focusing more on knowledge creation than on technology diffusion and more on networks with respect to individual firms. That leads to overcome the divide between high technology sectors and the rest of the economy and highlights the interest in analysing medium technology sectors and knowledge intensive services, which represent the largest and more dynamic component of the European economy and are different from low technology sectors and traditional services.

This study aims first to clarify the factors determining the process of knowledge creation and innovation, by comparing the classical linear or Tayloristic approach focusing on R&D investments and large vertically integrated firms specialized in high technology industrial sectors and the more modern systemic or interactive approach, focusing on interactive learning process, tacit knowledge and networks of SMEs in medium technology industrial sectors and knowledge based services.

Second, this study aims to compare three different forms of regulation of the economic relationships, such as the free market, the government and the governance models and it focuses on their respective capability to promote an higher speed of change rather than the static factors of competitiveness, such as decrease of prices and exploitation of economies of scale. That may contribute to clarify the policy challenges of European regions facing the actual global financial and economic crisis and the ongoing long term evolution of Europe toward the model of the knowledge economy.

Finally, this study illustrates the characteristics of competence centres, which are increasingly adopted by many European countries and regions as a new tool for innovation policy and for the coordination between various regional private and public actors. Moreover, it analyses the complex system of interdependent policy measures required for the development of modern service activities in the large European cities.

Thus, it may be useful to highlight some key figures, which illustrate the importance of medium technology sectors and of knowledge intensive services for the European economy.

In fact, while innovation policies mainly focus on the development of high technologies and R&D investments, medium technology manufacturing sectors represent the largest component in the trade of OECD countries (56,3%) and their share in the period 2000-05 has continuously increased, while both the share of low technology and that of high technology products have decreased (table 1).

The machinery and transport equipment sector (with the exclusion of office and telecom equipment) is the most important component of the medium technology manufacturing sectors for world exports. Exports (outside the EU) of this sector from the European Union (625.079 in 2007) are 1.6 times the exports of United States (401.475) and 2.7 times the exports of China (229.932).

The trade balance of European Union in this sector is highly positive (297.533 in 2007), while that of the United States is negative, and it is 6.8 times higher than that of China (43.751), and higher than that of Japan.

Table 1:
Structure of OECD¹ manufacturing trade² by technology intensity
Share in total manufacturing trade

	2000	2001	2002	2003	2004	2005
High technology	26,7	25,8	25,2	24,5	24,4	24,1
Medium-high technology	37,6	38,0	38,8	39,3	39,0	38,7
Medium-low technology	15,1	15,0	14,9	15,5	16,5	17,6
Low technology	20,1	20,7	20,9	20,7	19,6	19,0

Source: OECD, STAN Indicators Database, March 2005

www.oecd.org/sti/stan/indicators/

1. Excludes Luxembourg and Slovak Republic

2. Average value of total OECD exports and imports of goods

Table 2: The competitiveness of the European Economy in medium-technology sectors
Unit: US dollar at current prices (Million)

		European Union		European Union (27) Net	United States	United States	United States Net
		external	external				
Manufactures	2000	666.608	608.538	58.070	648.907	968.207	-319.300
	2007	1.406.496	1.187.164	219.332	909.393	1.409.631	-500.239
Office and Telecom Equipment (OTE)	2000	83.962	145.289	-61.327	153.399	215.544	-62.145
	2007	117.920	238.606	-120.686	134.934	262.074	-127.140
Machinery and Transport Equipment except OTE	2000	278.629	189.413	89.216	258.801	348.408	-89.607
	2007	625.079	327.546	297.533	401.475	491.377	-89.902
Machinery and Transport Equipment	2000	362.591	334.702	27.889	412.200	563.952	-151.752
	2007	742.999	566.152	176.847	536.409	753.451	-217.042
Manufactures	2000	449.686	212.666	237.020	219.859	169.883	49.976
	2007	640.881	314.428	326.453	1.134.805	677.633	457.172
Office and Telecom Equipment (OTE)	2000	108.179	60.866	47.313	43.498	44.427	-929
	2007	103.124	69.680	33.444	347.113	226.279	120.834
Machinery and Transport Equipment except OTE	2000	221.482	45.202	176.279	39.102	47.504	-8.402
	2007	348.757	80.920	267.837	229.932	186.181	43.751
Machinery and Transport Equipment	2000	329.661	106.068	223.593	82.600	91.931	-9.331
	2007	451.881	150.599	301.282	577.045	412.460	164.585

Source: World Trade Organization Statistics: Statistics Data Base, 2008,
<http://stat.wto.org/Home/WSDBHome.aspx?Language=E>

In particular, Italy's exports in this sector (177.058 in 2007) are the 28,3% of the European total and are mainly made by (138.931 in 2007) by machinery different from autos.

High technology sectors represent only 1,08% of total European 27 employment in 2006 and this share has been decreasing (table 3). On the contrary, manufacturing medium technology sectors have a much greater importance since they represent 9,88% and low technology sectors represent 7,25% of total European 27 employment in 2006.

According to Eurostat medium technology sectors include sectors such as: machinery and equipment, electrical machinery and apparatus, motor vehicles, other transport equipment, chemicals and chemical products excluding pharmaceuticals, medicinal chemicals and botanical products, coke, refined petroleum products and nuclear fuel, rubber and plastic products, non-metallic mineral products, basic metals, fabricated metal products except machinery and equipment, building and repairing of ships and boats.

Table 3: EU27 - Employment in technology and knowledge-intensive sectors
(shares on total employment)

	2000	2004	2005	2006
High technology manufacturing sector	1,27	1,11	1,07	1,08
Medium high technology manufacturing sector	6,13	5,66	5,51	5,52
Medium low technology manufacturing sector	4,66	4,44	4,34	4,36
Low technology manufacturing sector	8,23	7,75	7,55	7,25
Manufacturing sector	20,3	18,96	18,46	18,21
Total knowledge-intensive services:				
NACE Rev. 1,1 codes 61, 62, 64 to 67, 70 to 74, 80, 85 and 92	30,34	32,18	32,36	32,78
Total less-knowledge-intensive services:				
NACE Rev. 1,1 codes 50, 51, 52, 55, 60, 63, 75, 90, 91, 93, 95 and 99	33,12	33,32	33,71	33,67
Other sectors	16,24	15,54	15,47	15,34
TOTAL	100	100	100	100

Source: Eurostat database in Science and Technology.

Thus, to promote the competitiveness and innovation of medium technology sectors, which represent the largest share and the most dynamic component in European industry, is becoming an issue, which relates more to industrial policy and even to the macroeconomic performance of the aggregate European economy, rather than to European R&D policy and scientific excellence. That indicates the importance of promoting strategic industrial projects in the medium technology sectors, as it will be explained in this study.

However, the concept of the knowledge economy requires a broader perspective to innovation and to consider not only industrial sectors, such as high tech manufacturing sectors and medium technology manufacturing sectors, but also the knowledge intensive services, which according to Eurostat include: water and air transport, post and telecommunications, financial intermediation, real estate activities, research and development, other business activities, education, health and social work, recreational, cultural and sporting activities. In fact, the share of knowledge intensive services (32,78%) on total EU employment is higher than that of total manufacturing (18,21%) and it is also rapidly increasing while the share of manufacturing in total employment is decreasing.

2. The evolution of industrial clusters

Innovation is not adopted by SMEs in isolation and is not the result of the individual inventor or entrepreneur. Innovation requires the combination of different competencies within processes of

collective learning. Firms are forced to cooperate in order to increase and diversify their knowledge base. Moreover, the processes of knowledge creation have a localized nature, as knowledge can only develop in a localized or specific framework and it calls for the “cognitive proximity” of the various actors, which participate to an interactive learning process. Therefore, differently from large firms, SMEs should not be considered individually, but rather as part of a complex regional production and innovation system.

The approach of regional innovation systems (RIS) (Cooke, Heidenreich and Braczyk, 2003; Cooke et al., 2006) is related to the approach of national innovation systems (NIS) (Lundvall, 1992; Nelson, 1993). It emphasizes the systemic dimension of the innovation process, which derives from the fact that a regional system of innovation is made by a plurality of actors, like large and small firms working in a production sector, where network relationships exist or could be economically foreseen, institutes of research and of superior training, private laboratories of R&D, agencies of technological transfer, chambers of commerce, associations of enterprises, organizations of professional training, specific governmental agencies and appropriate offices of the public administrations. The sense of belonging represents the base of an “associative approach” or of an “associative governance”, that leads to the creation of club, forum, consortia and different institutional schemes of partnership (Cooke and Morgan, 1998). A regional system of innovation could be defined as a system in which the firms and the other organizations are systematically engaged in an interactive learning through an institutional environment characterized by local embeddedness.

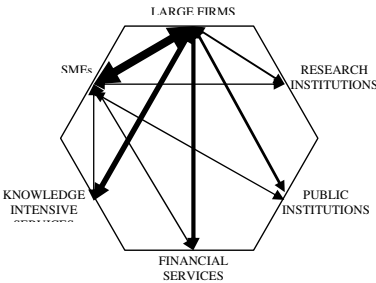


Figure 1: Information and knowledge links in a regional innovation system

Source: Cappellin, R. and Wink, R. (2009), International Knowledge and Innovation Networks: Knowledge Creation and Innovation in Medium Technology Clusters, Edward Elgar Publishing, Cheltenham.

The structure of regional innovation system can be illustrated by the relationships between six groups of local actors: large industrial firms, industrial SMEs, business services, financial services, research institutions and public institutions, as indicated in figure 1. Each group of actors is characterized by very tight internal relations and it may represent a sub-network made by different firms and organizations within the overall regional network. The network relationships between these groups of actors have different intensity and they are mostly hierarchically organized around the largest industrial firms, as indicated in figure 2, and also may rapidly evolve in time.

Both the concept of the cluster (Porter, 1990 and 2000; Becattini, 1990; Cappellin, 1998; Steiner, 1998) and that of the regional innovation system are based on the existence of various firms, of

geographical proximity and of complex material linkages between the firms. However, while the concept of the cluster focuses on sectoral specialization, the concept of the regional innovation system focuses on R&D and technology transfers and it clearly identifies the intersectoral character of these information and knowledge relations. Moreover, differently from clusters, the analysis of regional innovation systems explicitly considers the role of intermediate or bridging institutions and not only of the firms and the possibility to define a development strategy of the regional economy. In fact, the spontaneous clustering processes of innovative activities is not always sufficient for competitiveness and it needs to be complemented by the design of an explicit cluster strategy.

The concept of knowledge and innovation networks (Maillat and Kebir, 1999; Capello, 1999; Capello and Faggian, 2005; Simmie, 2005; Tödtling and Trippel, 2006; Geenhuizen and Nijkamp 2006), while being related to that of the regional innovation systems, is characterized by the explicit analysis of the processes of knowledge creation within and between the various nodes and by the interregional character of the various relations. Thus, this latter concept perfectly fits into the context of medium-technology industries, as the intersectoral and interregional linkages of knowledge play a major role for the evolution of these industries.

In the most developed European regions, the traditional industrial clusters, specialized in a single sector, have evolved into territorial networks (Cappellin, 1998; Cappellin and Orsenigo, 2000; Carabelli, Hirsh and Rabellotti, 2006), which are characterized by:

- a greater sectoral diversification,
- a greater integration of the various sectors of the local economy and also
- an increasing internationalisation.

Table 4: From an industrial to a knowledge economy in medium technology clusters

	Knowledge economy: competitiveness through innovation, high creativity		
Governance: identity Networks	Interactive learning and incremental innovation	Systemic innovation and governance of knowledge networks and diversification	Governance: strategic networks
	Process innovation, supplier dominated, imitation of competitors and lock-in effect	Vertical integration, large leaders firms and technology transfers to subcontractors	
	Industrial economy: cost competition, low creativity		

One very important result from the empirical observation of clusters in these regions refers to the greater importance of knowledge flows than material flows for the network linkages. For example, clusters specialized in medium technology sectors are characterized by an intense network of international export flows since at least the 70'ties in the most developed regions and more recently by frequent investment in foreign countries and the development of international subcontracting.

While the material flows of the clusters are interregional and increasingly international, the geographical span of the various forms of knowledge flows and of the technological cooperation relationships between SMEs is mainly regional. Thus, the cluster concept has evolved from a predominantly material linkage and agglomeration based concept to that of a network, which supports knowledge generation and the sharing of knowledge.

The shift from an industrial economy, where competition is based on costs, to the model of the knowledge economy (Bell, 1973; Drucker, 1993; OECD, 1996; Lundvall, 1992; Lundvall and Johnson, 1994; Foray and Lundvall, 1996; Morgan, 1997; Maillat and Kebir, 1999; Karlsson, and Andersson, 2007), where the key factor of competitiveness is innovation and creativity, can be analyzed in the perspective of the shift from a model of automatic free market interdependence, as in “identity” networks, to a strategic model, as in the “strategic” networks, as illustrated in table 4.

The limits of the traditional industrial clusters are underlined by the fact that the linkages between SMEs in the process of interactive learning within a cluster are often informal, rather chaotic and time-consuming. That highlights the need for an explicit effort in the organization of knowledge networks and knowledge interactions (Cappellin, 2003a and 2004a; Karlsson, 1997; Powell, 1990; Tödtling and Tripl, 2005; Steiner and Hartman, 2006; Wink, 2008) between the firms and specialized suppliers, clients, knowledge intensive services, research institutions, public administration, other local organizations and many other external actors.

3. The process of knowledge generation in innovation networks

The linear model of innovation (Bush, 1945; Balconi, Brusoni and Orsenigo, 2008) adopts a Tayloristic approach and it is based on the clear division between different phases: basic research, applied research, development, production, marketing and diffusion, which are performed by different institutions or organizations, such as universities and research institutions, large firms, small firms and various auxiliary service activities. Each of these phases and organizations is producing a different output such as scientific articles, patents, incremental innovation, product differentiations, new product design or complementary services. This top down sequence of activities corresponds to the model of firms, prevailing in the early 50'ties when the linear model was first proposed and the production cycle in a “Fordist” firm was vertically integrated and centred on a moving assembly line. It also corresponds to the rational comprehensive planning model according to which the stage of plan making anticipates in a linear sequence the stage of plan implementation. The critique to the linear model usually emphasizes the various feedbacks and cycles which occur in the various phases of the innovation process and the fact that often the factors leading innovation are not science but rather the experience of users and the need to solve technical problems occurred in responding to the needs of the market (Kline and Rosenberg, 1986, Von Hippel, 1988; Lundvall, 1992; Fagerberg, 2005).

A different critique to the linear model may be proposed on the base of a cognitive approach. In fact, a process of knowledge creation is occurring within each of the functions and temporal phases of the linear model (figure 4.1). Moreover, knowledge may have a different character in any phase, as the creation of analytic or science based knowledge (Asheim and Cohenen, 2005; Asheim et al., 2007) characterizes the basic research phase, synthetic or engineering based knowledge the development phase, evaluation or organizational knowledge characterize the production phase and symbolic or creativity based knowledge the marketing phase. However, knowledge is in a continuous evolution and needs to be combined with different and complementary knowledge, which may characterize the other phases in the abstract logical sequence indicated by the linear model. Knowledge flows from one phase to the other upward or downward phases of the linear model through the interaction between the various actors, who play a key role in the individual

phases. According to a different classification of knowledge types, codified and tacit knowledge are cyclically combined together (Nonaka and Konno, 1998, Howells, 2002). In fact, codified knowledge, as the top of an iceberg, emerges from a large base of tacit knowledge.

Thus, it is arbitrary to establish an hierarchy between the four different types of knowledge indicated above, as they are all relevant in a continuous innovation process and they may have a different importance in different countries, regions or firms. Clearly the creation of knowledge is not the monopoly of the research centres and the firms and other actors are not the passive users of knowledge already existing. Although science and basic research are important at the global level, the specific innovation in local sectoral or company context may requires different types of competencies or knowledge.

In particular, R&D investments are a key factor for the creation of analytical knowledge and the growth of science based or high tech sectors. In the contrary, the competitiveness and growth of medium technology sectors, where synthetic knowledge is a distinctive characteristic, depend especially on the capability to increase the stock of tacit and codified knowledge and to promote interactive learning processes between various firms and organizations.

A radical shift of perspective is needed from the concept of technologies, R&D expenditure and rational process of optimization of individual firms to a focus on the processes of knowledge creation and learning within networks and on the development of the internal capabilities of firms and actors (Bougrain and Haudeville, 2002). Thus, the most important issue is not the distinction between the different forms of knowledge, according to different typologies, but rather to identify the various factors which affect the quantity, quality and speed of the process of knowledge generation. These factors are largely common to any cognitive process, as they are the results of the studies on the working of the human mind and its influence on human behaviour. In fact, a cognitive perspective in the analysis of the process of knowledge creation may be important also for a more efficient use of R&D funds in the organizations specialized in the production of analytical knowledge or involved in basic research.

In fact, according to the model of neural networks, an innovation is the result of an adaptive learning or searching process, which leads to new synaptic connections of various nodes. A scientific breakthrough and an innovation occur, when the joint impulses or signals coming from other nodes not only are compatible with the node considered, but also overcome a certain threshold of intensity or activation value. Each units calculates its own activation value depending on the activation values it receives from the input units. That allows the considered node to perceive this stimulus. The node may then decide whether to conflict with it or rather to adapt to it. The signal is then passed on to output units.

The pattern of activation set up by a net is determined by the weights, or strength of connections between the units. Weights may be both positive or negative, where a negative weight represents the inhibition of the receiving unit by the activity of a sending unit. Thus, knowledge creation depends primarily on the settings of the weights between the units. In a spatial setting these weights depends on geographical, organizational and cognitive distance and the existence of appropriate facilitating institutions and infrastructures (Cappellin 2003a).

If the stimulus is compatible with the existing cognitive system of a firm or a specific socio-economic actor, an interactive processing may lead to identify an incremental solution to an existing problem and that stimulates the act of innovation. Clearly also time is a crucial factor as it facilitates perceiving a continuous stimulus or absorbing and adapting gradually to it.

Therefore, in a network perspective, technological change may be interpreted as the result of the continuous or gradual search by each node, of the most appropriate level and form of integration or co-operation with the other nodes or actors within the network. Technological change is similar to a process of iterative adaptation of the direct and indirect links between any couple of nodes in order to maximize their respective interaction and integration (Cappellin 2003a).

Figure 4: Two different models of knowledge creation and innovation

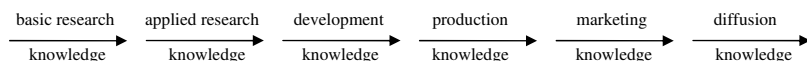


Figure 4.1: The linear/Tayloristic model of innovation and the flows of knowledge

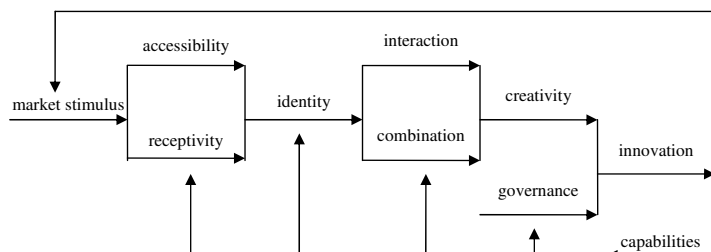


Figure 4.2: The cognitive model of knowledge generation and innovation

Source: Cappellin, R. and Wink, R. (2009), *International Knowledge and Innovation Networks: Knowledge Creation and Innovation in Medium Technology Clusters*, Edward Elgar Publishing, Cheltenham.

In particular, according to the approach of territorial knowledge management (TKM) it is possible to distinguish six factors in the process leading to an innovation (Cappellin 2003b and 2007; Wink, 2003; Cappellin and Wink 2009) (figure 4.2). These factors seem to also correspond to the indications of the literature on cognitive economics (Nonaka and Konno, 1998; Rizzello, 1999 and 2003; Egidi and Rizzello, 2003; Loasby, 2002 and 2003; Holland, 2002; Metcalf and Ramlogan, 2005). In particular, the external “stimulus” induced by the opportunities of the demand, the pressure of competition or the change in technologies determines a tension leading to the search for a solution of the problems of the firms. This searching process is facilitated by a higher “accessibility” to potential complementary partners (Torre and Rallet, 2005; Cappellin, 2004c; Boschma, 2005), and it also requires an appropriate “receptivity” of these latter. The creation and strengthening of a common “identity” (Becattini, 1990; Crevoisier and Camagni, 2000), made by common values and sense of belonging, is the prerequisite for the cooperation and the search for joint solutions. These latter are the result of “creativity” capabilities (Asheim and Clark, 2001; Florida, 2002; Wink, 2007) and the original combination of different and complementary pieces of knowledge through a process of interactive learning between various local actors. Then, new ideas can be translated into economic innovations only through an appropriate organization and “governance”, which implies the commitment of appropriate resources and the integration of the new ideas with complementary production capabilities.

Moreover, innovation is leading to a process of learning and the development of new capabilities, which improve the various factors indicated above. Finally, innovation is going to change the external selection environment for other firms and it may represent the stimulus to innovation for them. That indicates that innovation and learning are a dynamic and cumulative process.

Innovation requires the combination of different competencies and firms are forced to cooperate to increase and diversify their knowledge base. Thus, innovation is the result of a processes of collective learning and flexible forms of cooperation between many different private and public, regional and international actors, such as large firms, SMEs suppliers, knowledge intensive services, higher education and research institutions, financial intermediaries, public administration and many other partners such as professional association and media.

A “systemic” approach focuses on the processes of knowledge creation and collective interactive learning (Lundvall and Johnson 1994; Florida 1995; Karlsson, 1997; Keeble, Lawson, Moore and Wilkinson 1999; Lawson and Lorenz 1999; Antonelli, 2005; Morgan, 1997; Steiner and Hartmann, 2006), on the iterative adaptation between the different partners in a network and on the implicit automatic selection of the most competitive innovations.

Knowledge circulates within networks through formal and informal institutions. Explicit or codified knowledge may be exchanged on technology markets. Instead, tacit knowledge requires allocation mechanisms which are different from the markets, since it has an asymmetric character, it implies high risks and it requires reciprocal trust, identity and shared values leading to collaborations. Only specific organizations and institutions and not traditional markets are capable to insure those connections which allow the exchange and the tight interaction of tacit knowledge and competencies.

A network approach allows to explain not only the concept of creativity and of interactive learning but also the time or speed of the innovation process. In fact, like in a flock of fishes, many firms and actors participate within an innovation network to the process of innovation, performing specific tasks and introducing innovation in their respective field of activities. They procure innovative products/services from supplier firms and provide innovative products/services to client firms. Inputs sources are complementary between themselves and clients of the products are fungible between themselves.

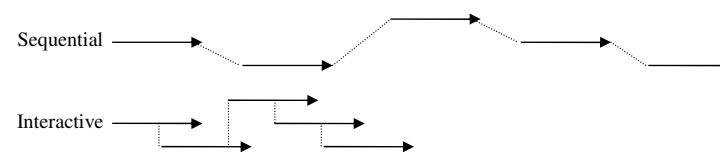


Figure 5: The speed of innovation in a sequential and in an interactive cycle between the firms in a cluster

Each firm in turn, as in a race, assumes the lead of the innovation effort performing the role of the key innovator and uses the contributions previously elaborated by other firms and provides an original opportunity both for other followers firms, who will continue the innovation effort, and for the competitors who will imitate and improve his original solutions. The almost spontaneous coordination between the firms in an innovation network allows an high flexibility and to rapidly change the direction of the innovation effort, reacting to new opportunities or challenges.

The speed of innovation process is decided by the speed through which the firm is capable to orient itself and to select between the possible suppliers and between the possible clients (Figure 5). This process may be compared to a relay race where a runner should hand off the baton to the next runner. Usually, this latter starts running before the first runner has completed his run. That allows to initiate a collaboration with other firms before they will complete their innovation and to collaborate with them in orienting the final results of their innovation effort, while a learning

process is occurring in the firms, who initiate later their innovation process. The selection of suppliers and that of possible clients is related to their respective waiting and searching times and is affected by scanning costs or switching costs.

The speed in the selection of suppliers and clients depends on the adaptive and strategic behaviours of each firm and on various types of costs and factors, such as: the transaction costs in the negotiation process, cognitive distance between the partners, the memory of previous experience, the reciprocal learning costs, the receptivity of each partners, the trust relationships, the risk of opportunistic behaviours and the asymmetry of information, the preference for the future, for novelty or the risk aversion and the existence of specialized services and bridging institutions. In fact, the speed in decision making and coordination in a network depends on leadership or the capability to steer the action of other actors or on good governance, which is more an art than codified knowledge.

In a dynamic environment the creation of value and of new knowledge depends on the integration of the knowledge acquired from many firms and the speed of innovation depends on the interaction between a plurality of actors. Due to their flexibility, networks represent the most effective form of organization to promote a fast speed of innovation. In fact, the major advantage of the network model of organization is to insure to the firms a faster access to a wide scope of complementary competencies existing in other firms and to remove the barriers, which are hindering to operate into new products, processes and markets and could lead to a lock-in situation. Through network integration, firms are capable to decrease the resources and time for adopting an innovation, with respect to the situation where they would be required to develop internal capabilities. This high flexibility is a key competitive factor in a dynamic market, where innovation has to be adopted faster than competitors.

Networks are characterized by lower adjustment costs or switching costs (Cappellin, 1983) in the choice of new possible partners. Weak ties or indirect links can easily be transformed into strong ties or direct links, when the need to respond to external opportunities and threats make that necessary. For example, networks allow even to SMEs to have access to global markets, as through indirect links or the cooperation with large local or foreign firms it is possible to export and also to produce in remote areas without a direct investment of the firm considered. Networks also imply less transaction costs (Williamson, 1981; Cappellin 1988) in inter-firm relationships than a competitive market made by isolated producers and users. Within networks firms can easily change the level of cooperation with previous partners, as implicit contracts can more easily be adapted than formal contracts. Moreover, networks lead the various actors to invest in the creation or strengthening of soft and hard infrastructures and routines linking them. That makes the relationships between firms more intense or increases the speed of the flows between the firms.

In a governance perspective, networks allow that ex-ante coordination, which is needed for long-term investments and major innovation. Networks facilitate the solution of conflicts between the various firms, which are inevitable in purely competitive market, thus reducing the costs and risks and the waste of time related to these conflicts and lacks of coordination. However, the network model limits the autonomy in decision making of the individual firm, compared to a competitive market made by isolated firms, or the case of a hierarchical organization, such as a single large integrated company or an autonomous state. Clearly, within networks decisions depend on an interactive process of negotiation between the various firms and other actors and often develop in time in an iterative way.

Table 5: Why the process of innovation in SMEs and in medium technology sectors differs from that of large firms in high tech sectors

	Linear/Tayloristic approach	Cognitive/Systemic approach
Key factor	Technology	Knowledge
External stimulus	Cost competition, supply changes and new equipment	Market orientation, demand changes and user needs
Internal process	In house R&D and technology transfers	Interactive learning
Role of human resources	Labour substitution and receptivity to new technologies	Competencies of the actors, creativity and entrepreneurship
Competitiveness factor	Productivity increase and economies of scale	Continuous innovation, flexibility and fast change
Governance model	Rational optimization by individual firms and government bodies and/or market competition	Connectivity, iterative adaptation and selection within innovation networks
Policy instruments	Public finance to R&D and public market regulation	Multi-level governance, bridging institutions and public-private partnership

Source: Cappellin, R. and Wink, R. (2009), International Knowledge and Innovation Networks: Knowledge Creation and Innovation in Medium Technology Clusters, Edward Elgar Publishing, Cheltenham.

In conclusions, the crucial points which differentiate a systemic approach from a classical (linear or Tayloristic) approach in promoting innovation in the SMEs networks of medium technology sectors are highlighted by table 5. The stimulus to change and innovation within firms is not only determined by the pressure of competition, the need to increase productivity and reduce costs, or the opportunity created by the supply of modern technologies and the use of modern equipments. On the contrary, the most important factor is represented by the identification of new markets, the aim to adapt to changes in the demand and the opportunity to satisfy new users needs. While in the

linear process of innovation the formal process of R&D investment plays a key role, the systemic approach of innovation highlights that solutions are gradually discovered through a process of interactive learning involving many different actors not only within the R&D laboratories. The desired outcomes are not just the increase of productivity indicators, often interpreted as a disjoint result, but rather the speed of a continuous process of innovation, where each change is the evolution of previous changes. Entrepreneurship and governance, through public-private partnership, are required to organize the joint effort of different actors and firms. The focus shifts from stimulating competition between the local actors to promoting connectivity and iterative processes of reciprocal adaptation and selection of the best productive combinations.

Thus, cluster policies require new forms of governance of the relationships between the various local actors and also the identification / selection of new actors. The multiplication of players and layers of negotiation – international, national, and local – demands a different model of regulation, called “multilevel governance” (European Commission, 2001; Kaiser and Prange, 2004), based on organisational structures of interaction and partnership. In particular, while medium size firms have developed vertical flows of tacit knowledge within their respective supply chain, they need to be supported in order to develop horizontal linkages between different technologies.

4. The role of KIBS as bridging institutions in innovation networks

Since interactive learning is the key process in knowledge creation and the access to tacit knowledge is crucial in SMEs and medium-tech sectors, networks are an appropriate form of organization, which facilitates the interaction and the flows of information and knowledge. Within networks nodes and links are constrained by the existence of spatial distance and of intermediate institutions. In this perspective, knowledge intensive business services (KIBS) have an increasing role as knowledge intermediaries. In particular, the role of KIBS may be crucial in the identification of key problems and in the design appropriate strategies.

The service activities represent the largest part of the employment and of product in a modern economy. The industrial firms of most developed countries outsource a growing part of the manufacturing activities to other firms in countries with lower labour costs. They adopt capital intensive productive processes that allow to automate the productive cycles and to substitute the manual employment. The industrial firms in developed economies increasingly specialize in immaterial or tertiary activities, such as commercialization, design, finance, organization of production, management of the supply chain, transports and logistics.

The development of services affect the development of the industrial activities and also it is influenced by the development of the latter. A strong industrial base is crucial for the development of qualified services. On the other side, the industrial base of a region or of an urban area can not be competitive without services.

In fact, the crucial factor of the competitiveness of firms has become the capability to continuously and quickly change the products and productive processes to face the international competition, which requires a continuous decrease of the production costs, a greater adaption of the product characteristics to the needs of users and a continuous substitution of the traditional products with new products, which satisfy the traditional as well as new needs of the consumers. The tertiary activities both internal and external are crucial for ensuring high qualitative levels of the productions and of customer services and for promoting the product and process innovation.

The development of the service activities (“explicit” tertiary activities) is linked with the growing role that the services activities carry out inside of the industrial firms (“implicit” tertiary activities),

where the activities of manufacturing transformation are sustained by the development of the tertiary activities. The demand of advanced services is tight complementary to the development of tertiary activities inside the industrial firms. The tertiary activities of recurrent use are carried out within the industrial firms, while those more specialized and less recurrent are bought from outside.

In other words, the main development factors of the tertiary activities are the evolution of the technology and the demand of the industrial activities, which require a greater quality and the continuous innovation of the productions in the framework of an international increasing competition, which makes impossible to be competitive on the base of low production costs in the developed economies (Antonelli, 1998; Antonietti and Cainelli, 2007; Gadrey and Gallouj, 1998; Miles, 2005; Miozzo and Grimshaw, 2005; Muller and Zenker, 2001; Soete and Miozzo, 1989; Strambach, 2001; Wood, 1998).

On the other side, the development of the tertiary activities and the reconversion of the economy towards the tertiary activities is linked with the higher education levels and qualification of the workforce, the development of knowledge and the increasing propensity of the workforce for not manual occupations. Thus, the most developed economies are becoming more competitive in the sectors which require a more qualified professional workforce, as that is relatively abundant within these economies, which de-specialize from the manufacturing sectors, where a low qualified workforce is required. Due to this characteristics, the modern business service activities are normally defined as “KIBS – Knowledge Intensive Business Services” in the international literature.

In particular, the following typologies of knowledge-based services can be identified:

- “knowledge intensive business services” (KIBS), which include also the service activities to the people considered in their function of employees, such as professional education and mandatory social insurance;
- “knowledge intensive people services” (KIPS) and having an technology intensity, which require workers with an high professional competencies, such as health services, or which use in intensive way innovative technologies as complex instruments and ICT.

Both these innovative service activities are part of the larger definition of “knowledge intensive services” (KIS).

Clearly, that does not exclude that knowledge and technological change are increasingly important even in the case of the traditional services, both those addressed to the firms and those addressed to the people, as in the case of modern large distribution and logistic services and leisure activities, where specialized competences are required.

While the contribution of KIBS to the innovation of the user firms is widely recognised, it is more difficult to distinguish the characteristics of innovation inside the KIBS (Barras, 1986; Gallouj and Weinstein, 1997; Hipp and Grupp, 2005). Generally it can be stated that innovation within KIBS is characterised by:

- the continuous change of the typology of the services to be delivered to new different customers,
- the continuous improvement of the quality and the typology of the services delivered to the same customers.

For example, over the years the services offered by engineering companies have been gradually extended, together with an evolution in the very concept of engineering services. That has determined the blurring of the traditional sectoral distinctions and engineering companies have extended their activity from the traditional fields (such as: design of technical solutions in machinery and equipment engineering, civil engineering, hydraulic engineering and information

technology), into various new fields (such as: finance, project management, marketing, health and safety, environmental studies, historical conservation, territorial and urban planning and architecture, transport economics and logistics, regional, urban and rural economic impact studies). These new fields may be tightly related between themselves and often they are also required in the planning and execution of major civil or industrial projects.

In synthesis, the process of innovation and knowledge creation within KIBS has an incremental and cumulative character and it is based on the succession of:

- a) application of general tacit and codified knowledge in the solution of the specified problems of the users;
- b) a gradual generalization of the results obtained in application experiences for the development of new both tacit and codified knowledge, which represent the base for further applications to new customers and new problems.

The succession of generalization phases and application phases in the process of creation of new knowledge and competences within KIBS can be described as in figure 6. KIBS proceed to the recombination of the knowledge previously acquired, to its reprocessing and adaptation and this brings to the generation of new innovative services, which represent de facto an innovation for the KIBS themselves. In other words, the relationships of interaction between KIBS and the user firms bring to innovations within the users, but also to the development of experiences, of competences and therefore of innovations within the same service firms. Thus, KIBS themselves are “innovators” and they not should not only be considered for the contribution provided to the innovative capabilities of their customers.

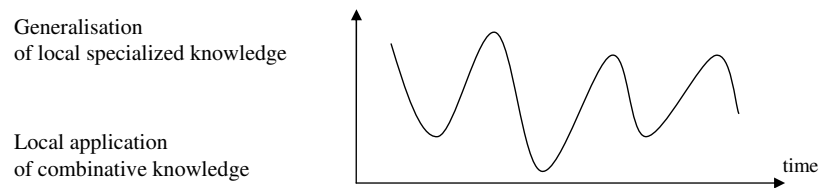


Figure 6: The process of knowledge creation within Knowledge Intensive Business Services

In particular, the model of creation of the new knowledge and of generation of innovation in the KIBS is different from the “linear model” or also the from the “linked-chain model” (Kline and Rosenberg, 1986), which suppose a tight linear relationship or a feedback relationship between the phases of basic research, applied research, development and innovation. On the contrary, it has a “systemic nature” involving the interaction between different firms, as, due to their “problem solving” nature, KIBS develop new knowledge and new competences in an informal way, on the base of a tight interactive relation with their users.

The interactive activity between demand and supply or between the users and the provider in the production of a KIBS determines that not only the knowledge can be transferred from KIBS firms to the user, but also that the opposite flow is important. In fact, KIBS learn from the experience of problem solving on behalf of a large scope of customers. In that perspective, KIBS carry out the function of “immaterial infrastructure” or “intermediate institution”, in the flows of tacit and codified knowledge in a cluster of SMEs, as KIBS facilitate the use of common organizational models and the sharing of technological knowledge between different firms and mainly between the SMEs within a local production system. According to Mueller e Zenker (2001), the interaction of KIBS and their customers contribute to stimulate the generation and the diffusion of knowledge within the national and regional innovation systems.

5. Governance as a distinct model of regulation.

Institutions matter in a market economy (Williamson, 1981; North, 1990). However, in a developed market economy, many economic relations are not regulated by the market competition between firms producing the same products. Neither they are regulated by the norms defined by the state or by the internal rules within a large company. In fact, many economic relations are regulated by negotiations, agreements and forms of partnerships between the firms working in different sectors and between various economic stakeholders, characterized by different capabilities.

The increasingly close linkage between organizations in civil society and the State and the development of policy networks (Marsh and Smith, 2000) is an important element of the “shift” towards governance and it characterizes almost all countries. This new multi-stakeholder dialogue may include not only employers associations, trade unions and the national government, such as in the traditional social contract model of central European countries, but also a wide set of actors. In fact, policy-making in most modern economies, not only in continental European countries but also in the United Kingdom and United States, includes not only individual companies, in industry, banks and media sectors, employers associations and trade unions, but also a wide variety of civil society organisations, alliances and networks, operating locally, nationally and across borders, such as thematically organised business networks, business intermediaries, NGOs, community groups, religious communities, think tanks, foundations, professional and scientific associations, research institutes and academic institutions, local, regional and national public institutions, authorities and governments, supranational and international multilateral governmental organisations.

Governance is a term denoting the fact that collective decision making in modern Western societies is taking place today less frequent in form of hierarchical order by governmental authorities, but increasingly by network arrangements of public and private actors that negotiate cooperative solutions. We may define governance as a model of regulation of the relationships between the firms and the actors belonging to a policy network, based on interdependent adjustments decided on the base of negotiation procedures.

There is a large variety of modes of governance of knowledge relations. These forms of dynamic coordination range from coordinated transactions and constructed interactions to quasi-hierarchies (Antonelli, 2005). For example, the following organizations represent different governance modes:

- international and interregional agencies,
- large multinational companies and financial groups cross-participations between firms,
- vertical sectoral clusters of firms in the same supply chain,
- joint projects between national and foreign firms for new productions and new technologies,
- large “networks of excellence” between research institutions and research groups,
- committees, norms and technical standards between the firms of the same sector,
- industry and professional associations,
- cultural and professional associations, scientific associations,
- professional communities of practice,
- local networks, communities or industrial districts,
- local stakeholders coordination tables and territorial pacts with local actors,
- regional innovation strategies (RIS) and territorial knowledge management,
- forms of public-private partnership and strategic planning contracts with large firms,
- poles of competitiveness and centres of competence.

The governance model represents a change from a free market model and it seems to correspond to a new phase of development, where technology has an increasing systemic dimension, rather than a single firm perspective and the speed of adoption of innovation has become more crucial than the decrease of production costs in the competition between the firms. These changes require a greater integration of the various actors and the emergence of new institutional and organizational structures, such as networks, which would enhance social interaction.

Since the exchange of knowledge and especially of tacit knowledge cannot be effectively coordinated by conventional markets, the density of intermediate institutions (Nooteboom, 2002; Keeble et al. 1999) and the adoption of a governance model enhance innovation, as they favour reciprocal trust, identity and shared values and collaborations, while avoiding opportunistic behaviours, adverse selection and moral hazard.

Table 3: Forms of organization and regulation of economic relationships

	Government	Free market	Governance
Principle	Authority	Competition	Partnership
Result aimed	Order	Equilibrium	Agreement
Information provided	Regulations	Prices	Contracts
Instruments of organization	Control and adaptation	Pricetaking	Negotiation and leadership
Individual motivation and behaviour	Respect of authority	Autonomy, exit or conflict	Trust and bargaining
Complexity	Hierarchy	Individualism	Interdependence
Factor of efficiency	Economies of scale	Perfect mobility and flexibility	Transaction costs and adjustment costs
Interdependence	Vertical integration	No external economies	External economies
Number of actors	Individual actor	Infinite number	Limited number
Level of integration	Maximum integration	Minimum integration	Intermediate integration
Field of action	Sectors	Markets	Policy networks
Problems addressed	Authoritarianism	Monopoly	Conflicts of interest
Corrections to problems	Democracy	Antitrust policy	Specialization and dynamic coordination
Political Ideal	Egalité	Liberté	Fraternité
Juridical base	Civil law	Common law	Selfregulation and subsidiarity
Space of relevance	Any State and Corporations	Liberal Market Economies	Coordinated Market Economies
Goods	Scale intensive goods	Commodities	Specialized goods
Factor of competitiveness	Economies of scale	Lower prices	Time advantage
Type of innovation	Radical innovation	Incremental innovation	Systemic innovation
Knowledge base	Basic research	Codified knowledge	Tacit knowledge
Time framework	Static	Static	Dynamic

Governance plays a key role in determining the flexibility of an innovation network and in reducing the “switching costs” or adjustment costs to innovation, thus promoting a horizontal and vertical

diversification of the traditional productions in these clusters and avoiding the risk of a lock-in effect in territorial clusters.

Governance is a distinct model of regulation of economic relationships. It is different both from the free market model and also from the traditional top-down planning approach. The differences between these three forms of organization and regulation of economic relationships are synthetically indicated in table 3.

Different behavioural mechanisms and motivations characterize the three models of regulation: orders, control and respect of authority and adaptation characterize the hierarchical model of government. Freedom, competition and also conflict and exit characterize the model of free market. Trust, negotiation and leadership characterize the model of governance.

Each of these three different policy making models focuses on a different instrument for the organization of the economic relations between two actors, such as: the mechanism of norms and top down coordination in the hierarchical model, the mechanism of prices in the market model and the mechanism of contracts and agreements in the governance model.

In the “government” model, decisions are taken by a public authority and enforced on the base of a principle of authority. The hierarchical model explains the regulation of economic relationships by the State but also within the large individual firms. Second, the free market model is based on the principle of competition, and it advocates that “the best policy is no policy” and that public intervention is leading to distort the efficient allocation of resources automatically insured by the market (Bianchi, 1995). Third, the governance model is based on the principle of partnership and agreement between various actors, which are reciprocally recognized and legitimized.

The increasing wider adoption of a governance model represents the result of the adaptation to a continuously changing environment, rather than a deliberate change of strategy. In fact, it is embedded in the ongoing structural dynamics, which are largely common to all European countries and also to all modern developed economies. In particular, it is now widely recognized that a interventionist top-down model (“government”) in the innovation policies is neither possible nor desirable, since innovation for its very nature cannot be reduced to command and it has a pro-active character and is open to new discoveries. Thus, the dirigist approach of economic planning and of the “welfare state” should be changed into an approach based on the concept of partnership and subsidiarity. This is particularly decisive for medium-tech industries, as they are made by many different actors, who would hide their knowledge in the case of a command-and-control approach.

The governance approach in policy-making is tightly related to innovation, as this latter erodes the disciplinary borders and internal hierarchies, which characterize the government model. For example, Schumpeter’s creative destruction clearly determines conflicts and does not respect consolidated hierarchies. Governance is also tightly related to the internationalization process, as this latter undermines closure and hierarchies and erodes the regulation capabilities of the states. Moreover, the internationalization of economies insures to the innovators the freedom of exit from those hierarchical organizations, where they cannot accept a dependent role.

However, the increasing perception of the negative effects of globalization and the unregulated market mechanism leads to advocate a greater role for the state. That determines a cyclical shift between the market model and the state model. For example, the increasing complexity and interdependence of innovation processes lead to assign in various cases a greater role to national and European initiatives in a complex process of multi-level governance of knowledge and innovation networks.

According to an extreme interpretation, governance is a model which may not require the presence of a public institution (“governance without government”). However, it seems more precise to indicate that the role of the state changes in a governance model, with respect to the role of state in the government model or in the free market model. According to a governance approach the policy maker should not optimize a specific objective function, but rather promote the variety, diversity and creativity, the adaptation to the market stimulus and the exploitation of technological opportunities through the creation of an innovation system made by various institutions and open to the external world. A new innovation policy should not be based on a “prescriptive” approach but rather on a “transactive” approach, as the most important problem is not “what to do” but rather “how to do” and “with whom”. The policy makers should identify key stakeholders and act on the transaction costs, in order to promote the best internal integration in the relations between the various local actors and a greater openness toward the external actors. Innovation policy does not only concern the development of technologies but also the role of institutions and organizations. Rather than to optimize a specific goal, policy-makers should focus on the promotion of creativity, the adjustment to the market stimulus, and the exploitation of technological opportunities through the creation of a national or regional innovation system made by various institutions and open to the international economy.

6. The comparison of the governance and the free market models.

While most of the political science literature investigates the comparison between governance and government (Boyer 1990; Marsh and Smith 2000; Pierre 2000; Powell 1990; Rhodes 2008; Streeck and Schmitter 1985), an economic perspective leads to focus on the problem of the respective advantages of the governance model and the free market model in the regulation of economic relationships in a modern capitalist system: an issue which characterizes the current debate on privatization and marketization.

In fact, economic theory illustrates various limits of the free market model. Differently from the other regulation models, in a market model, the actors refuse to obey and also to agree and they prefer to compete each other. The actors adjust their willingness to supply and demand goods or services in response to the price signals generated by markets. Markets are self regulating and the coordination of economic relationships may be indirectly or automatically done by the market, who assigns productions to the most competitive firms, as the result of the competition between the many existing suppliers and of the optimal choice by the many possible users. On the contrary, in a governance model, the coordination is the result of the negotiations and explicit agreements between a limited number of individual stakeholders.

In particular, various reasons explain why the model of ‘multilevel governance’ is more adequate for managing innovation processes than the free market model (Cappellin and Wink, 2009):

- a) innovation has distributive effects: governance avoids conflicts and promotes inclusion.
- b) free market competition does not consider actors interdependence: governance promotes connectivity, specialization and integration.
- c) free market does not consider information asymmetries and opportunistic behaviours: governance facilitates the flows of tacit knowledge.
- d) the model of perfect competition is a static model: governance decreases adjustment costs and promotes higher speed of change.
- e) free market supposes perfect forecasting capabilities and aims to short-term results: governance reduces risks, enhances trust and long-term investments.
- f) the model of perfect competition is aiming to reach static general equilibrium solutions: governance aims to steer the process of evolution of organizational structures.

- g) free market competition is leading to concentration and oligopolistic structures: governance aims to remove barriers, conflicts of interests, rents and challenges established power structures.

This debate is related to the respective advantages of the so called liberal market economies (LMEs: such as United States, United Kingdom, Australia, Canada, New Zealand and Ireland) and the coordinated market economies (CMEs, such as: Germany, Austria and Switzerland, France, Italy and also Japan) analysed by Hall and Soskice in their edited volume on “Varieties of Capitalism” (2001 and 2003), as the management of interdependencies between individual, collective and corporate actors in coordinated market economies is different from the government model and also the market model.

In the highly coordinated market economies of continental Europe, intermediary organizations play an important role in processes of exchange between economic actors and strategic interaction or non-market relationships among firms and other actors have a key role in the investment decisions and innovation.

The governance model is also tightly related to the corporatist and federal systems existing in various countries in continental Europe. This system is characterized by the strong belief on autonomy and also the tight interaction between the various social, cultural and economic organizations and between the regional institutions among themselves and with the national state.

In corporatist societies social groups and local communities are entitled to various forms of collective participation and self-government and can regulate autonomously important aspects of sectoral and economic development, according to principles of vertical and horizontal subsidiarity (Lehmbruch, 1977; Schmitter and Lehmbruch, 1982; Cappellin, 1997; Streeck and Kenworthy, 2005).

In some cases (i.e. technical standardization), communities of individual actors through their respective organizations may establish “private interest governments” (Streeck and Schmitter, 1985). Sorge and Streeck (1998), for example, identified this influence as the main reason why the German industry reached a comparative advantage in the field of “diversified quality production”.

Due to their different form of regulation, Hall and Soskice hypothesize that liberal market economies (LMEs) specialize in radical innovation, while coordinated market economies (CMEs) focus more on incremental innovation. Our argument is similar but also different, as we indicate that the existence of a thick system of intermediate institutions plays a key role in explaining the concentration of medium technology sectors in coordinated market economies: On the contrary, the lack of this system of institutions explain the lack of significant clusters in medium technology sectors as also the large trade deficits in these sectors in most liberal market economies, such as the United States or United Kingdom.

In fact, the sectoral specialization in medium technology sectors organized in the form of networks of SMEs is tightly related to the existence of a complex system of intermediate institutions made by local chambers of commerce, territorial and sectoral specific industry associations, trade unions, professionals associations, public vocational schools, local universities and research organizations, local banks, etc. and to the adoption of the governance model of social and institutional relations. Massive public industrial investment subsidies and also a large effort in R&D may prove ineffective for the reindustrialization and the development of medium technology sectors in some countries which have abandoned these sectors long time ago. In fact, that aim would require a long term effort in the construction of a system of institutions, which are still lacking in these countries and represent the institutional environment without which is impossible to promote complex processes of innovation in these sectors.

A governance model represents a new and different paradigm, which is basically different from the free market model, for economic and especially for industrial and innovation policy. A neo-liberal model advocates greater wage and labour flexibility and greater competition as the panacea to every economic problem. However, in a modern knowledge economy the concept of innovation seems more important than that of price flexibility, and the concept of integration of the various economic actors appears more crucial than to promote the high competition already existing in the national and international markets. While the free market model advocates the same recipe of more competition and more flexibility in any case, not only industrial sectors but also in labour markets, finance, science and education and even interregional and international relations, the network and governance model is linked to the need of a greater integration between the economic actors and a faster innovation, which require the existence of intermediary functions, a greater stability of relationships, a long-term perspective and the supply of adequate public investments.

In particular, governance aims to decrease both the transaction costs (Williamson, 1981; Cappellin, 1988) between the actors and the adjustment costs to new technologies (Cappellin, 1983), and that promotes a higher speed of change. The governance of innovation networks allows to tackle those problems, which hinder the speed of innovation, such as bottlenecks, missing links, inertia, resistances, corporate rigidities, collusion, privileges and rents and redistributive inequalities, to overcome fragmented decision-making and to reduce organizational conflicts between the various actors.

The free market model aims to competition in an horizontal perspective, but it does not consider intersectoral interdependencies and it does not prevent forms of collusion in a vertical perspective between different sectors. In fact, the free market model leads to outsourcing, deverticalization processes and an overly complex sequence of production and commercialization layers, which increase the transaction costs, make opaque the circulation of information, determine asymmetric information, favour opportunistic behaviours, create conflicts of interest and rents situations. Thus, in many modern capitalist economies in Europe, the various forms of collusion between firms, in the bank, insurance, industry, media sectors, through direct and indirect financial links and the exchange of positions between the boards of these organizations, and the tight personal relations between the representatives within the various industry associations and with the world of politics have determined pervasive conflicts of interest between the supplier and the user, the controlled and the controller which are damaging the final consumers and the citizens. These rents and conflicts of interest are also among the main reasons of the increasing income disparities and insure to specific groups of actors an advantage with respect to the other actors. A market, which operates freely without rules, inevitably leads to collusion and concentration of the economic and financial power into few actors.

Intersectoral integration leads to conflicts of interests and it endanger that "separation of powers" which is the base of a pluralistic democracy, as indicated by the Montesquieu's principle of separation between the legislature, executive and judiciary powers. In fact, totalitarianism is occurring when all political and economic power is concentrated in a single group of actors or ruling class. In fact, as indicated by A. Smith specialization principle, the more developed is a society the greater should be the division of labour between sectors and also the division of powers between the different firms and organizations.

Forms of intersectoral collusion or integration represent a danger and create a rent situation. They are aimed to short term financial profits and to defend and exploit specific rent positions. Regulation or governance is required in a network in order to prevent vertical and horizontal collusion, which may damage other actors.

In fact, the 2007-2008 financial collapse of the financial system especially in liberal market economies, such as United States and United Kingdom, has been determined by the pervasive conflict of interest and lack of regulation, such as indicated by the self assigned bonuses by the managers and the artificial pyramids of innovative financial instruments.

These collusions represent the major obstacle to systemic or inter-sectoral innovation and diversification in European industry, as new innovative initiatives could conflict with the incumbent organizations and could undermine the existent power alliances between them. Clearly, SMEs in medium technology sectors are excluded from these exclusive networks and are hindered in their diversification and growth.

These forms of intersectoral collusion cannot be tackled by the traditional competition policies, which focuses on an individual sector, and require a broader governance of the relationships between the various economic actors. Regulation allows separation of functions and recognition of the respective legitimacy of each actor and avoids to confuse their individual role. Governance should insure the separation of the fields of activity of the different firms and organizations, in order to prevent conflict of interests and to insure a system of checks and balances.

In particular, the network model is based on the principle of specialization, as each node should perform a different function or role within a network. In a network model the relationships between actors are based on monetary or real exchange, negotiation, but also on specialization, division of labour and separation of roles and of activity, in order to avoid conflicts of interest.

Relationships in a network should be based on negotiations and agreements and neither on competition leading to conflicts or to the defeat and exclusion of some actor, nor on hierarchical power relationships leading to mergers or bureaucratic organizations. Governance enhances the combination of complementary capabilities on the base of public and transparent negotiations and agreements. In fact, on the one hand, innovation breaks the order of the hierarchy, and on the other hand it requires a tight and long-term dialogue and cooperation between different and complementary actors, which is not insured by the individualism, the conflicts and also the collusion characterizing a free market.

The alternative to the a free unregulated market is not represented by state capitalism or dirigism, but rather by a modern system of governance based on:

- the specialization and division of labour between the various actors, in order to prevent conflict of interests and to insure a system of checks and balances,
- transparent public negotiations and agreements based on reciprocal recognition and trust and allowing the control by consumers and citizens,
- an active role of public institutions as a facilitators and leaders in the design of medium term projects.

In conclusion, the three models of the regulation of the relationships between various actors may coexist not only in society but even within the same organization, as firms are in fact internally based on an hierarchical principle, while they compete with the other firms in the same sector or market and they negotiate cooperative agreements with their suppliers and their clients.

Moreover, each model of regulation of the relationships may lead to problematic situations and requires adequate instruments to correct them. Democracy avoids the problem of authoritarianism in the government model. Competition or anti trust policy is required to avoid collusion and monopolies in the free market model. Governance avoids the problem of intersectoral collusion and conflicts of interest in the case of networks.

Thus, the governance model regulates the integration of the various autonomous economic and institutional actors and enhances the development both of the market relationships and a pluralistic democracy. The procedures of negotiation in a governance model link the major economic and institutional actors through an interactive and sequential policy or institutional learning process. Both market and hierarchies clearly still continue to exist, but they are both working in the framework of decision processes having a negotiation nature.

7. The economic crisis and the challenges for industrial policies in Europe

A policy for the knowledge economy based on the approach of “governance” or “dynamic coordination” implies the use of different policy instruments with respect to those usually adopted in traditional innovation policies, such as:

- public R&D;
- public subsidies to private R&D;
- public demand of innovative products and services;
- IPR in order to insure a monopoly power to innovators,

In particular, the empirical and theoretical research on innovation within medium technology sectors highlights the need for an evolution of regional innovation policies:

- a) from the focus on individual firms to the governance of the network of firms,
- b) from the distribution of R&D public funds to the connection of innovative capabilities,
- c) from a focus on exploitation of specific technologies to one on exploration of diverse technologies,
- d) from a focus on process innovation and cost competition to one on product innovation and time competition,
- e) from sectoral specialization to intersectoral integration and sectoral diversification,
- f) from a focus on accessibility to technological sources to one of receptivity by the local actors,
- g) from the supply R&D infrastructures to the identification of the new demand by the final and intermediate users,
- h) from the distribution of public funds to the stimulation of private investments,
- i) from the traditional free market approach or the hierarchical planning approach to a modern governance approach,
- j) from informal cooperation based on trust to formal commitment on strategic projects.

The new characteristics of the global financial and economic crisis seem to indicate that the traditional macroeconomic policies are inadequate. Measures on the aggregate demand should be coupled with measures on the supply side. Innovation is not only the key factor in order to reduce costs and to create new innovative productions, which are crucial for international competitiveness. On the contrary, it also stimulates material and immaterial investments, in equipment, R&D, services and human capital, which could immediately sustain the aggregate demand and at least partially compensate the decrease of internal consumption and exports. For example, firms can take advantage of production lulls determined by the actual crisis in order to improve the employees skills with government training subsidies or greater public long term loans to students at zero interest could encourage specialized education: these are measures which at the same time sustain revenues and demand, on the one hand, and expand the production capacity, on the other. The same joint impact on demand and supply would be insured by the development of renewable energies and by tighter environmental regulations and public programs. The global crisis may represent an opportunity whether the needed large public stimulus is not oriented only to expand the internal demand, but also to accelerate the restructuring of the supply side and to promote a greater international competitiveness, for when the crisis will end.

In fact, the huge losses of the financial institutions indicate the size of the waist of private financial resources, which have been used during the past decade for acquisitions of other financial institutions, in order to maintain and strengthen corporate power relationships, the creation of innovative and toxic financial instruments, which have allowed to extract large management fees, or investment in real estate, leading to an inflation in housing prices. These private financial investments have diverted private firms and banks from investing in R&D, innovation and the development of new innovative sectors, as it would have been useful in order to promote the international competitiveness of developed economies and to decrease the global unbalances in external trade.

In fact, a strategic element of an European response to the global crisis could be a large concerted European program aiming to increase the overall productivity, to promote a greater competitiveness of exports toward non European countries and to facilitate a fast transition toward a modern knowledge economy. In particular, this program could focus in promoting the international competitiveness of existing and new clusters of SMEs and large firms in medium technology sectors.

In a strategic perspective there is the need to exploit the major factors of competitive advantage of the European economy with respect to the emerging economies, such as:

- a highly qualified labour force.
- the high diversification of industrial productions within the various industrial clusters allowing the creation of new productions as combination of traditional specializations,
- the emergence of new needs, which often have a collective nature, by consumers and citizens and the creation of new markets,

European innovation policy could aim to:

- shift the focus from technology to knowledge and introduce new products characterized by high complexity and quality,
- promote horizontal integration and diversification and organize complex production systems made by different complementary partners,
- respond to the new emerging needs in more sophisticated markets,
 - a) respond to changes in the private demand: economy of leisure and culture,
 - b) respond to changes in the collective demand: economy of collective needs, such as sustainable energies,
- change public policies: increase public expenditure and taxes to respond to widely diffused public needs and to compensate slower structural growth in private consumption.

The global financial and economic crisis compels to accelerate the time of innovation, to unlock conservative coalitions, to promote a diversification of productions and markets and to adjust the relationships between the SMEs, large firms, financial institutions, modern specialized services and research centres and public institutions.

These policies do not imply that the public sector ex ante identifies the sectors where to concentrate investments, but certainly is the responsibility of the public sector to promote negotiations and agreements between the private actors for a medium-long term perspective and to define specific organizational instruments, such as the competence centres to be illustrated later in this study, in order to integrate the various resources and capabilities of private actors. Governance implies to steer the innovation networks and to break conflicts of interest and different forms of collusion, which hinder innovative initiatives.

While national and supranational policies are required for defining global guidelines and large framework programmes and the amount of the available financial resources, the regional and

territorial dimension is crucial for identifying operative projects and forms of collaborations between the firms and the other public and private actors. That indicates the need that regional and local governments are allowed to have a greater role in economic policies and initiatives in the present global crisis.

The return to a dirigist model is not feasible and also the search for an intermediate solution between market and state seems misleading. The new characteristics of the developed economies and the importance of interdependent network relationships at the regional, national and also international require to solve the problems according to a different model of policy making, which may be called multi-level governance which, as indicated above, is logically different from market competition and state dirigisme, as indicated above.

The crisis will last longer whether policy makers will not acknowledge that there is the need to abandon traditional policy making models and to adopt a different model of regulation of the relationships between the various economic actors, both private and public, in a modern economy, where the decisive factors are the speed, flexibility, integration and interconnections of the various actors.

8. The governance of innovation networks and the “competence centres”

Competence centres are a new instrument of innovation policy, which is suitable for the SMEs in medium technology sectors, but it may be used also in other sectors, such as high tech industry and knowledge intensive services, and even for organizing communities of users and producers aiming to respond to new collective needs (IKINET, 2007). National and regional competence centres are designed to stimulate cooperation in research and technological development in strategic important production fields between companies, academia, the public sector and other organisations involved in promoting innovation, overcoming the gap between pre-competitive technological research and practical industrial application.

The idea of the cluster policies and competence centres in various European countries is based on the following characteristics of competence centres:

- are part of a national or regional network created by a national or regional public program, which has defined a competitive mechanism for the selection of the various proposals of competence centres and an national or regional agency for the steering of the overall network of competence centres,
- have a regional focus but act on an international scale,
- allow to reach a critical mass, in order to develop international visibility in an industrial and/or technological perspective and to increase the attractiveness of a cluster with respect to international competitors,
- concentrate on a specific thematic production field,
- are capable of generating innovations with a particularly high value-added potential,
- cover many links in the value chain and connect multiple sectors of industry and scientific disciplines,
- establish an outstanding communication and co-operation platform by promoting public-private partnership and existing networks between large and small firms and other regional actors, in close cooperation with universities and research, educational and vocational centres,
- aim to implement a common strategy of innovation and economic development for a specific territorial cluster or regional innovation system,
- represent an innovative and operational mode of “governance” or a “soft infrastructure”, that aims to develop synergies around specific collective innovation projects oriented toward one or more well focused markets,

These programs are highly similar in the various regions and countries (see Appendix), while having different names, such as national networks of clusters, “poles de compétitivité”, competence centres, centres of expertise or technological districts. Examples of these programmes are the following:

France: www.competitivite.gouv.fr/

Finland: www.oske.net/in_english/programme/objectives/ and www.tekes.fi/eng/

Austria: www.ffg.at and www.ffg.at/content.php?cid=341

Competence centres are different from international research “Centres of Excellence”, which mostly belong to larger research institutions and focus on well defined fields of advanced pre-competitive research, often in tight cooperation with specific industries, with the aim to raise the quality of research and to improve its international visibility and reputation. In fact, competence centres should aim to promote the accumulation of knowledge between different firms and sectors through processes of interactive learning, the exchanges of tacit knowledge and the building of specialized competencies. However, competence centres, which focus on innovative industrial projects and on the competitiveness of a national and regional industrial and innovation system, may also contribute to the enlargement of the technological and general information base, required for cultural and social development.

Competence centres are also different from the traditional “Technological Centres”, which have been created by local and regional institutions since the early 80’ties in many regions and aim to provide new technological and business services to individual SMEs within territorial clusters. On the contrary, competence centres aim to the design and management of large joint projects with several firms and other partners for the development of innovative productions for the industrial diversification of a cluster.

According to a cognitive approach to innovation policy the aims of the competence centres could be the following:

- respond to the emerging needs of the user side, identify and aggregate new demand, explore new markets with high growth potential or new “lead markets” for the regional productions,
- promote the use of the knowledge accumulated within the cluster, the circulation of tacit knowledge and the development of new competencies through the process of interactive learning between the local actors, performing the role of hub or platform within the respective knowledge networks,
- create new activities or “strategic spin-offs”, which can lead to a production diversification of the regional economy into new sectors of application, by investing in projects close to commercialization to avoid path-dependencies and lock-in effects,
- promote the design and adoption of new large strategic projects of innovation, requiring the coordination and cooperation of many partners, in the existing clusters and regions rather than the creation of new geographical clusters,
- raise new funding through public-private partnership, involve modern financial intermediaries in strategic industrial projects and provide key competence in the selection of innovative projects submitted for financial support, as the problem has often been the abundance of private funding and the lack of profitable projects,
- build new formal and informal institutions, infrastructures, norms, rules and routines, adopt new forms of “governance” of the knowledge and innovation networks and design an explicit long term strategy of the competence centre,
- promote the participation of new partners in innovation networks, such as KIBS and universities, which may enlarge the base of innovation and contribute to the design of a mid-term development strategy,

- represent a bridging institution and promote local contacts between SMEs and large firms, on the one hand, and between them and the research institutions, on the other hand,
- promote international links between competence centres of different countries, the participation to European projects and enhance a greater international integration and competitiveness in an increasingly complex and connected world.

Competence centres are crucial in order to reduce the “switching costs” to innovation and to accelerate the speed of the process of adoption of innovation, thus avoiding the risk of a lock-in effect in territorial clusters and promoting an horizontal and vertical diversification of the traditional productions in these clusters. Competence centres should carry out an exploration activity leading to the design of many large and small projects. They should identify emerging needs in existing and new markets and create coalitions of regional and also international partners needed to solve the problems.

Competence centres contribute to develop a new vision and long-term strategy and increase the awareness of needed changes in the clusters and the stimulus to innovate by firms and other actors in the clusters. Competence centres should not only focus on the needs of individual large companies (OEM) or vertical supply chains. They should also adopt a territorial perspective, i.e. dealing with horizontal relations between different sectors, and an institutional perspective, i.e. promoting new forms of multilevel governance. They should identify emerging needs in existing and new markets and create coalitions of regional and also international partners needed to solve the problems.

Competence centres should adopt a selective approach and aim to identify and develop new strategic projects. Regional policy should identify regional fields of competence and relevant target areas of new technology. Rather than to sustain the existing fields of specialization in a given cluster, regional “competence centres” should focus on new fields of production, related to traditional specializations in the various regions, by promoting the collaboration between firms of different sectors having complementary competencies.

The following three fields of competence can be identified as candidates for innovation policies according to their respective stage of development: a) developed fields of competence, where R&D institutions are well connected with the current specializations of the regional economy, b) developing fields, where strength in the supply by research institutions does not correspond to the actual demand by the regional firms, c) emerging fields in an early stage of research undertaken, where there is the need of policy support for future development. The example of competence centres policies in countries such as France and Finland indicate the possibility to invest not only in the well know high technology sectors (such as: biotechnology and pharmaceuticals, electronics and software, nano-technologies, energy technology, aeronautics, medical diagnosis, etc.), but also in medium technology (such as: chemistry and plastics, automotive, industrial automation, agricultural machinery, public transportation, marine and submarine technology, environmental technology, construction, media and content production, food processing technology, horticulture, etc.) and even in new complex and largely immaterial fields (such as: tourism, logistics, business services, welfare, culture, entertainment activities, etc.), related to new collective needs of consumers and citizens in a modern knowledge economy.

In fact, competence centres can be organized for different high tech and medium technology industrial sectors and they may also focus on the service activities and the development of new lead markets driven by the individual and collective needs of particular communities of users. They may aim to promote different types of knowledge and not only on scientific based (analytical), but especially on engineering based (synthetic) and even art based knowledge (symbolic) and organizational and evaluation knowledge.

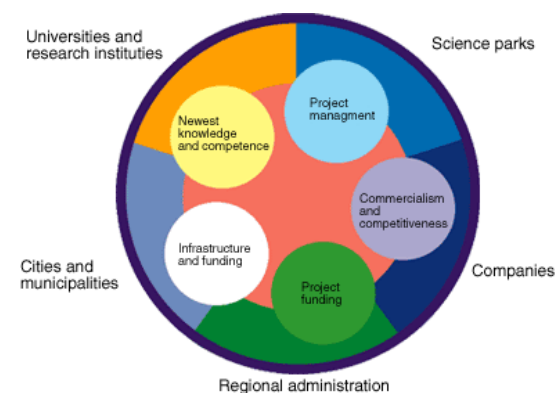


Figure 7: Main partners within a “Competence Centre” at the regional level

Competence centres may be organized as a public-private-partnership, where the regional government acts as a coordinator together with a consortium of private actors or the regional business promotion agency acting as supporting and managing institution (figure 7). Openness to new actors within the various clusters is a decisive prerequisite for sustainability to avoid path-dependencies and lock-in effects or the emergence of an elitist club made by few firms isolated from the rest of the cluster.

Competence centres may stimulate the firms to change their corporate strategy to a forward looking model and represent a stimulus to the international openness of regional clusters by promoting forms of collaboration with external partners, such as international research institutions and large international firms.

With respect to finance, public support via projects sometimes only leads to short-term structures, which run into risk of losing the engagement of partners after the end of external funding. However, pure long-term public funding would destroy incentives of the private partners to look for efficiency. Thus, a suitable way out for funding cluster structures could be public-private partnerships and collaboration with private financial intermediaries together with public funding for more long-term strategic projects of public interest.

9. The governance of knowledge networks within cities

Urban areas are incubators of inventions and innovation and at the core of the transformation into the knowledge economy of their regions and countries (Florida, 1995 and 2002; Landry, 2000; Simmie, 2001; Simmie and Strambach, 2006; Vázquez Barquero, 2006; Salet, 2006; Cappellin, 2007; Geenhuizen and Nijkamp, 2007). Based upon a high exposure of new information and knowledge from the global economy, a very diversified sectoral structure (Jacobs 1969), a large intra-regional supply of qualified and demanding customers and a high accessibility to customers nationally and internationally, large city-regions function as seed-beds for the development of new innovative goods and services.

In conclusion, cities represent a “local production system” or a form of territorial network which is rather similar to other forms of territorial networks studied in regional economics literature, such as industrial districts, clusters, regional innovation systems and milieu innovateur. However, while most studies have examined the transition to the knowledge economy at the national level, in the various industrial sectors and in the various geographical clusters, we still need a better understanding of the working of knowledge networks within and between city-regions and in modern knowledge intensive service (KIS) activities.

A network perspective in the analysis of urban problems highlights that cities are endowed with some original characteristics, which may represent new opportunities in a knowledge economy, such as:

- high openness to external stimulus related to the easy access to international markets,
- high accessibility related to the advantages of geographical concentration,
- high receptivity related to the availability of highly educated human capital,
- high local identity and social capital related to long dated common history and traditions,
- high creativity related to the combination of diverse and complementary competencies,
- high governance capabilities related to the existence of powerful and well organized local governments.

However, knowledge networks and the process of interactive learning may be hindered in large city regions by the existence of:

- many new but only scattered needs and segmentation of the local markets of new goods and services,
- low accessibility due to traffic congestions,
- low receptivity due to differences and too high cognitive distances, tensions and conflicts,
- low common identity due to deep diversities and fragmentation and an high mobility/turnover of population,
- low creativity due to short term commercial attitudes and lack of long term commitment,
- low governance capabilities due to lack of coordination and the fragmentation of the many decision making bodies.

The process of transition of cities and urban areas to the model of the knowledge economy implies the tight interaction of four major policy areas (figure 8). These represent a challenge for future urban research and urban policies. The relationships between these four urban policy fields in a knowledge economy can be described as follows:

- L-C: the more complex social composition and the higher level of education lead to an increase of creativity and of the innovation potential of the economy in the city-region, as well as to a greater preference for non-manual jobs, the demand of modern services in health, sport, culture, figurative arts, music, continuous education, greater sensibility for environment, energy saving, personal security as also for tourism and international transport and logistics.
- L-T: The development of service activities requires the creation of modern office centres in easily accessible locations. The transformation into a knowledge economy is accompanied by the adoption of modern just in time organization, an increase of people mobility and transport congestion and this latter may decrease the agglomeration economies of a large city-region with respect to smaller urban centres.
- C-T: the increase of shopping and leisure activities lead to an increase mobility and traffic congestion and new living standards lead to different housing preferences. The change in the education levels may lead to an higher demand for housing in qualified locations and the provision of modern and efficient public services.

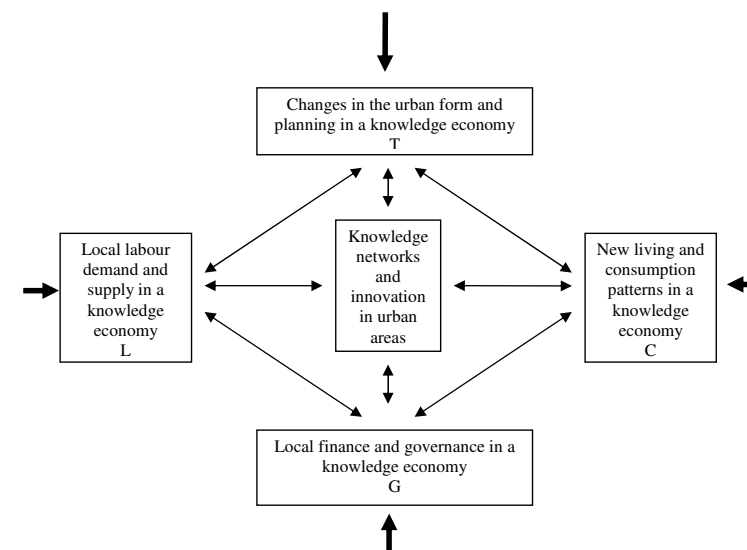


Figure 8: Four policy areas in the evolution of cities to the knowledge economy

Source: Cappellin, R. (2007), KNOWCITIES, The role of city-regions and of urban policies in the knowledge economy, Proposal for a FP7 Project, IULM University.

- G-L: Public regulations may create new lead markets such as in the field of energy and environment, thus increasing the opportunity for the creation of innovative firms and sectors. Clearly greater public investments in higher education lead to an increase of qualified workers and facilitate the adoption of innovation.
- G-C: public institutions should promote large public project which may lead to the creation of a new identity or a re-branding of the city-region. They can promote the creation and the activities of non profit associations and specialised communities of interest between the local residents in various fields thus promoting the diffusion of new social welfare, cultural, leisure activities, and and lead to a greater cooperation between local actors and further demand of collective services. The organization of expositions and public competitions may be instrumental in promoting new behaviours and the demand of modern services.
- G-T: modern governance allows the creation of policy networks and the launch of large urban projects, which may be the drivers of further private investments.

The role of people in the knowledge economy is usually recognized by focusing on the supply side of the economy, as tacit knowledge, competencies, collective knowledge and interactive learning processes are social processes, which lead to an increase of production capacity or of total factor productivity of the national economy. However, the explicit reference to the demand leads to consider a new dimension of the knowledge economy. In fact, the knowledge economy is also characterized by the development of new products and services and especially by new needs and living habits.

Cities are also a living environment. Citizens within cities are users and consumers, which express new needs and demand for new products and services (Cappellin, 2007). In fact, the close connection between potential clients, expressing new complex needs, and firms and organizations, endowed with advanced capabilities and open to form of collaboration with other firms and organizations, is representing a powerful stimulus to innovation. Thus, cities are also a key market, which represents a crucial opportunity for the development of new economic activities and the birth of new firms.

The evolution of cities to the knowledge economy implies new emerging needs and behaviours by the households and individuals and the new demand of private and public services/goods as the result of the greater “knowledgeability” of users. Knowledge workers are also knowledgeable consumers, characterized by a larger demand for meeting places, travel, transport and ICTs, health, environmental quality, a higher demand for security and less crime, more demand for media, cultural activities and education, more preference for city-centre living, unfortunately leading to more car traffic, air and noise pollution, etc..

Moreover, the development of new goods/services is usually the result of an effective interaction and co-production between the user and the producer. New life styles and consumption patterns have a collective character and are tightly related to the interaction between the various consumers and citizens in the city-region and in some cases new products/services emerge initially as a self-production within the framework of specialized associations or communities of interest. The creation of new goods and services may require the capability to aggregate emerging and diffused needs of a community or association of users, characterized by a specific culture and desiring a specific product or service.

However, within city-regions the increasing specialization of economic activities is also accompanied by an increasing segmented plurality or divides of living and consumption patterns and often by too little cultural and social integration and an increasing fragmentation. The effect of higher knowledge may be that to further differentiate the preferences of users, as they are related to gender, age, income, national origin characteristics and/or to differentiate these preferences with respect to people having lower levels of knowledge.

Thus, there is the need to investigate the interplay between the demand (needs) and the supply (production capacity) and its consequences for policies in city regions as well as national and regional policies creating incentives for the improvement of the knowledge bases of city regions. The new urban life styles and needs promote the spin-offs of new economic activities in service and industrial sectors and the development of new activities which may later be exported to other areas and countries.

The possible conclusion is that in a modern society, individual producers cannot satisfy new emerging needs, but they require a collective, although not always national state, provision. Local and regional policies may incentive private communities to organize themselves within the city regions and adjust public procurement policies to encourage new forms of consumption.

Moreover, new living and consumption patterns in a knowledge economy diffuse from one city-region to other city-regions in a national and international framework. Different European city-regions indicate interesting disparities and different patterns of evolution. The structures of knowledge networks are different in the various city regions and European policies should aim to encourage the emergence and diffusion of knowledge between the regions and, in particular, identify how gatekeepers in different network types can be connected.

In particular, local governments may create a modern and high quality living environment through a better use of modern technologies in various fields of urban policies, such as construction of environmentally sustainable and technologically smart buildings, and re-conversion of industrial derelict sites. An high quality living environment also involves the creation of science parks, conference centres and similar new modern infrastructures, the adoption of energy saving technologies in residential building and in public and private transport, pollution control systems, the recycling of urban waste, efficient water management systems. Furthermore, local governments in modern urban areas must provide modern hospitals and advanced medical services, specific vocational training and further education courses, new entertainment and tourist activities, modern shopping centres, security controls technologies, and e-government technologies in the public administration. Thus, the traditional instruments of local policies within city regions have to be adjusted towards a changed environment.

Moreover, municipal administrations usually represent the most important companies in a city or regional economy. That implies that they have the possibility to orient local public expenditure to innovation in the various individual chapters of their budgets. As in the case of national public expenditure, the impact on innovation of local expenditure through the demand side may be very important and it is complementary to the traditional measures, such as public R&D subsidies, working on the supply side.

In conclusion, the evolution toward a knowledge economy and the changes in the urban economic-social-cultural system imply the search for new forms of urban governance. Strategic learning requires the exploration of wider horizons and of new policy strategies in a multi-actor and multi-level governance context. Public policies should promote connectivity and an active civic participation by the various segments (as defined by skills, age, gender and nationality) of the urban economy and society, through the experimentation of democratic innovation, innovative alliances, and strategic coalitions, avoiding the limits of formal participation or of technocratic decision-making. Modern policies in city-regions require the crossing of the borders between public and private sectors and the crossing of the borders of contiguous administrative jurisdictions and different but complementary policy sectors. That indicates the complementarity and the competition between a neo-liberal approach and a multilevel governance approach in the provision of public services and the need for the coordination of urban industrial policy with labour policy, education and welfare policies, as well as physical planning.

10. Conclusions

This study has aimed to illustrate the tight relationship between innovation processes and various models of economic regulation. In fact, the adoption of a systemic or network approach in the explanation of innovation leads to the adoption of a new regulation approach, called governance, which is different both from the neo-liberal free market approach and from the government dirigisme approach.

This study has aimed to clarify the specific dimensions of innovation policies in industrial clusters and in urban areas and it focuses on two related aspects: the increasing importance of the processes of knowledge creation in various firms and organizations and the spatial dimension of knowledge creation (Cappellin and Wink, 2009). In fact, the process of knowledge creation and innovation has a specific regional dimension and it explains the different performance of regions, industrial clusters and urban areas.

Medium technology sectors have achieved high success in industrial restructuring in recent years and play a key role in European competitiveness, as they represent the largest share of European

export in manufacturing industry and indicate the highest growth rate in European exports toward global markets.

It emerges the need to distinguish between two different types of SMEs in modern industrial economies: on the one hand the traditional SMEs, which are either isolated in local markets or depend from the orders of one large firm (OEM) and are often working in low technology productions, and the wide and diversified population of SMEs, which are working as specialized suppliers in medium technology sectors and in some cases even in new fields at the frontiers of technology, on the other. These SMEs are highly specialized, have a very qualified labour force, are used to operate in the international markets for a variety of clients and actively participate to the innovation processes in collaboration with other SMEs, knowledge intensive business services and large national and even international firms.

The traditional industrial clusters, specialized in a single sector, have evolved into territorial networks, which are characterized by a greater sectoral diversification, a greater integration of the various sectors of the local economy and also by an increasing internationalisation. The cluster concept has evolved from a predominantly material linkage and agglomeration based concept to that of an institution that supports knowledge generation and the sharing of knowledge.

While the “linear approach”, which still applies to large firms and high-tech sectors, is focusing on internal R&D activities and external technology transfers, innovation processes in SMEs and medium technology sectors are characterized, according to a “systemic approach”, by informal and gradual collective process of interactive learning, the iterative adaptation between the different partners and an implicit process of automatic selection of the most competitive innovations.

In particular, the processes of knowledge creation have a localized nature, as knowledge can only develop in a localized or specific framework and it calls for the “cognitive proximity” of the various actors, which participate to an interactive learning process. This “systemic approach” leads to promote knowledge networks and cooperation between the various local and external actors and to develop the internal capabilities of these actors. Networks organize diversity and facilitate the combination of information and knowledge.

Differently from large firms, SMEs should not be considered individually, but rather as part of a complex regional production and innovation system. The focus on the regional dimension of knowledge creation, as in the concepts of regional innovation systems and of territorial knowledge management, has led to identify the drivers or the factors and policy instruments on which to act in order to promote interactive learning processes and the development of competencies in a given regional production system. In fact, according to the territorial knowledge management approach (Cappellin and Wink, 2009) the process of innovation is based on three related concepts, such as: connectivity, creativity and speed.

First, connectivity implies that the creation of new knowledge can not develop within a firm in isolation, but it requires the stimulus from outside and the interaction with different actors, who may belong to different sectors. The concept of connectivity implies high accessibility, which is affected by different types of geographical and organizational distance, and an high receptivity, which depends on the individual characteristics of the interacting actors and their cognitive distance. These forms of interaction most of the time occur between suppliers and clients or in the relationships between competitors, between complementary firms in different sectors, which are linked by exchanges of products and services, the mobility of workers, the development of financial relations and not only by formal collaboration in research.

Second, creativity is most of the times problem oriented and it implies the capability to originally combine internal tacit knowledge, which is highly flexible, with external complementary codified knowledge or to combine different types of knowledge, such as: analytical, synthetic and symbolic knowledge. As the combination of three basic colours gives all other colours, pre-existing pieces of knowledge when they are originally combined, give the origin to new knowledge. This capability to combine specialized knowledge may be defined combinative knowledge.

Third, speed in the process of knowledge creation depends on the adjustment costs or switching costs in the choice of new possible partners by the individual firms or in the imitation of competitors, as various actors introduce different complementary innovation at different times and have different roles in the innovation race. A specific innovation is linked to previous complementary innovations according to various paths. The coordination of the different contributions and the organization and change of the links in the innovation network is the activity of governance and it has a key role in determining the speed of innovation.

The key factor in the process of creation of new knowledge is represented by human resources, which should not be considered only for their absorptive capacity and resistance to the adoption of technologies, but rather as the actors, which promote innovation and are endowed with specific capabilities. Moreover, the exchanges of knowledge between the European firms indicate the increasingly important role of the knowledge intensive services both private and public as a bridging institution.

The free market model of regulation is inappropriate in an economy where the information and knowledge represent both the most important factor and also an important aim, as tacit knowledge and competencies can not circulate on markets and require the role of intermediate non private institutions.

Creativity is incompatible not only with an authoritarian and bureaucratic organization but also a system based on individualism, the competition and recurring conflicts, since the crucial characteristic are the sharing of knowledge, cooperation and integration of complementary capabilities.

A neo-liberal model advocates greater wage and labour flexibility and greater competition as the panacea to every economic problem, not only in industrial sectors but also in labour markets, finance, science and education and even in interregional and international relations. On the contrary, the network and governance approach aims to a greater integration between the economic actors and to a faster innovation, which require the existence of intermediary functions, a greater stability of relationships, a long-term perspective and the supply of adequate public investments.

The free market approach leads to increase the process of outsourcing and to a fragmentation of production cycles in many different layers. This de-verticalization process leads to a complicate production structure which not only increases transaction costs but also facilitates the cases of asymmetric information, opportunistic behaviour and conflicts of interest. These latter occur when an agent of a firm establish agreement with a third firm, which may be supplier or client of the first firm, for his personal interest. Governance on the contrary brings to forms of quasi-integration, which allow a more ordered production organization, to decrease the transaction costs and to accelerate the times of innovation.

A market, which operates freely without rules, either determines too fragmented decision-making and facilitates organizational conflicts between the various actors, or it inevitably leads to collusion and concentration of the economic and financial power into few actors.

The direct and indirect financial links between the firms, the exchange of positions of the managers between the administration boards of the firms and their personal relations within the various industry associations and with the world of politics have created an high concentration of power in the corporate elites. These forms of intersectoral collusion between firms, in the bank, insurance, industry and media sectors, have determined various rent situations, which damage other actors. They also represent the major obstacle to systemic or inter-sectoral innovation and to the diversification in European industry into new fields of production.

The role of the state is different in the model of governance, with respect to the case of free market of government interventionism. Public regional or national institutions should assume a pro-active role, facilitate the negotiation process and promote agreements between the various actors so that they act in concert. Specific functions of the state are:

- to insure a precise division of labour between the various actors, through norms defining the sectors of specialization,
- to promote reciprocal recognition and trust and various forms of control by weaker and scattered third parties, such as citizens and consumers, through procedures insuring transparent public negotiations and agreements,
- to facilitate the design of medium term projects, through the function of initiative and leadership.

Innovation is a stimulus to investments, which are usually more complex and larger than formal R&D investment. Process innovation and product innovation within individual firms together with larger joint initiatives by various firms for the generation of new innovative sectors stimulate investments. The actual gloomy short term prospects of the demand and of profits decrease the investments by the firms. However, the medium and long term prospects for the creation of new sectors may justify major private and public investments, which would immediately sustain the demand. Thus, innovation is not only a factor leading to expand the supply side of the economy in the long term, but it may also be the instrument for immediately sustaining the demand in the actual global economic crisis. Public budget deficits and public subsidies to banks and private industries would be more politically acceptable, whether they were instrumental not only to re-launch the economy in the short term but also to immediately support large investments in the creation of new activities, which will be economically efficient and also rentable. Thus, the launch of long term multiyear investments would stabilize the revenues of many SMEs in the production of specialized components and help in reducing the risk of their respective investments.

Competence centres are a new instrument in innovation policy, which has not yet been adopted by many countries or regions, and it can be used for a sectoral diversification of the regional economy and for the generation of new innovative activities, not only in high technology sectors but also in medium technology sectors, modern private services and innovative public services. Centres of competence are a bridging institution, which is needed for concerted actions based on the complementary capabilities of many local actors, such as large firms, research centres, financial institutions and SMEs, and to allow these latter to initiate international cooperation schemes with multinational firms and foreign regional and national governments. Centres of competence are a policy instrument which could be used, especially in the present crisis, in order to mobilize large investments in complex projects based on diverse technologies, which often are too distant from the usual core business of the individual local large firms and which require management and financial capabilities which are unavailable in local universities and research centres. Centres of competence should aim to commit local large firms to long term investment projects, which would stabilize the investment effort in the regional economy, as large investment projects are usually not postponed when a sudden short term crisis is occurring. Centres of competence should be part of national and European networks of centres of competence, allowing the sharing of very specialized technical and organizational knowledge, while they require to be embedded in the regional territory in order to

identify the specific local potentials for the development of new rather specialized economic activities, taking into account the already existing sectoral specialization and labour capabilities.

Finally, innovation policy should focus on urban areas, as these latter play a key role in the evolution of the national economies into the knowledge economy. Large cities are major hubs in the international air, sea and rail transportation networks. They are the incubators of innovation, especially for their greater accessibility to markets, higher internal sectoral diversification and larger endowment of very qualified workers and entrepreneurs. Moreover, large cities are the living habitat of a large share of national population. In particular, the increasing cultural levels of the citizens is related to the emergence of new life styles and new needs, both for private services and having a collective nature, such as environment, energy, culture, entertainment, security and education. These new lead markets emerge within cities and stimulate the birth of new private firms in service and industrial sectors and of new public services, which may create a very large number of new qualified jobs. Thus, local government should adopt a new approach in policy making, called governance, which is different from the traditional spatial planning and also from neoliberal policies leading to the privatisation of local public services. Governance implies the capability to promote a greater integration between different policy instruments, such as: the local direct public expenditure, the regulation of economic activities especially environment, land use and in retail and services, the direct support to service and industrial firms and to the quality of the local labour supply and not least the launching of major urban projects, which will have a complex effect on the labour market, on the spatial structure of cities, on the urban life quality and not last on the finance and organisation of local administrations.

In conclusion, modern approaches to the economics of innovation indicate the role of territorial factors not only in the late adoption of major new technologies, but rather in the generation of specific and complex innovation in different sectors, such as in the case of medium technology sectors, modern knowledge based services and also new public services. These sectors are major components and actors in a modern knowledge economy or in a regional system of innovation and are not less important than high technology industrial sectors and research centres. A modern approach of multi-level governance indicates that innovation policy at the regional and local level should aim to promote a greater connectivity, internal diversity and flexibility of local innovation networks and a greater openness to forms of partnership with national and international firms and institutions. Thus, national innovation policies should assign a greater role to regional and local governments, who should not limit themselves to physical planning and the provision of health and other traditional public services, as it is occurring in Italy.

Thus, while national and international governments may be responsible for strategic programmes and decisions on financial resources, regional and also local governments should have the responsibility of organising operative projects, which may enhance the potentials of localized process of interactive learning in the various regional innovation systems.

Future research could investigate: 1) the patterns of creation of analytic, synthetic and symbolic knowledge in mechanical sectors in Italy and Korea, 2) the characteristics of the process of interactive learning and knowledge creation in regional knowledge and innovation networks in industry and KIBS within large urban areas, and 3) the evolution of the approaches to innovation policies at the national and regional level in Asia and Europe.

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APPENDIX

Table 1: The competitiveness of Italy and Korea in medium-technology sectors
Unit: US dollar at current prices (Million)

		Italy Exports	Italy Imports	Italy Net Export	Korea Exports	Korea Imports	Korea Net Export
Manufactures	2000	212.499	162.359	50.139	154.899	98.156	56.744
	2007	420.557	331.985	88.572	330.412	206.187	124.225
Office and Telecom Equipment (OTE)	2000	10.517	20.603	10.086	58.686	34.012	24.674
	2007	10.933	27.294	16.361	92.680	45.536	47.144
Automotive	2000	18.492	25.440	6.948	15.194	1.773	13.421
	2007	38.128	49.484	11.357	49.484	6.684	42.800
Machinery and Transport Equipment except OTE and automotive	2000	63.397	33.383	30.014	26.396	23.294	3.101
	2007	138.931	68.267	70.664	74.565	55.270	19.295
Machinery and Transport Equipment except OTE	2000	81.889	58.823	23.066	41.590	25.067	16.522
	2007	177.058	117.751	59.307	124.049	61.954	62.095
Machinery and Transport Equipment	2000	92.406	79.426	12.980	100.275	59.079	41.196
	2007	187.991	145.045	42.946	216.729	107.490	109.239

cartogramma 10: SLL 2001 – Manifatturieri per tipologia produttiva

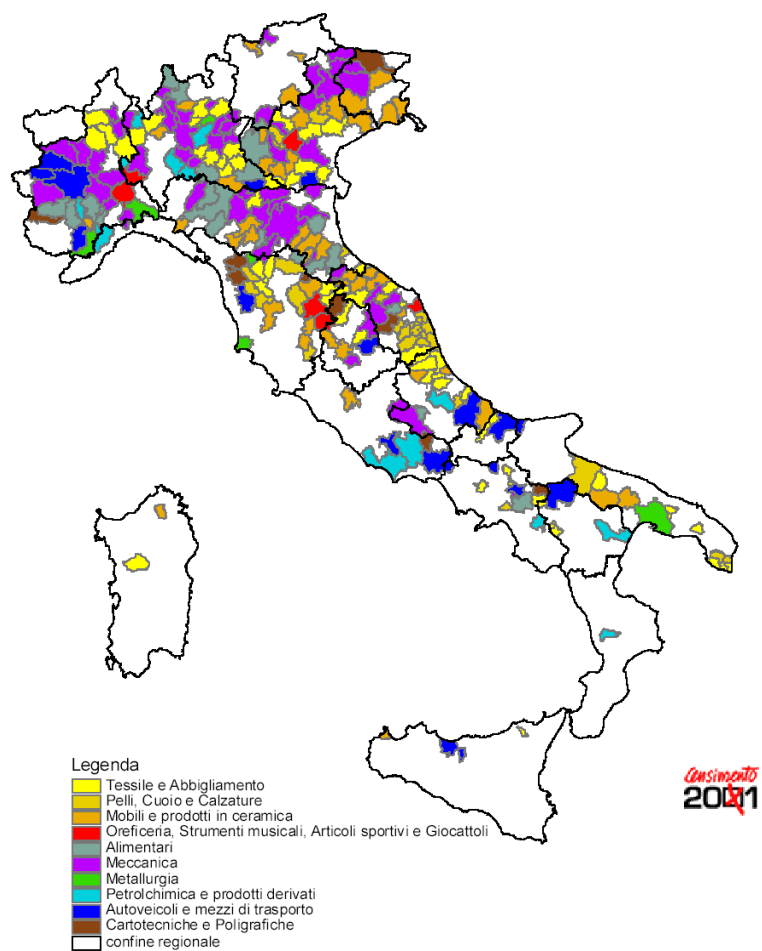


Figure 1: Italy manufacturing local labour systems by sector

cartogramma 8: SLL 2001 – Manifatturieri per dimensione di impresa

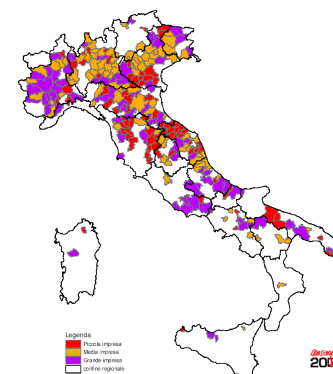
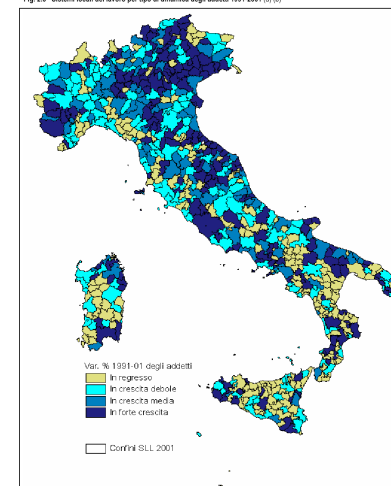


Figure 2: Italy manufacturing local labour systems by size of firm

Fig. 2.3 – Sistemi locali del lavoro per tipo di dinamica degli addetti 1991-2001 (a) (b)



Fonte: elaborazioni su dati Istat, 7° e 8° Censimento generale dell'industria e dei servizi
(a) Calcolata a parità di campo di osservazione del Censimento 1991
(b) In regresso: var. % degli addetti negativa; In crescita debole: var. % degli addetti positiva ma inferiore al 5%; In crescita media: var. % degli addetti intorno alla media nazionale (6%-10%); In forte crescita: var. % degli addetti superiore al 10%

Figure 3: Italy local labour systems by growth of employment 1991-2001

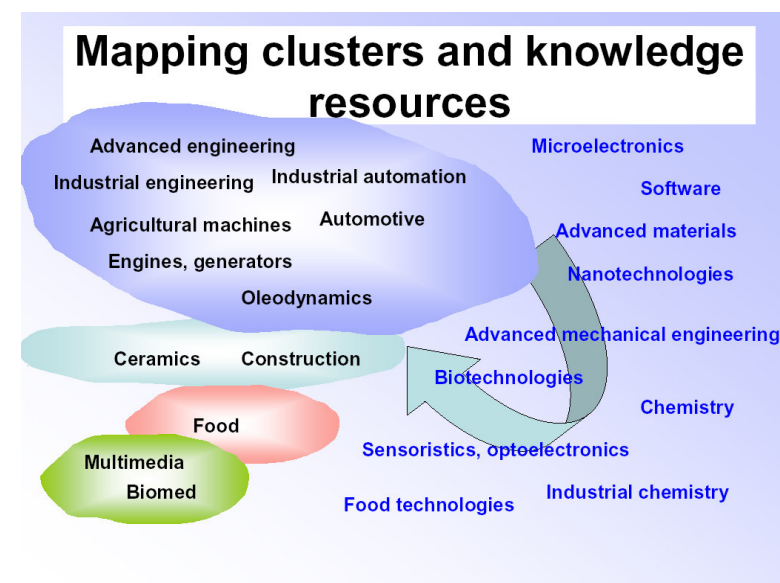


Figure 4

Source: Silvano Bertini, Economic Development Unit - Emilia-Romagna Region

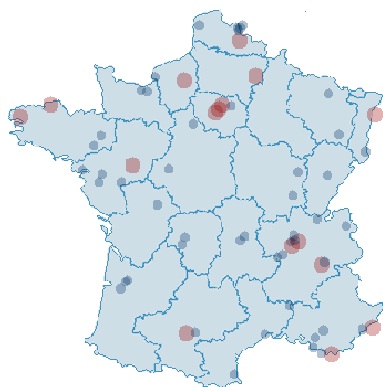


Figure 5:
French Poles of Competitiveness

- Aerospace Valley (aeronautics, space and onboard systems),
- Lyonbiopole (infectious diseases and medical diagnosis products),
- Medicen Paris Region (biomedical imaging, and molecular and cell medicine),
- Minalogic (micro- and nano-technologies, and embedded software),
- Secure Communications Solutions / SCS (information and communications technology solutions),
- System@tic Paris Region (systems and technology for optics, electronics and software),
- Cap Digital Paris Region (digital multimedia content and technology),
- Axelera Chemistry and Environment Lyon Rhone-Alpes (eco-designed chemical products),
- Media and Networks (audiovisual, telecommunications and information technologies),
- Trans (rail, automotive, logistics and intelligent transport systems),
- Industry and Agro-resources (industrial plant-based products),
- Therapeutic Innovation (pharmaceuticals, healthcare, biotechnology and medical instruments),
- Mov'eo (automotive and public transportation),
- Mer Bretagne (maritime safety and security, marine and submarine technology, marine energy, resources, biotechnology and environment),
- Mer Provence-Alpes-Cote d'Azur (maritime safety and security, marine and submarine technology, Marine energy resources, biotechnology, and information and communications technology),
- Vegepolys (specialized plants, horticulture, seeds and arboriculture).



Figure 6:
Finnish Centres of Expertise

- Biotechnology
- ICT
- Media and Content Production
- Welfare Technology
- Energy Technology
- Environmental Technology
- Tourism
- Chemistry and Plastics
- Food Processing Technology
- Logistics
- Business Services



Figure 7: Italy largest cities

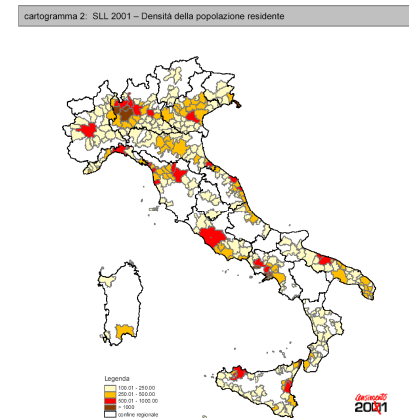


Figure 8: Density of resident population