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Regions in the Global Knowledge Economy

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Introduction: the "glocal" dimension

Two bodies of literature converge to explain regions in the global knowledge economy and to identify the factors that lead to competitiveness and innovation of a local economic system.

The first section of this statement summarizes the progress in regional studies from a purely locational approach to the focus on clusters and industrial districts. The second part shows how advances in the economics of innovation lead to a renewed and different interest to regions and local systems of innovation.

The third section concludes showing how the two trends of the literature just mentioned are instrumental to explain regions in a context where competition becomes global and increasingly based on knowledge goods and services. The focus on the "glocal" exchange of outputs of the knowledge economy is useful to explain the factors behind the rise and fall of new centers of production and growth. In this statement glocalization is defined as the phenomenon that leads to the competition, on a global market, of products and services whose successful development from the conceptualization of an idea to the actual commercial application requires enabling factors (such as institutions, entrepreneurship, knowledge, skills…) that are embedded in a specific local environment. The study of this phenomenon justifies the convergence of regional economics and the economics of innovation.

The goal of this statement is to present the literature which might be used in two classes on regional development in the knowledge economy and glocalization of production, that could be taught in a planning, business or public policy department.

Regional Economy: from Localization to Clusters

The early interest of economists in regions focuses on optimization of production location. Marginalist theory in classic economics heavily influences the first attempts to explain the regional economy, and "distance" is used as another dimension in the profit maximization function of the firm.

The first attempts to model these theories can be found in Von Thunen (1826), in which the author describes the most efficient use of land for various types of agricultural-related activities in an "isolated state". Transportation costs and the prices of goods produced are the two variables which determine the final optimal distribution of activities. Labor costs first appear in Weber (1909). In Weber's model, assuming that labor and raw material are not evenly distributed on the territory, manufacturing industries have to consider both transportation costs and salary differentials.

The main limit of the above mentioned models is their emphasis on the supply side: the inclusion of a demand counterpart is therefore the necessary next step. Losch (1938 and 1943) and Hotelling (1929) reject Webber's least cost assumption, and introduce a system of equations which considers the demand side of the localization problem. Later developments of localization theory, see for example Hewings et al. (1981), prove the importance of many other factors to be included in the maximization model. Variables such as technology, inter and intra-industry connections, specialized labor, financing and corporate ownership have to be considered. The result is the increased complexity of those models focusing on the definition of a stable equilibrium, and possibly a less incisive descriptive power.

A different recent development of localization theories comes from the new geography of production (Krugman, 1991) where the factors that lead to a particular form of aggregation (industrial and metropolitan), become the focus of the analysis. In particular, Krugman applies the concepts of path dependency and historical accidents (David, 1986) and considers their importance for some location advantages, such as the presence of intermediary services and sub suppliers, infrastructures and specialized labor. Path dependency has to do with the self-enforcing mechanism that lies behind the nature of some types of external economies that enforce the stability of some (maybe sub-optimal) equilibria

In the study of Italian industrial districts (Becattini, 1990; Brusco, 1982) the intuition of Marshall (1920), and the study of external economies (Vernon, 1960) are applied to the analysis of business dynamics and clustering. According to the literature that followed up Marshallian studies, there are three sources of external economies: the first is the presence of a large pool of specialized labor, and the consequent local division of labor; the second factor is the development of a network of specialized intermediate goods and service industries; the third factor is the emergence of a vibrant and local exchange of tacit knowledge, which leads to the circulation of knowledge spillovers among the firms and other organizations within an industry. All these three factors share a "positive feedback mechanism", which has the property to be self-enforcing.

The study of the Italian case moved away from the assumption that it is possible to look at industrial district dynamics as agglomerations, focusing only at the cumulated effect of external economies. Path dependency and historical accidents are indeed part of the explanation, but social relations and competitive dynamics shape business climate and enable (or interfere with) the conditions for a fruitful circulation of tacit and local knowledge and flexible specialization. According to Harrison:

> The industrial district model posits a very strong form of the embedding of economic (business) relations into a deeper social fabric, providing a force powerful enough to provide for the reproduction of even so apparently paradoxical a practice as co-operative competition. (Harrison, 1992)

Soft indicators such as trust, the definition of a knowledge domain and the dynamics of co-ompetition (cooperation and competition) are all elements that help explain the dynamics of vertical and horizontal concentration of firms, and the competitiveness of a region.

Bellandi (2002) describes the "dual engine" behind the Italian light industrialization model. In an environment where flexible specialization is the key for international competition, large firms rely on the dynamism of highly specialized subcontractors, which however are then able to emancipate from their main customers and seek international demand. This is a model that requires the co-presence of both small and large firms within the industry. This model prescribes that the interactions within the district (and therefore not the mere agglomeration of firms) are the most important unit of analysis, to understand the causal effect that leads to external economies.

Markusen (1996) points out at the fact that the "Italianate" variant is only one possible configuration for the development of industrial districts.

> Although the presence of Marshallian industrial districts, even the Italianate version, can be confirmed in a number of American instances, the claim made for the paradigmatic ascendancy of this form of new industrial space do not square with the experience of most rapidly growing agglomerations in industrialize and industrializing countries. (Markusen, 1996)

SMEs are not the only driving factors of clustering and industrial district, state owned enterprises, public investments, and large corporations are also important "clustering agents". Their specificities and the implications for lasting economic development of the regions they localize are obviously different from the problems connected with clusters of SMEs, but nevertheless researchers and policy makers should be very careful in considering these different types of industrial districts, especially when competition happens to be global and based on technological change.

Recent studies take a more qualitative approach to explain the advantages of clustering. Porter (1990) finds out that a significant part of international trade originates from local agglomerations of firms in a specific sector. Porter explains the effects of clustering through the "competitive diamond", a self-enforcing system, that enable firms to find sources of their competitive advantage in their interactions with the local system of sub-suppliers, customers, competitors and incumbents they operate in. The concept of a cluster is different from an agglomeration of firms in the same industry, and has to do with:

> a geographic concentration of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions in a particular field that compete but also cooperate. (Porter, 1990)

The focus is on the interconnections between firms and the "spillover effects" that the presence of specialized factor of production, a vibrant business climate and the dynamics of cooperation and competition have on the competitive advantage of a cluster. The borders of the clusters are drawn with some difficulties (Doeringer and Terkla, 1995), but nevertheless they represent a quite popular unit of analysis to explain difference in regional performance, understand the performance of a regional economy, and to "maximize the impact of government services to private industry" (Turner, 2001). The methodologies that practitioners use are not always robust, and regional scientists insist that localization and specialization quotients are not the only relevant measures. Many different solutions are suggested. Porter (2003) focuses on the fact that clusters specialize in products whose demand is not only local, and he therefore identifies a set of "traded clusters". Feser and Berger (2000) warn practitioners to be extremely careful with a mechanistic application of the concept of clusters; they explore the national input-output table to understand the market interaction between industries. Through a factor analysis, they then identify clusters, focusing on the intensity of sub-supplier relationships. The study of the industrial districts, led the national statistics bureau in Italy to identify local production systems, focusing on the commuting patterns and local sub-contractor interactions (Sforzi, 2002).

Becattini (2000 and 2002) writes that the main difference between the study of industrial districts and the rest of the literature is the attention for the "embeddedness" of the local production system in the local society, whereas the cluster literature focuses principally on the "dynamic integration amongst productive units".

Bergman and Feser (1999) argue against the determinism of Porter's cluster. The self-enforcing mechanism that lays at the heart of the cluster theory cannot be given for granted, since "changes in the social, cultural, or political environment could lead to altered relations between cluster firms such that the positive synergies are reduced". These authors affirm the importance of inter- and intra-industry linkages that have to be the most important unit of analysis, whereas the concept of (local) industrial districts and clusters might shift the attention away from what is the underlying mechanism that leads to external economies. If nature of linkages becomes the crucial aspect, the next step will be to realize that not every single key linkage, which contributes to competitive advantage and creates external economies, has to be local. Key links in the value chain might be also nonlocal, and cannot be captured if the study centers on the nature of competition and collaboration within a regional cluster. Global competitive advantage can be explained also by global dynamics, and this is becoming very important as the third section of this statement will argue.

Another major critique to cluster theory has to do with its analysis of innovation. The very idea of competitive advantage is static. The competitive diamond explains only the enforcing mechanism behind clusters, but it is not able to account for the appearance and disappearance of successful ones. The latest development of the theory (Porter, 2000) focuses on the advantages that the cluster has to promote an incremental form of innovation, since firms within a cluster are likely to perceive more clearly new needs from customers and possible applications for new technologies. However, the dynamics of this engine do not explain the breakthrough and discontinuities of a disruptive form of innovation. The next section will show how significant progress in the economics of innovation leads regional scientists to focus on the cumulative and local nature of discriminate factors for technological change, which are ultimately critical to explain a firm's and a region's "dynamic capabilities" and competitiveness.

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Local Systems of Innovation: from National to Regional

National Innovation Systems (NISs) (Lundvall, 1992 and Nelson, 1992) have been the starting point to explore an economic system affected by continuous changes in the technological landscape. NISs live through turbulence and the actors within the system adapt and change (reshaping also the system), and the direction and intensity of change are not only determined by the strengths and weaknesses of the actors, but also by those of the system. Invention is different from innovation. The concept of innovation cannot be explained within the technological realm, but it is a progressive and cumulative learning process which happens as local institutions explore and exploit the resources available in their environment. Public and private laboratories might well be the main source for modern discoveries and inventions, but the dynamics of exploration and exploitation requires necessarily interaction between different institutions, and between different sectors of the same organization. Also, the level of innovativeness is not an absolute value, but has to do with the current knowledge that is available within the system: a technology is innovative if it is new for the firms that adopts it, but not necessarily for the entire market.

> Innovation is the process by which firms master and get into practice product designs and manufacturing processes that are new to them, whether or not they are new to the universe, or even to the nation. (Nelson, 1992)

A corollary of this definition, is that innovation does not only happen in high technology industry. Many innovative activities happen in the traditional sector; therefore the analysis of NIS should encompass also industries that have been traditionally considered low tech.

The NIS is a system which is populated by a set of institutions whose interactions determine the innovative performance of national firms, however, the concept of system should not necessarily suggest the idea of something which is synchronized and coordinated or planned in advance.

The concept of NIS stands on the hypothesis that the most appropriate aggregation unit is the nation, since country specific approaches and characteristics of the innovation systems contribute to explain the framework in which agents operate. This framework is however not without fallacies, and the same authors that advocate for its use recognize the conceptual limitations. According to Nelson (2000), the analysis of an innovation system at a national level, has three different main limitations:

- sector-specific dynamics;
- macroeconomic and international convergence;
- lack of uniformity within a nation.

The classical approaches to NIS treat internationalization not much as a threat to the validity of the concept per se, but they argue that due to international convergence, any NIS has to be seen as an open system: policies and study approaches that will not take this element into account, will not be likely to focus on the most important issues and give appropriate recommendations.

> The term [NIS] suggests much more uniformity and connectedness within a nation than is the case. (…) Increasingly, the attempts of national governments to define and support a national industry will be frustrated because of internationalization. (Nelson, 2000)

In spite of this caveat, the aggregation at national level does not seem to be under scrutiny, and in fact, the sources of "lack of uniformity within a nation" are not explained by different dynamics which happen at a sub-national, i.e. regional, level, but they are rather justified through the other two sources of differentiation, sector-specific dynamics and dissimilar impact of international dynamic.

The institutional learning school takes a different approach to the problem. The starting point is the focus on the interaction within the socio-economic system and the emergence technological innovation. The concept of NIS is not found to be the most appropriate level of aggregation:

> The idea of a NIS, qua conceptual framework, is very crude indeed from a policy analysis or organization management point of view. (De la Mothe and Paquet, 2000)

According to this school of thought, the main limitations of the NIS approach are:

- **the analysis tend to focus on formal R&D activities**. New approaches have found that for many innovations, the most creative and breakthrough aspects had to be explained considering informal networks, spillovers, and synergies.
- **The national dimension is too broad** to focus on the complexities that characterize the regional level. Local administrations and growth poles are the geographic dimensions where some of the most important decisions take place, and where some of the most important factors which determine local competitiveness develop.
- **The concept of NIS goes with the idea of economic sovereignty of a nation**. The growing importance of the global market diminishes the bilateral association between

> government and local economy. More and more local and national systems of innovation depend upon (and can influence) decisions taken elsewhere in the world.

The most appropriate level to look at this issue is therefore a "meso-level" which focuses on development blocks, technology and industrial districts, and innovative milieu, Camagni (1991) and Hall (1990).

Ohmae (1993) writes that the "nation state has become an unnatural, even dysfunctional unit for organizing human activity and managing economic endeveaor in a borderless world. It represents no genuine, shared community of economic interests, it defines no meaningful flows of economic activity. On the global economic map the lines that now matter are those defining what may be called regional states."

An early approach to explore the sub-national dimension of technical change can be found in the core-periphery models. Vernon (1960) justifies the spatial dimension of the industry life cycle, focusing on the importance and localization of external economies. He notices how, as an industry matures, firms tend to move away from the core, looking for other localization advantages in the periphery. This phenomenon frees resources in the core, for firms to focus on the next new industry. Norton and Rees (1979) empirically test the dynamism of this model, and they show that the "innovative capacity as a source of industrial rejuvenation" of the core cannot be given for granted, and that the decline of the Manufacturing Belt in America shows that, as well as the localization of mature industries, so the rapid-growth industries can disperse. This study concludes recognizing the complex dynamics that enter into play:

> It is not one cause per se but the accumulation of causal relationships that determined this dispersal of innovative capacity to the peripheral states of the U.S. (Norton and Rees, 1979).

A better understanding of the economics and management of innovation (Rosenberg, 1982) provides some of the elements to shed some light on the dynamics of the local system of innovation. These progresses justify the shift of attention from a national to a regional level. The attempt has been to understand better the "micro-foundation" of innovation (Dosi, 1984 and 1988). Technological change and innovation, in line with the intuitions of Schumpeter (1943), is still the main source of competitive advantage that firms have to defend their position on the market or to break through new markets.

Three different set of concepts are critical to understand the progress of the economics of innovation and technological change.

Bounded rationality and absorptive capacity. In a context characterized by bounded rationality a la Simon (1972), it is important to look at ways that organizations combine tacit and codified, external and internal knowledge in their effort to learn and imitate. The main tenant of Simon's theory is that individuals (and organizations), are not optimal in their decision making process and only in some cases "locally optimal" in the process that leads to the accumulation of information that is relevant for their choices. There are costs associated with the acquisition and processing of information, and therefore, most of the situations that individuals and organizations operate in, are characterized by uncertainty. It follows that, in order to understand agents' behavior, is necessary to dismantle the rationality assumption which lays at the hearth of the classical economic theory. Simon suggests that the best way to understand individuals' behavior is to assume "bounded rationality", where agents behave in a manner that is "nearly optimal with respect to their goal and the resources that are available to its accomplishment". Following this line of though, in terms of innovation and technological change, Cohen and Levinthal (1990) introduce the concept of absorptive capacity, which in a bounded rationality setting represents one of the most important assets that firms have to use and improve. The concept of absorptive capacity helps explain the way individuals and organizations learn since:

> prior related knowledge confers an ability to recognize the value of new information, assimilate it, and apply it to commercial ends. These abilities collectively constitute what we call a firm's "absorptive capacity". Cohen and Levinthal (1990)

Organizations differ from individuals since the forms of "collective learning" they develop have the goal to achieve commercial exploitation of ideas and competence. Communication within the organization is also critical, since learning happens at various levels, that not always share the same tacit knowledge and language. There is a tradeoff between the flexibility that the organization needs to allow its sub-structures to operate (and develop tacit forms of knowledge) with whom to pursue new forms of knowledge, and the function of "gate-keeper" that the organization needs to embody in order to assure a codified and shared form of knowledge which becomes the form of communication to assure a fruitful transfer and exploitation of knowledge absorbed from outside. Both the intensity and direction of learning are therefore critical to explain organizations' innovativeness and growth. Investments in formal in-house R&D investment is only one way through which firms grow their knowledge and experiment new technologies, but R&D is also important to make the organization able to absorb and exploit knowledge produced elsewhere. The returns on this investment and learning are highly cumulative since "learning performance is greatest when

the object of learning is related to what is already known", the direction of R&D investment and learning shapes the direction of the organization's absorptive capacity, and leads to a constant reshaping of the boundaries of bounded rationality, and situations of lock-in and lock-out, with respect to specific technological realms.

Routines, technological paradigms and dynamic capabilities (Nelson and Winter, 1982; Dosi, 1982; Teece et al., 1997). When the assumption of perfect information assumption is abandoned, technology is not any more a trivial maximization problem. For the economics of innovation, the main consequence of the bounded rationality assumption is that technological change choices are "ill defined problems", with multiple possible (suboptimal) solutions. An organization has to solve these problems relying on both codified and tacit knowledge. Nelson and Winter (1982) suggest that through experience, organization build memory and experience and actually develop routines for problem solving activities. Firms are seen as a bundle of routines that in fact represent one of the most important assets of the organization. Routines evolve through time, and in a competitive environment typical of non centrally planned economies, they go through a selective process, which resembles Darwinian evolution of different DNA setting and biological species. Routines optimization is therefore not a useful way to look at firms dynamics, whereas survival and evolution of the organizations that rely on a specific set of routines is a more relevant research question. Routines act as "focusing devices" (Rosenberg, 1982), to explain firm specific choices regarding technology and technological change. Dosi (1982) specifies the nature of these devices suggesting an analogy between scientific and technological paradigms:

> Both scientific and technological paradigms embody an outlook, a definition of the relevant problems, a pattern of enquiry. A technology paradigm defines contextually the needs that are meant to be fulfilled, the scientific principles utilized for the task, the material technology to be used. (...) a "pattern of solution" of selected technoeconomic problems. (Dosi, 1982)

Technology is therefore a variable that does not only define the operations of the firm, but technological change has to be part of the strategic decisions of an organization. In order to look at this specific issue, Teece et al. (1997) define the concept of dynamic capability of firms and argue that in environments characterized by rapid technological change, anticipation, early adoption and adaptation to new strategies and technologies might well be among if not the most important factors to determine the competitive advantage of firms.

Path dependency and technological trajectories. Technological paradigms are selective, finalized and cumulative in nature. Their systematic application leads to the emergence of particular technological trajectories. Path dependency (David, 1986) is a consequence of

> cumulativeness. David argues that the emergence of sub-optimal technological outcomes can only be explained through a cliometrics perspective that shows how the development of a market got locked in a specific technological trajectory. The direction of learning and change in industrial sectors, as well as the development of local economic systems (Krugman, 1991), are determined by "accidents leading to a cumulative process".

This direction of discourse leads to a renewed interest for external economies and to factors such as localization and concentration of knowledge and activities (Thomas, 1985; Sokoloff, 2000). The most common approach that innovation economists decide to follow, in order to understand regional innovation systems, is to find coherent and replicable methodologies to measure external economies. Among the three dimensions identified as the sources of external economies in the local cluster (or industrial district), the economics of innovation focused on the study of knowledge and R&D spillovers. Krugman argues that since "knowledge flows are invisible; they leave no paper trail by which they might be measured" economists should focus on the other two sources of positive feedbacks and externalities, as theorized by Marshall: the pooling of demands for specialized labor and the development of specialized intermediate good industries.

Jaffe (1986) takes up Krugman's challenge, arguing that knowledge spillovers among the firms in an industry are particularly relevant and they actually "do leave paper trails" as evidenced by the analysis of patents and patent citations. Datamining techniques using patents prove to be particularly useful to explore concentration of technologies and the circulation of knowledge among firms and research labs that are inventing and wish to protect their IP for commercialization. Patent citations, in particular, are a proxy for knowledge spillovers. In the early applications, the use of patents finds relevant empirical evidence for the presence of spillover across industries that share a common technological base. The same studies show empirical evidence for the concept of absorptive capacity already discussed, since the firms that seem to have the most significant positive returns for knowledge spillovers from other organizations, are the firms that invest more heavily in internal R&D. Consequent studies looked at the localization and line of business of citing and cited inventor and/or assignee of the patent, to explore the geographical concentration of knowledge flows. US patents have particularly desirable characteristics as a measurement tool, and in spite of the approximations and assumptions that need to be made in order to interpret their significance, they make possible comparisons through space and time. Jaffe et al. (1993) are able for example to show that the location matching probability of citing and cited patent is significantly higher than a "control frequency" which takes into account only the concentration of a specific technology. Assuming that patent citations do in fact measure knowledge flows, this approach is able to show that over time knowledge propagates from the center where new inventions are

produced, to the proximities of the center, and over time to the periphery, like the wave produced by a stone in the water. The use of patents and patent citations becomes very popular, and finds applications to regional studies such as in Porter (2001 and 2003). Porter and colleagues estimate the potential of a nation to innovate, basing these calculations on a projected production of patents which is then mapped against the real one. The use of patents is here combined with the focus on cluster-specific conditions and linkages, given the importance of "local spillovers for innovation".

Other "soft" indicators, much more difficult to measure and generalize, are closer to the phenomena that cause the emergence of positive feedbacks and virtuous path dependency, which in turn are useful to explain the dynamic of location advantages. Both nonmarket and market transactions contribute to the presence (or absence) of these positive feedbacks.

The transactions that happen outside the market are particularly difficult to analyze and reinterpret in terms of their effects on local economic competitiveness. Given the already discussed importance of tacit knowledge, regional studies focused on the mechanisms that make its circulation more pervasive. Putnam (1993) in particular notices that the level of trust present on the market is not enough to allow a productive exchange of experiences, and collective learning. In his studies, he defines social capital as the "features of social organization, such as networks, norms, and trust, which facilitate coordination and cooperation for mutual benefit". Putman finds out that the presence of "strong traditions of civic engagement" and local institutions which preserve social capital are associated with more prosperous communities, not only in social but also economic terms.

A similar attention to trust and its effect on local competition can be found in the analysis of transactions that happen in the market. Growth pole theory shows that certain kinds of investment and industrial presence have propulsive effect on concentration, technological change and competitiveness (Perroux, 1988). One of the main critiques of growth pole theory is its inability to explain the causality behind the propulsive effect of an initial investment, in particular because of the lack of attention to the interconnections that should characterize the system. Lorenzoni (1997) shows how the achievement of positive feedbacks within industrial concentrations requires a hybrid system of firms that are bonded together in external and internal networks. The conclusions of the previous section pointed out how some authors (see for example Harrison, 1992) insist on the fact that external economies are not the only relevant aspect of the clustering phenomenon, but the analysis should focus on social interaction, informal networking and the way that un-codified knowledge exchanges happen. In a context characterized by technological change and bounded rationality, such elements are extremely relevant, and "trust" is found to be an important element to

explain also transactions that happen on the market, and ultimately impact on the competitive advantage of firms, and more in general for the possibilities of growth for a region (Cooke and Wills, 1999). Sabel (1993) considers trust as a precondition for social life, and when it comes to business, agents realize that a "studied trust" approach is necessary, in order to achieve better results and get the most from the transactions from other agents in the system. Interactions that take place at a local scale are more likely to be characterized by high trust than interactions that take place at a nonlocal level.

The achievement of a desirable level of trust is however not always possible without the intervention of institutions that facilitate this process. The study of how trust comes about and what are the implications for the local economy leads to a different attention for the phenomenon of clustering. The theory of the associational economy (Cooke and Morgan, 1998 and an empirical approach in Cooke and Wills, 1999), and the concept of "innovative milieux" (Hall, 1990) focus more on the concentration and exchange of knowledge, rather than on the agglomeration of production in a particular industry.

According to Storper (1992), knowledge and technological changes are the most important dynamics to observe to understand the competitive advantages of "technology districts":

> Technological advantage exists when the actors in a given place possess products, processes, and attendant knowledge that permit them to produce goods and services not elsewhere available.

Technology districts become therefore the most appropriate unit of analysis in the study of global competition, on markets that are increasingly dependent on "product-based technological learning", and where local specificities are matching the requests of a global demand. The next section will explore this issue further, discussing how the rules of localization and competition change, as technology and socioeconomic conditions create the opportunities for a global division of labor.

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Regions in the Global Knowledge Economy

Regions are territories for global competition. Knowledge intensive goods are in many cases the object of the most desired transactions. Innovation and technological change are therefore important variables to explain the rise and fall of new and old centers of production. Berger and Locke (2001) show the importance of a new research question: what is the impact of globalization on the clustering advantages that have been discussed so far?

The previous section suggested that, as a new understanding of the local economy and of the local economic system comes about (Sabel, 1989), scholars face the challenge to define the appropriate framework for the study of the changing role of regions in the world of global competition of knowledge (Storper and Scott, 1995; Storper, 1997). These studies reinforce the importance of regions, in spite of the advances in transportation and telecommunication technologies, since:

> there is powerful evidence that changes in the technology of transacting are sometimes outweighed by the creation of new networks of transactions that are highly sensitive to geographical distance by virtue of their substantive complexity, uncertainty and recurrence over time. (Storper and Scott, 1995)

This is the place where the economics of innovation and the study of regional economic systems converge. Freeman (1994) writes that the importance of learning, external sources of knowledge and incremental innovation have become “the mainstream understanding of technical change”.

Florida (1995) introduces the concept of the learning region as the “underlying infrastructure” which facilitates the flow of knowledge, ideas and learning, for a new form of global, knowledge intensive, capitalism, which substitutes the concept of the region (and of national state) that was present in the mass production time.

One of the main tenets of this literature is that the development of new technologies and markets does not bring into being the end of geography. On the contrary, geography becomes even more important, since many of the factors which determine success and failure of firms and economic systems on the global market are embedded in the local production and knowledge system.

The literature that looks at regions in the context of globalization is variegated and quite established. This statement focuses only on part of it, and in particular, on the two dimensions that the local systems of innovation considers, in order to adapt its prediction to the dynamics of globalization:

- *the industry dimension*: internationalization of competition, firm location and networks;
- *the global-local dimension*, and the way knowledge and competences change and are accumulated at a local level.

Other streams of the literature focus on the conditions for a region, to become an hospitable place for foreign direct investment, and the conditions that increase the likelihood of knowledge and technology transfer to the local economic system. Elements such as infrastructure, education, skilled labor, currency and tax incentive policies, intellectual property right protection systems, the presence of a (potential) domestic market and the presence of an interland that could become the next site for expansion are considered, just to name a few.

The industry dimension.

Internationalization of competition, firm location, and the key issues posed by Penrose (1956), Hirsch (1967 and 1976), Buckley and Casson (1976), are very relevant for the study of regions and how they are able to attract investment and knowledge formation activities (Frobel et al., 1978). Vernon's studies on the changing location of value-adding activities (Vernon, 1966; Vernon, 1974) are an attempt to introduce more realistic explanations for the theory of trade. As it has already been argued in the previous section, Vernon argues that during the life cycle of an industries, it is possible to observe a change in the relative importance of external economies, that lead to different sources for localization advantages, and therefore do different drivers for location and division of labor.

Massey (1979) defines three elements that lead to the international division of labor: (1) a growing automation of production, (2) the growing vertical and horizontal dimensions of firms and (3) the modularization of production, that allows for a geographical separation of the different phases. **Multinational enterprises** are most of the time at the center of a very complex network of internal and external transactions. The findings of convergence theory explain, at least partially, what could be the consequences, and foreseeable socio and economic implications, of the geographical centralization of executive power governing a global manufacturing and market system. Dunning (1977) focuses on the regional implications of the relocations of multinationals' competitive advantage, on the importance of location in MNEs strategies (see also Kaldor, 1985), and the impact of both liberalization and technological/organizational progress (Dunning, 1998).

More recently, the study of **production networks** (Reich, 1991; Cohen and Borrus, 1997, Dicken, 1998) leads to a complete rethinking of the organization of these groups of firms, where control and ownership are separated, even geographically, and the most important factors that determine the strength of the firms are the generation and circulation of ideas within the network.

New issues of regional or national identity, competitive advantage, different national approaches to the networks of production, and a new form of capitalism, lead to significant implications for intra-firm relationship inside, and industrial policy.

Global production network are seen as an alternative to multinationals, or other vertically integrated organizations. A part of the literature focuses on the consequences of this new form of global **vertical specialization**. In particular, very much relevant for this discussion on the new role of regions in the global economy, is the emergence of transnational technological communities, and the observed reversing of the brain drain phenomenon to a "brain circulation" dynamic (Saxenian, 2002). This is one of the elements that contribute to the turbulent dynamics of the rules for international competition, and to the creation of new centers of knowledge accumulation, innovation and growth, and "innovation in the periphery". The focus of the interest shifts therefore to another, maybe unexpected, consequence of vertical specialization, namely the relocation and globalization of R&D investment, and key advanced tertiary activities (Florida, 1997; Kenney and Florida, 1994; Acs, 2000). Particularly relevant policy implications follow for both developing and developed countries and for the strategy of companies that take part into this process, since it was thought that the competitive advantage of the most advanced economies, even in a context characterized by continuous outsourcing of production, was going to rest upon the concentration, and continuous regeneration of the innovativeness of these activities.

Technological advances in telecommunication and transportation are the main drivers for strategic location shifts. They also open up difficult organizational challenges that are significantly **sector specific**. The study of the particular dynamics within an industry (Storper, 1992; Macher and Mowery, 2003) and strategic decisions about decentralization (Mowery and Teece, 1992; Mowery, 1995), explain the emergence of new industrial practices, such as contract manufacturing, and the semiconductor ables firms (Leachman and Leachman, 2003), that changed the geography of production and the international division of labor (Luthje, 2002).

The Global-Local Dimension and Regional Competitiveness

The advances in IT bring about a new technological revolution, and the "amplification of brain power" (Cohen et al., 2000) has not been without consequences for the geography of production. In the era of digital goods and digital markets, distances between industries and regions are reshaped, but they do not cease to exist (Macher and Mowery, 2003). The two drivers of amalgamation of national capitalism and the renaissance of regions are the two forces behind the new geography of capitalism, whose main characteristic is the creation of a "global mosaic of regions" (Scott, 1996).

A prominent research question is the understanding and the definition of those factors that lead to the acquisition or loss of global leadership by a region. Storper and Scott (1995) list four reasons why the local dimension of global competition matters:

- the nature of local networks,
- the "leaky" nature of knowledge and the informal channels of innovation,
- the local labor markets,
- the local economic culture and order.

When the unit of analysis is the region, case studies (See here: Hall, 1985; Nelson and Wright, 1992; Saxenian, 1994; Castells and Hall, 1994; Romer, 1996; O'Riain, 1997; Cooke and Morgan, 1998; Markusen et al., 1999) are found to be particularly useful research tools, to show the relevance of specific factors in very successful or unsuccessful regional economic systems, given the local content and importance of history of situations when external economies and increasing returns are present (Arthur, 1989).

Reich (1991) argues about a new global division of labor, which makes irrelevant the classifications of employment used so far. Particularly important is therefore to understand, what are the factors that determine the localization of what Reich calls the "symbolic analysts". Feenstra (1998) argues that the international disintegration of production has significant repercussions on the demand of both unskilled and skilled labor. Such a shift in demand is "observationally equivalent to the changes induced by technological innovation", with similar implications in terms of structural unemployment and social inequities. Both manufacturing and services might be affected by this phenomenon. Dossani and Kenney (2003) argue that the developments in transformation, telecommunication and information technology, and the modularization of the service process, might lead to a displacement of service activities which will be faster than the displacement experienced in the manufacturing sector.

Borrus and Zysman (1997) argue that cross-national production networks and "Wintelism" change the relative strategic importance of different phases of production, and consequentially redistribute long-term value creation, and competitive advantage among regions and companies. One of the consequences of globalization is the displacement of manufacturing activities (Cohen and Zysman, 1987; Sturgeon, 1997) and innovative, fast growing industries (Norton and Rees, 1989) from old to new core centers of production. The physical separation between design and manufacturing poses the question whether leadership in product development can be held if the underlying technologies and their implementation in production systems cannot be maintained.

Again, the recent development of the literature shows that such dynamics are very much sector (as well as region) specific. Zysman (2003) argues that for emerging sectors, such as biology and nanotechnology, "where is all about how you make things (..) the question of production, product innovation, value creation, and market control remain entangled", and such issues are dense of implications for the development of the industry, localization of production and re-industrialization or transition strategies (Hall, 1985).

Glocalization has therefore to do with the explanation of regional success and failure stories, and goes beyond the study of the factors that led a particular place to be attracting for foreign direct investment. According to Malecki (2000): "the goal of globalization represents achieving a balance between being global, with the scale advantages associated with size and global scope, and being local within each regional or national market and network of resources".

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